American Public Power Association

Community Solar A–Z
Guide for Public Power Utilities

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American Public Power Association

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The American Public Power Association represents not-for-profit, community-owned electric utilities that power homes, businesses and streets in nearly 2,000 towns and cities, serving 48 million Americans. More at www.PublicPower.org.

Public Power Forward is an APPA strategic initiative to help members address technological and regulatory changes reshaping their relationships with customers. APPA provides education and training on relevant issues and new technologies. APPA also develops tools to help members integrate distributed resources, energy efficiency, and demand response into their businesses and operations.

Introduction

What is Community Solar?

Solar power capacity in the United states is expanding rapidly while installation costs continue to drop, making it increasingly popular with consumers. Declining costs and growing consumer interest are increasing the construction of both utility-scale and rooftop solar, while community solar has emerged as a third viable option. Community solar projects have proven immensely popular and have helped keep the utility visible within the community as an environmental leader.[1]

For this guidebook, community solar is defined as a solar power installation that is jointly owned or leased by community members or — if owned by a third party — provides shared benefits (including purchased power, credits against electric utility bills, and fixed rates for power) to participating community members. The utility-sponsored community solar project model is the predominant model for public power utilities. Under this model, customers generally receive a bill credit for their share of generation from the project.

Why Community Solar?

Community solar helps public power utilities to offer a valuable service to customers who are seeking renewable power but lack the financial means to buy or lease rooftop solar panels, have rooftops on which they cannot install solar panels, or may be renters.

Public power utilities can develop goodwill with these customers and the community at large by providing community solar. Utilities can also demonstrate environmental stewardship in a tangible way.

Community solar also offers utilities other potential benefits. Customer-sited distributed energy resources (DERs) can create rate, reliability, operational, and safety issues. While these issues may also arise with a community solar project, they can be simpler and easier to manage. Community solar projects can be sited to maximize production, manage operational issues, and increase community visibility. Economies of scale make community solar a cost-effective alternative to residential rooftop solar installations. While there are no precise figures differentiating community solar costs from utility projects and rooftop DERs, the cost of community solar is generally higher than utility-scale solar but much lower than customer-sited solar, because of size differences.[2]

The table below highlights the potential benefits of community solar for customers and utilities.

Utility Benefits

- Helps respond to otherwise unmet customer demand for solar
- Demonstrates utility's responsible environmental stewardship
- Improves customer relationships
- May optimize system benefits of solar production
- Offers better visibility of system production and interplay with system operation and unit dispatch

Customer Benefits

- Economies of scale mean lower costs
- Access to solar for customers that cannot or may not want to install rooftop solar
- Marketing benefits to commercial/industrial customers, depending on Renewable Energy Credit issues
- Simplicity in billing
- Helps avoid permitting, maintenance, and negative aesthetic impacts[3]

Although there are undoubtedly benefits to community solar, it does not come without costs. In the worst case scenario, a utility might invest time and money only to

1 http://www.seattle.gov/light/solarenergy/commsolar.asp

2 Rocky Mountain Institute, *Community-Scale Solar: Why developers and buyers should focus on this high-potential market segment,* Insight Brief (March 2016), p. 9.

3 Adapted from Leidos presentation to APPA members.

Introduction

discover customers simply are not interested. Utilities must seriously consider why they want to develop a community solar program, what benefits they want to achieve, and how they will achieve them.

About This Guidebook

The first section of this guidebook examines the pros and cons of community solar and asks if it's the right choice for your community and utility.

The second section provides an overview of the financial structures for community solar projects, ownership models, and tax and securities issues.

The third section is an overview of program pricing options, and discusses how to price shares and what types of billing mechanisms are available with community solar.

The fourth section discusses program administration, including how to mitigate undersubscription and turnover risks.

The final section explores project design and construction, including site selection, permitting and environmental review, procurement and contracting, and interconnection and technical considerations. The final section also examines operations and maintenance, as well as exit strategies and decommissioning.

Many public power utilities are developing community solar projects — some descriptions are available on the American Public Power Association website, with lessons learned.[4] There are additional case studies in this guide.

4 http://www.publicpower.org/Programs/interiordetail2col.cfm?ItemNumber=44432&navItemNumber=44433

Section 1

Is Community Solar the Right Choice?

Why do you want to develop a community solar program, and what do you hope to achieve through it? Before you put out an RFP for a third-party developer or start putting out mailers proclaiming your innovative new idea, you must first consider whether community solar is truly the right choice for your utility.

Community solar programs may be the most cost-effective way for your utility to provide a solar benefit to your customers. While they offer a wide range of benefits, they are not without potential drawbacks. This section prompts you to examine some questions about the suitability of community solar for your utility and community. This section will also discuss some of the unique characteristics of public power utilities, and how your specific circumstances may necessitate slightly different approaches than other utilities.

Initial Issues to Consider

Is there internal or external pressure to provide solar resources?

Public power utilities are uniquely positioned to respond to customer concerns and interests, and they often engage with the community to better understand customer desires. With this in mind, there may be external political pressure to develop a solar program, whether it be utility-scale, community solar, or DER. While community solar can have positive reception in the community, utilities have an obligation to consider the full revenue impacts of implementing such a program.

Is there customer interest in a community solar program?

It would be unwise to embark on a project without a basic survey of your customer base. Even if you have established the potential benefits of community solar through an extensive cost/benefit analysis, these benefits will not be realized if customers do not subscribe or undersubscribe.

While your utility might have a good general sense of the community and its interests, that is not enough if you're investing a large amount of money in a program which might not recoup its costs.

CPS Energy in San Antonio, Texas developed a Simply Solar program to allow more customers to participate in solar energy. The Simply Solar program includes a Solar Host leasing program for individual residential customers, as well as Roofless Solar, a 1-megawatt community solar program. The objectives of the program include:

- Providing solar to all customers, including low and moderate income customers, renters, and homeowners whose rooftops cannot sustain solar panels.
- Reducing demand by 771 MW by 2020 and the early retirement of coal generation.
- Hedging fossil fuel prices with long-term fixed solar PPAs.
- Distributing solar more thoughtfully across the grid.
- Adequately recovering fixed costs and reducing dependence on rebates.
- Reducing overall costs of solar through economies of scale.[5]

Do you have the means to implement and run a community solar program?

The median public power utility has approximately 2,000 metered customers and typically lacks the staff to coordinate, implement, and manage a community solar program. The work is not completed on the first day the solar panel generates electric power — it is ongoing. So consider your potential time burden.

However, smaller utilities are not disqualified from engaging in community solar. Small-scale projects are viable and can be managed comparatively easily. Smaller utilities also may wish to work with their joint action agency (JAA) or state association in implementing local projects. JAAs

5 Adapted from CPS Energy presentation to APPA members.

Is Community Solar the Right Choice?

The Delaware Municipal Electric Corporation (DEMEC) has worked with its utility members to implement a number of solar projects throughout Delaware. DEMEC wanted to meet its Renewable Portfolio Standard (RPS) obligation while increasing solar access and participation for renters, students, and customers with limited solar access and/or funds. DEMEC partnered with its member utility the City of Newark to offer customers options to participate in solar projects. Participants pay an entry fee of $50, and then pay for the solar output at a rate that is one cent less than what they would ordinarily pay for electricity. The money from the entry fee is used for community wide energy efficiency measures, such as LED street lighting.[6]

can not only help you secure financing and find partners; they can also provide some of the manpower to operate the program after launch.

Does a community solar program have the potential to benefit all of your customers, even those who do not directly participate?

Public power utilities still need to make sure that community solar projects do not create unreasonable rate disparities among customers. A ratepayer impact measure (RIM) test can be used to quantify the costs of the program, as well as the estimated cash flows, to determine how those costs will be distributed among customers.[7] This is one way to determine if your project will lead to a cost shift to non-participants. Other cost-benefits can be applied in advance to measure other potential impacts.[8]

Do state and local regulations support the development of community solar for your utility?

Some states have policies aimed at promoting the growth of solar resources, and as such they may have tax policies aimed at spurring development. These tax policies will be explored at greater length in the next chapter. Other states have statutes that might place tighter regulations on community solar shares, meaning they could be regulated as securities, even when federal law grants more leeway. Net metering and billing policies may also impact the financial value of community solar. Utilities should be sure to understand all of the relevant statutes and regulations that might impact a community solar project in some way.[9]

Along the same lines, many states have some form of Renewable Portfolio Standard (RPS), although in some states the RPS does not apply to public power utilities. Find out by visiting the Database of State Incentives for Renewables & Efficiency (DSIRE) website,[10] which tracks which states have an RPS goal and their mandated portfolio percentage. Community solar can help public power utilities in states with an RPS mandate achieve renewable portfolio goals.

How does community solar — or solar in general — fit into your portfolio?

Even if your utility does not have a state-mandated RPS goal to meet, the local community may want the utility to have a greater share of renewables in its portfolio (see the first question on external pressures). Community solar offers public power utilities the ability to plan for solar projects in their service territories and consider (and demonstrate to customers and their communities) the full range of the cost, rate, operational and reliability advantages and disadvantages for specific projects. For example, a community solar

6 Public Power Daily, *Public Power Weekly Exclusive: Community solar makes participation affordable in Delaware,* June 8, 2015, accessed at http://www.publicpower.org/Media/daily/ArticleDetail.cfm?ItemNumber=44013. See also the DEMEC website at: http://www.demecinc.net/DEMEC-Solar-Energy-Resources/

7 J.R. DeShazo, Alex Turek, and Michael Samulon. *Guide to Design Decisions for Utility-Sponsored Community Solar.* UCLA: Luskin Center for Innovation (May 2015), p. 22.

8 Ibid., p. 24. The Societal Cost Test (SCT), for example, is akin to a Value of Solar measure, quantifying the benefits of items such as avoided line losses, avoided capacity costs, and non-energy benefits including reduced carbon emissions.

9 See the appendix of ibid., for a summary of community solar legislation in the states.

10 http://www.dsireusa.org/

project may be placed close to a urban load center that may be unsuitable for both multiple small-scale projects and larger utility-scale solar projects.[11]

Will you need to develop new infrastructure?

It is possible your utility will need to develop and/or expand transmission and distribution lines for off-site systems. It may also become necessary to lease land or purchase roof space if the system is off-site.[12] These issues can be avoided or altogether mitigated if the site is on utility or city-owned property, but that might not be feasible, meaning the site will have to be located somewhere else.

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11 David Feldman, Anna M. Brockway, Elaine Ulrich, and Robert Margolis. *Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation*. Golden, CO: National Renewable Energy Laboratory (April 2015), p. 4.

12 Ibid.

Section 2

Financial Structure and Tax and Securities Concerns

If a utility decides to move ahead with a community solar project, several important financial decisions need to be made early in the life of the project. Will the utility directly own the project, or will third-party financing and development be involved? For most public power utilities, third-party involvement of some kind is likely to be required to take advantage of tax credits. Once project financing has been arranged, the project administrator must decide how panels are to be sold and what price. The next step is to determine the best method for crediting and/or compensating participants for their portion of the project. The chosen method may have important implications regarding Securities and Exchange Commission registration and oversight.

Moorhead Public Service (MPS) in Minnesota established its Capture the Energy solar demonstration project in 2011. It provided generous incentives to customers who wanted to install solar panels on their roofs. This pilot program generated moderate interest, so MPS reallocated some of the budget from the Capture the Energy program to a new Capture the Sun program.

The Capture the Sun program was an attempt to promote the community solar concept. MPS conducted an RFP process and hired a local contractor to install arrays, the first of which were built in 2015. Three arrays have been constructed, totaling just over 60 kilowatts, with more slated for 2017. Customers were able to purchase 310-watt panels at $470, or 12 monthly installments totaling $480. Customers who own arrays receive an annual credit for their share of production — MPS determined that the administrative burden was too great to bill monthly.

Ownership Structure

There are many community solar ownership structure models. This subsection explores the pros and cons of each model.

Customer Ownership

Under this scenario, a group of customers organize to develop, finance, and manage a shared solar project. The utility could provide some form of assistance, either indirectly by helping customers find the resources for the project, or directly by hiring a contractor to build the panels while otherwise leaving ownership in the customers' hands. Customers may receive tax benefits if they own the PV panels.

Pros

If a group of customers are motivated by a desire to have more renewable power, the utility can garner a degree of community goodwill by assisting them in developing the project. Financially, the utility is not risking as much as it would through a project it directs or finances. Utility involvement in the project may be important to manage siting and other infrastructure-related issues associated with the project.

Cons

For the customers, this options entails a high degree of involvement and management which they may not be truly able to undertake. At a minimum, there are operation and maintenance considerations and other financial obligations even after the project has been completed and is generating electricity. If customers decide they cannot continue to operate the facility, the utility may either find itself with an obsolete and non-functioning facility or in possession of and responsible for a facility it was not prepared to maintain. This ownership model may require different and more complex rate and billing adjustments by the utility than would other models.

Utility Ownership

Under this scenario, the utility finances, constructs, and manages the project. Another hybrid option is for the utility to purchase a turnkey project: a third party constructs the project and turns it over to the utility at completion. The utility could also take over the project once the third party has realized the benefits of the federal Investment Tax Credit

(ITC). Although a public power utility would be unable to claim this tax credit, the ability to site the project and manage all other aspects of the program might keep it economically viable, and thus the utility might decide to take on the project by itself with no third-party involvement.

Pros

The utility gets to manage the project from start to finish.

Cons

The public power utility's inability to take advantage of the ICT is the biggest drawback of the utility ownership model, at least so long as third parties are not involved. The utility also faces greater financial risk if the project is undersubscribed.

Third Party Ownership

Most public power utilities are likely to be familiar with this model. Under this model, a third party entity completely finances and constructs the project. The utility enters into a power purchase agreement (PPA) with the third party, and in turn enrolls customers into the program. The third party benefits from the federal ITC, and may also take ownership of the Renewable Energy Certificates (RECs).

Pros

This option is likely to be the most economically beneficial, as the third party's ability to claim the ITC may lower the cost to build the solar facility, which in turn may be passed down to a reduced financial commitment from the utility. Furthermore, if the utility is able to obtain full subscription, then it will bear little to no upfront cost and it can be assured a steady stream of revenue to meet the cost of the PPA.

Cons

If the program is undersubscribed relative to the PPA costs, the utility faces the obligation of the PPA to a new revenue stream, which in turn means non-participants must cover the cost. Also, if the third party maintains ownership of the RECs, then the utility will not be able to use those RECs to meet any RPS obligation. Furthermore, the third party would have day-to-day operational management of the facility.

Taxes and Tax Credits

Tax credits and accelerated depreciation are pivotal elements in community solar, though these incentives can only be directly claimed by taxable entities. The ITC is one of the primary financial instruments used to spark project financing. Solar developers can obtain a 30 percent tax credit on their capital investment in solar projects.[13] Third party developers working with publicly owned utilities can monetize the ITC and accelerate depreciation both to their benefit and to the benefit of their utility partner.[14] This lowers project costs and reduces the LCOE.

Another financial incentive available to third party developers is the Modified Accelerated Cost Recovery System (MACRS), which allows depreciation for recovering property investments for tax purposes over a five-year time period. Combined with the ITC, these federal tax incentives can offset as much as 50% or more of the cost of solar projects.[15] Like the ITC, only taxable entities see the benefits of the MACRS, though third party associates can still claim both credits.

Tax investors in solar projects, whether utility-scale or community solar, generally tend to favor a hybrid PPA/ownership model, where the utility purchases the output of the project for the five-to-seven-year period during which tax benefits are available. In year six or seven, the utility assumes ownership of the project. While somewhat more complicated, community solar projects can be designed to accommodate this change in ownership.

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13 SEPA, *Utility-Scale Solar: The Path to High-Value, Cost-Competitive Projects: How to Optimize the Economics of Utility-Scale Solar Photovoltaic (PV) Facilities* (2016), p. 10. The ITC, when applied to investor-owned utilities (IOUs) for rate-making purposes, has to be "normalized" or spread over the life of the asset.

14 Ibid., p. 11

15 DeShazo et al, *Guide to Design Decisions,* p. 13.

Section 2

Financial Structure and Tax and Securities Concerns

The City of Ashland Municipal Utility in Oregon has developed two solar projects – Solar Pioneers, a 30-kW system built in 2000, and Solar Pioneers II, a 63.5-kW system constructed in 2008. Output from Solar Pioneer II was sold to customers initially at $701.75 for a single panel.[16] Currently a full panel can be purchased at $536.50, or $8.94 per month on a zero-interest loan.[17] The City of Ashland used the Oregon Business Energy Tax Credit by selling the tax credit associated with the project and receiving a one-time payment.[18]

The City of Ellensburg in Washington developed a 112-kW community solar park. The project began in 2006, and was completed in phases, with the final phase completed in 2011.[19] By developing in phases, the city was able to recoup funds from the initial phases to cover the costs of subsequent phases.[20]

Other Financing Opportunities

Despite being tax-exempt, public power utilities have found other ways to finance renewable projects in a way that can capture certain benefits. Several public power case studies show benefits, other than the ITC, that might be available. These may include state-specific tax credits, or alternative methods of implementing the program.

16 See presentation at Ashland's website at http://www.ashland.or.us/Files/AshlandSolarProgramPresentation_9_26_12.pdf

17 http://www.ashland.or.us/Page.asp?NavID=14017

18 DeShazo et al, Guide to Design Decisions, p. 14.

19 http://www.solargardens.org/ellensburg-community-renewable-park/

20 Ibid.

Securities Issues

One of the most challenging issues surrounding community solar is the question of whether a utility offering a customer participation in a solar program qualifies as the selling of a security, thus triggering requirements of Securities and Exchange Commission registration.

Sellers of financial instruments deemed to be securities must register with the SEC. The purpose of this registration requirement is to ensure financial information about the security is disclosed to potential investors.[21]

Case law has established precedent as to what the courts will deem to be securities. The Supreme Court's decision in SEC v. W.J. Hovey Co.[22] has continued to set the parameters of what comes under securities regulation as an investment contract. As summarized in a recent note in the UCLA Law Review, a contract is considered an investment contract when the buyer invests his or her own money in a common enterprise regarding which he or she has been led to expect projects and which profits will accrue solely from the efforts of the promoter or third party. This criterion is known as the Hovey test.[23]

With regard to community solar, shares in a community solar project easily meet the first two criteria of the Hovey test. With regards to the third criterion, the cumulative bill credits will generally be greater to than the initial investment, leading Booth to conclude that a participant can reasonably expect to "profit" from the investment in the solar project.[24] As for the fourth criterion, someone other than the buyer will be making investments in siting, construction, and in all of the elements of designing and implementing the project.[25]

21 Ibid.

22 328 US 293 (1946)

23 Samantha Booth, *Here Comes the Sun: How Securities Regulations Cast a Shadow on the Growth of Community Solar in the United States,* 61 UCLA L Rev. 760 (2014), p. 781.

24 Ibid., p. 782.

25 Ibid.

An SEC response to a no-action letter submitted by renewable energy developer CommunitySun has generated some optimism that the SEC would not treat solar shares as securities. CommunitySun offered a version of a community solar program to customers. It submitted a no-action letter to the SEC arguing that the shares sold in its SolarCondo program do not constitute a security as the primary motivation for customers was personal consumption. The bill credits they received were a secondary benefit, while energy use and the benefit to the environment were their overriding concerns.[26] SEC staff indicated that the purchase of a SolarCondo share did meet all of the criteria in the Hovey test except for the expectation of profit.[27]

NREL summarized the importance of this letter:

> Based on the CommunitySun no-action letter, the central questions in determining whether an interest in a shared solar project is considered an investment contract and therefore a security appear to be the motivation of the participant and the perception of the financial instrument. How a customer is compensated for a share of electricity, the documentation of the agreement, and the marketing of the product may all influence the customer's motivation and perception. Therefore, states, jurisdictions, and developers should keep in mind that the way a shared solar compensation framework is structured and marketed — that is, whether it could be seen or used as a financial play as opposed to simply providing a mechanism for the use of renewable energy or credits for that energy at an individual's meter — can have an impact on whether an interest is viewed as a security under federal law.[28]

There are still some lingering questions that have not been resolved. First, the SEC staff response was to a single letter involving one particular project, and thus does not necessarily reflect how the SEC would rule in subsequent cases. Therefore, the CommunitySun no-action letter is of limited applicability.

Even within the context of the CommunitySun case, it may be challenging to prevent community solar shares from being classified as securities. For one, net metering, or virtual net metering (VNM)[29] in the case of community solar provides a bill credit for the customer's share of the solar project. If the actual energy produced by the array is far greater than anticipated, and/or the customer's consumption level is low, then it is possible for the customer to significantly reduce their monthly bill or even profit.[30]

Attempts to remove the profit-making criterion of the Hovey test may prove difficult. For example, a utility could remove the profit motive upfront by charging a premium on solar shares and making it something more like a green pricing program. But even this runs into difficulties as some jurisdictions have broadened the Hovey test so that as long as a purchaser realizes "a valuable benefit of some kind," the profit prong is satisfied.[31] As for the fourth criterion, this would require having subscribers involved in the day-to-day management of the program, and is thus not a workable solution.

There are a number of exemptions participants and utilities could apply for, but in some cases qualifying for a federal exemption could be overridden by more stringent state laws.[32] Ultimately, the easiest solution might be to simply register the solar share as a security. It can still be sold, it just has to be registered with the SEC.[33] This might

26 David Feldman, Anna M. Brockway, Elaine Ulrich, and Robert Margolis. *Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation*. Golden, CO: National Renewable Energy Laboratory (April 2015), p. 16.

27 Ibid., p.15.

28 Ibid, p. 16

29 For community solar projects, VNM is akin to net metering for individual customer-sited DG. Individual subscribers receive a kWh credit against their metered load. The credit is a pro-rated share of the amount of capacity to which they are subscribed.

30 Ibid., p. 17.

31 Booth, Here Comes the Sun, p. 783.

32 See Booth, *Here Comes the Sun,* pp. 788-797 for a discussion of the four potential exemptions, and the drawbacks to each. For example, one exemption prohibits advertising the offering, thus making marketing much more difficult.

33 Feldman et al, *Shared Solar,* p. 18.

Financial Structure and Tax and Securities Concerns

CPS Energy was told by the contractor it worked with not to offer production guarantees, otherwise the product could be considered a security. On the other hand, providing estimates of likely production would be acceptable, and many utilities provide such estimates on their websites and in program literature.

create a paperwork burden, but would not necessarily make the program cost prohibitive.

This issue has not been resolved, and there is some disagreement as how to proceed. SEC oversight might be a consideration as you think about how to market and design your program, especially as you think about how to price shares and compensate participants, a topic which will be discussed in the next section. APPA has also a commissioned a white paper that goes into much greater depth on the application of securities law with regards to community solar.[34]

34 *Legal Implications of Community Solar: Certain Securities and Tax Law Considerations,* prepared by K&L Gates LLP for the American Public Power Association, November 2016.

Individual Claims to the ITC

Another unresolved issue is how an individual customer can claim the 30% federal solar residential tax credit for the purchase of solar equipment in a community solar project. The Internal Revenue Service, in a 2015 private letter ruling, concluded that a utility customer who purchased panels in a member-managed community solar farm in Vermont could claim the residential tax credit. However, the letter ruling was rather narrowly written and, as with the SEC CommunitySun no action letter, applies to the one customer.[35] One key factor of the ruling was that the customer had actual ownership of the panel on the date it began operation. Left unsaid by the letter ruling was whether there could be limitations on how purchase could be financed.

35 Julia Pyper, "IRS Guidance Finds Individual Community Solar Investor Qualifies for the Federal Tax Credit," GreenTech Media, September 8, 2015, accessed at http://www.greentechmedia.com/articles/read/IRS-Guidance-Finds-Individual-Community-Solar-Investor-Qualifies-for-the-Fe. The private action letter can be accessed at https://www.irs.gov/pub/irs-wd/201536017.pdf.

Section 3

Program Pricing

As discussed in the previous section, how (and how much) customers are charged for participating in a community solar program, as well as how benefits are distributed, may have ramifications for federal regulatory oversight. More importantly, these considerations will impact project financing and utility cost recovery. There are different options for participation pricing and customer benefits.

Utility Cost Recovery and Rate Design

As explained in an APPA whitepaper on rate design,[36] utilities conduct cost of service (COS) studies to develop rates that allow the utility to recover fixed costs.

Community solar programs are one way utilities can offer solar programs to their customers in a financially sustainable manner. However, cost recovery and rate design issues are still very relevant, as utilities need to determine how cost and benefit mechanisms will work together to avoid potential revenue shortfall and customer subsidy issues, while still encouraging participation.

Ensuring Cost Recovery and Benefit Allocation

There are two primary ways to ensure fixed and variable cost recovery, and both are simply different ways to charge participants for taking part in a community solar program. There are capacity-based pricing structures where a customer is charged a flat amount per watt or panel, and then energy-based pricing structures where the customer is charged on a per-kWh basis. There are pros and cons to each approach, though capacity-based pricing has generally been the more dominant trend.

36 Jim Cater and Paul Zummo, *Rate Design Options for Distributed Energy Resources* (Arlington, VA: APPA, 2016).

Capacity-based Participation

Under a capacity-based program, participants can own, lease, or subscribe to a certain number of panels or a proportion of the project. In return, participants receive bill credits proportioned to their share of the project.[37] Normally participants pay upfront, before the project has been fully constructed and is producing energy. Participants either pay a dollar amount per watt, or in some cases they purchase the array(s). The participant owns their portion for the life of the system, though this share can be transferred or sold to another utility customer. In return, the participant typically receives a bill credit for the energy produced by their share of the community solar project each month.

Energy-based Pricing

Energy-based pricing, or pay-as-you-go, reflects an arrangement whereby the participant pays for the system through a per-kWh charge determined by the cost of energy from the solar project. This rate is typically priced at a premium over the current retail rate. Since the rate is normally locked in, this solar rate may fall below the retail rate should the utility's rates increase in the future, as is likely. The solar project rate is billed to the customer for the energy allocated from the project to the customer.

The energy-based pricing mechanism is a bit more complex to administer, as it requires the utility to separate each participant's energy consumption at the retail rate, and the pro rata share of their ownership billed at the solar rate.[38] With capacity-based pricing, the utility only needs to calculate the participant's share of production, and assign a bill credit based on that production.[39]

Capacity-based pricing also provides a steadier stream of revenue, particularly at the development stage of the project. By purchasing shares upfront, participants provide

37 Feldman et al, Shared Solar, p. 7.

38 DeShazo et al, Guide to Design Decisions, p. 18.

39 Ibid., p. 17.

Section 3

Program Pricing

Cost of Solar

The cost of the community solar program to the utility, which can include project-specific capital and financing costs, fixed operations and maintenance costs (O&M), variable O&M, and/or purchased power costs, as well as program-related costs.

This can be quantified as the incremental cost of the utility purchasing solar relative to its average energy cost.

Value of Solar

The value of solar differs from utility to utility, but is generally/usually derived from the following: avoided energy costs, avoided line losses, avoided/delayed investment in infrastructure. Other benefits (e.g., environmental attributes or RECs) may also be included; these may be tangible or intangible.

This can be quantified as the cost savings realized by the utility due to the solar energy.

Participation Pricing

What the customer pays to participate in the program

Bill Credit

What the customer receives for participation in the program

The comparison between Participation Pricing and the customers' Bill Credit defines the program's economics to the customer

the project developer ongoing financing through the design and construction phases. Energy-based pricing means the recoupment of the capital cost of the project is spread out over the project's lifetime. This moves the cost recovery risk to the utility and its remaining customers.[40]

As the chart above helps to demonstrate, if participation pricing reflects the cost of solar and the bill credit reflects the value of solar, then the utility appropriately recovers its cost of service.

The high, upfront cost to purchase a solar panel may deter potential participants under the capacity-based pricing model. Some utilities offer on-bill financing, allowing participants to pay a fixed monthly fee until their investment is paid off. The City of Ashland, Oregon, for instance, offers a zero-interest loan, and participants pay a little less than $10 per month for five years.[41]

Whichever pricing model is used, the next step is to determine how much it will cost each participant to buy into the program. Customers will want to recoup their program participation costs and higher upfront costs could increase the payback period. Yet utilities and developers need a

40 Ibid., p. 19.

41 Ibid., p. 17.

Solar Energy Cost ($/kWh)	Assumed Annual Rate of Growth of Value of Solar					
	1.50%	1.75%	2.00%	2.25%	2.50%	2.75%
$0.0500	9	8	7	7	6	6
$0.0525	16	14	12	11	10	9
$0.0550	22	19	17	15	14	12
$0.0575		24	21	19	17	16
$0.0600			25	22	20	19
$0.0625					23	21
$0.0650						24
$0.0675	>25 Years					
$0.0700						
$0.0725						

predictable and sufficient cash flow to cover fixed costs and ongoing project maintenance expenses. These pricing decisions could have repercussions for non-participants as well. If the utility decides to keep participation pricing low, non-participants will subsidize some of the project costs.[42] Considering the discussion above about utility cost recovery, it would be counter-productive to have non-participants subsidize the project in any meaningful sense.

The preceding table provides an illustrative example of an analysis conducted to determine the customer payback (in years) of participating in a community solar program. It shows the number of years required for participants to recoup their program costs, at a given solar energy cost and assumed growth rate in the value of solar. The value of solar, for this particular example, is to be realized by the customer as a monthly bill credit, and was defined by the utility as simply the avoided energy costs plus avoided line losses. The value of solar can include fewer, more, or different components depending on the utility.

42 Ibid., p. 21.

Sizing Limits

Some utilities cap the number of energy or capacity blocks customers can purchase — either as a fixed number of blocks, or as a percentage of the customer's maximum load. Utilities might seek to ensure wider participation, thus limiting the amount available for purchase by any one residential customer or business, which could allow for wider customer participation. Rate and financial consideration might also influence this decision. Just as with solar rooftop systems, a customer may purchase enough units that the customer's monthly consumption from the electric utility is less than the amount of power generated from the customer's share of the community solar facility. If this happens, then the customer might wind up with a net negative bill —— meaning the utility would owe the customer money. As discussed in the previous section, utilities should not structure community solar program offerings in ways that look like financial instruments that are profitable to customers. Rather the offering should be designed to allow utility customers to participate in community solar projects to offset the electricity bills they would otherwise incur.

Section 3

Program Pricing

Independence Power & Light in Missouri caps the number of units a customer may purchase to the number of kWs "that are expected to deliver no more than 40% of customer's average monthly energy usage as determined at the sole discretion of IPL."[43]

Realizing Customer Benefits

There are two considerations within the context of customer benefits: the customer bill credit, and other benefits, including the treatment of RECs.

Bill Credits and Participant Incentives

Determining the bill credit mechanism is an important decision because of its impact on financing and cash flow as discussed in the participation pricing section. The credit mechanism could also impact how much the offering looks like a financial instrument, as discussed above.

From an administrative standpoint, the community solar program benefit allocation will require a new billing mechanism. The participant's bill will need to convey both the participant's share of solar production as well as the bill credit for that share of production (if it is a capacity-based program).[44] This may or may not require significant software updates, but the cost of billing systems modifications need to be incorporated into overall program cost and design considerations.

That technical issue aside, of greater concern is the precise allocation of program benefits to participants. Generally speaking, under a capacity-based pricing regime, the participant receives a bill credit based on their share of the generation produced by the array.[45] This arrangement is a form of virtual net metering, and is similar to how most distributed solar customers receive bill credits for their solar production. The table below demonstrates how credits would be disbursed.

Under this scenario, one unit equals 1kW of a 100 kW array. In this example the retail rate for electricity is 10 cents per kWh, and the utility credits at the retail rate.

The example above assumes the bill credit will be set at the retail price of electricity otherwise consumed. Considering the discussion above about cost recovery and the value of solar, the utility might want to consider an alternative arrangement and set the bill credit at a different amount, such as avoided energy costs, the value of solar, the wholesale power market price, or some amount other than the retail rate.

Under an energy-based pricing mechanism the billing is slightly more complicated. The customer is charged for their

Hypothetical allotment of credits for community solar participant

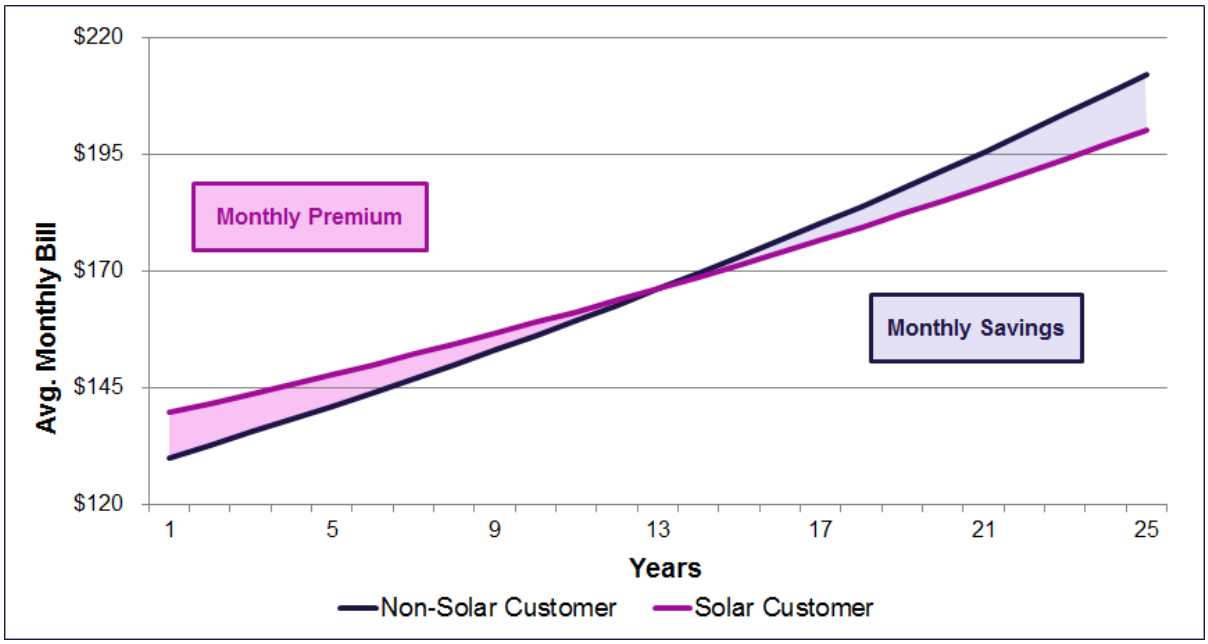
Purchased units	kWh produced by array	Credited kWh share of production	Monetary credit
1	10,000	100	$10
2	10,000	200	$20
3	10,000	300	$30

43 https://www.ci.independence.mo.us/userdocs/pl/CommunitySolarFarm-CustomerAgreement.pdf

44 DeShazo et al, Guide to Design Decisions, p. 28.

45 Ibid., p. 29.

Figure 1



Benton PUD Community Solar Program
Benton Public Utility District in Washington developed the Ely Community Solar Project, which began operating in mid-2015, and is in the process of developing a second site, the Old Inland Empire Community Solar Project. Subscribers pay $250 per 50-watt unit (18% of a panel), and receive monthly bill credit based on their pro rata share of the production. Subscribers also receive a $1.08-per-kWh, state-mandated production incentive. Each unit is estimated to produce 5 kWh of electricity per month.[46]

share of production at a locked-in community solar rate. All additional consumption is then billed at the retail rate.[47] As mentioned earlier, though the community solar rate may initially exceed the retail rate, in many regions it is expected that the utility's average cost for energy, either purchased from the market or from owned generation resources, will continue to rise so that at some point it is above the cost of solar energy. The expected timing of this shift should be carefully considered as it will impact program design decisions and pricing. Figure 1 provides an illustrative example of the forecast of monthly bills for solar program participants versus non-participants and shows that while solar power initially costs more than the default energy supply, eventually solar provides a cost savings to those customers participating in the program.

Most public power utilities with community solar programs use the capacity-based pricing model, and almost all use some type of bill credit mechanism to provide customer benefits, which is the method recommended by the Interstate Renewable Energy Council (IREC) in its Model Rules

46 http://www.bentonpud.org/community_solar/incentives1/. A table is provided showing the costs per unit, as well as anticipated bill savings per share.

47 Ibid.

Section 3

Program Pricing

Orlando Utilities Commission in Florida employs an energy-based pricing mechanism for its community solar program. Customers can subscribe to 1-kW blocks of energy up to 15 kW. The solar rate of energy is 13 cents per kWh[48], and will remain at that rate for the duration of the program. Customers must also pay a $50 deposit, which will be refunded with interest if the participant remains in the program for two years and retains a good credit rating. The deposit will not be refunded if the customer exits the program before two years. If the purchased energy is greater than the energy consumed by the participant, OUC buys back the energy at the retail rate.[49]

Logan City Light & Power in Logan City, Utah, offers customers an opportunity to purchase 100-kWh shares of output from its community solar farm, if shares are available. The first 100 kWh of energy are billed at 12 cents per kWh. This represents a slight premium compared to Logan City's current rates, shown below:

Residential Rate Schedule 1 (the existing residential rate)

$0.0949 per kWh for the first 400 kWh

$0.1162 per kWh for the next 600 kWh

$0.1302 per kWh for all additional kWh

Solar Residential Rate Schedule 1A (solar rate share)

$0.1200 per kWh for the first 100 kWh (this portion of the rate is locked in until July 1, 2035)

$0.0949 per kWh for the next 300 kWh

$0.1162 per kWh for the next 600 kWh

$0.1302 per kWh for all additional kWh[50]

for Shared Renewable Energy Programs.[51] It is also possible to allocate benefits via direct payments. While this latter approach may be administratively simpler, it potentially results in the accrual of taxable income for the participant.[52]

Renewable Energy Credits

A REC is defined "as the renewable energy attributes of 1 MWh of renewable electricity generated and delivered to the grid."[53] RECs are tradable commodities, and can be purchased by entities seeking to meet RPS mandates, among other things. Some community solar project developers sell RECs to utilities that must either create or purchase qualifying RECs for state RPS compliance purposes. Some states have enacted policies mandating that utilities purchase the REC output of community solar projects located within their service territories.[54]

A participant can claim the environmental benefits of using solar if they receive the REC or if the utility retires the RECs on their behalf. If the utility keeps the REC, only the

48 As a point of reference, see OUC's current rate schedule as of July 1, 2016. The all-in per kWh charge for the first 1,000 kWh per month is just under 10 cents, and just under 12 cents for all usage over 1,000 kWh. http://www.ouc.com/residential/service-rates-and-costs/electric-rates

49 http://www.ouc.com/environment-community/solar/community-solar/community-solar-terms-and-conditions

50 http://www.loganutah.org/government/departments/light_and_power/solar/community_solar.php

51 *Interstate Renewable Energy Council, Model Rules for Shared Renewable Energy Programs* (2013), p. 8.

52 Ibid.

53 Andrea Romano, "The Role of Renewable Energy Certificates in Community Solar," Navigant Research, January 12, 2016, accessed at https://www.navigantresearch.com/blog/the-role-of-renewable-energy-certificates-in-community-solar.

54 Eric O'Shaghnessy, Jenny Heeter, Chang Liu, and Erin Nobler. *Status Trends in the U.S. Voluntary Green Power Market Data.* National Renewable Energy Laboratory (2015), p. 15, accessed at http://www.communitysolarvalueproject.com/uploads/2/7/0/3/27034867/nrel_green_power_market_2015.pdf.

utility may claim the environmental benefits.[55] Ultimately, the decision of whether or not the participants receive the RECs may be dictated by utility needs and regulatory requirements. If the utility needs the RECs to achieve RPS compliance, the utility may want to keep them. In some cases, the participants may place a high value on REC ownership, and thus the utility could deem participant-ownership to be one of the customer benefits of community solar program participation, and market it as such. On the other hand, especially in locations with no RPS mandate, utilities have deemed RECs too administratively burdensome to deal with, and therefore they do not take the RECs or provide them to their customers.

55 James Coughlin, et al. *A Guide to Community Solar: Utility, Private, and Non-profit Project Development.* National Renewables Energy Laboratory (2010), p. 9.

Section 4

Program Administration

Depending on the precise ownership structure of the community solar project, the utility bears different risks. Program administration is a key design element in mitigating those risks. For example, if a utility owns the system, the risk of undersubscription will fall onto the utility. Therefore, how the utility markets the program will be an important element in the utility's recovery of costs. Other technical considerations, including mitigating customer turnover and the integration of billing data, are important administrative concerns, and will be addressed in this section.

Mitigating Undersubscription Risk

There are many steps a utility can take to mitigate undersubscription. The very first is to examine the local community's appetite for solar programs, and then to assess the motivating factors for customers who are potentially interested in participating in a community solar program. This will entail surveying the utility's customer base.

The Smart Electric Power Alliance (SEPA) has several resources available on the marketing aspects of community solar, including a paper on survey-based forecasting techniques, which are used to forecast market preferences for alternative products.[56] Under this method, different scenarios are offered to respondents, who then indicate their preference. While this precise survey method may not be applicable to your utility, the fundamental idea is gathering information about customer preferences, and marketing around those preferences.

In the particular survey referenced above, customers responded most favorably to messages that emphasized economic/financial considerations and the lack of hassle associated with community solar. These may not mirror the results in your utility's service territory, but SEPA's research suggests well-designed marketing messages will lead to more receptive customer base and potentially to greater participation. As SEPA explains, utilities can mine the data from the survey for relative preferences. Certain data could also be weighted to reflect the utility's service territory.[57]

Though data mining and other surveys can be helpful, it is strongly recommended that utilities design a custom survey specific to the utility's customers. Utilities should also hold stakeholder engagement workshops and community meetings as the program is being designed so the utility can incorporate suggestions. As discussed in the first section, you should not develop a project unless you are certain there is expressed interest in participation. Surveying your customers and then continuing to engage them through each stage of the project will help you determine if that interest is real.

Key questions to ask customers include:

- Should the utility support solar at a premium cost?
- How should the utility support solar?
- Would the customer be willing to pay a premium on the bill for solar?
- If paying a premium, would the customer prefer to pay a lump-sum up front to save on subsequent bills or pay a small premium each month to lock in a portion of your energy bill over time?
- How much of a premium would you be willing to consider?

Advertising the Program

Since many community solar projects are dependent on early participant funding through deposits and panel purchases, it is important to appropriately market the program to the local community. Though customers have become more sophisticated in their use of the internet and social media, traditional methods of communications – including mailers and bill inserts – can be very effective at drawing interest.

How a utility markets the program is likely to be somewhat dependent on the unique demographics of the

56 Accelerating Adoption of Community Solar: Demonstration of a survey-based forecasting technique to optimize program design and marketing of community solar, Pacific Consulting Group (PCG), in partnership with SEPA (February 2016), available at https://www.solarelectricpower.org/media/439739/accelerating-adoption-of-community-solar_final.pdf.

57 Ibid., p. 16

Seattle City Light (SCL) in Washington has developed several community solar sites. The utility used several forms of communication to encourage participation. It distributed bill inserts on paper and e-bills. SCL also emailed about 120,000 of its customers, with an open-rate of approximately 25%. SCL experienced a good deal of success in advertising community solar through its use of social media, including targeted Facebook ads. Local media and blogs also promoted community solar. Finally, SCL engaged in some in-person campaign promotions. It targeted small businesses, particularly in neighborhoods where the project was located, and also set up one-on-one interactions at tables at local community events. All-in-all, SCL has fully subscribed three different projects totaling over 150 kW.[58]

Moorhead Public Service (MPS) used the online survey tool Survey Monkey to gauge public interest in community solar. The utility also held public hearings and discussed it at Public Service Commission meetings. All of these efforts to market community solar elicited a mild response. MPS then sent out a mailer to all customers, and this elicited a far greater response. The first phase of the project completely sold out, and there are enough customers on the waitlist to ensure that at least one or two more arrays, totaling just over 20 kW each, will be constructed in 2017.

community it serves. Larger metropolitan areas may require a diverse mix of mailers, social media targeting, and even commercial airtime. Utilities located in smaller communities may want to focus on print advertising and bill inserts.

58 Adapted from SCL presentation to APPA meeting.

Project Visibility

Siting of the facility itself could be, at least in part, a marketing decision. Placing your community solar facility in a centralized location visible to the general public will give much more attention to the project than if the facility is located in an obscure location or if the arrays are generally hidden from public view. While such considerations should not overtake energy maximization issues, it is something to keep in mind as you consider potential sites.

Customer Deposit and Other Marketing Considerations

In another document, SEPA offers some other marketing considerations. They advise a shorter lease term — five years. This is based on customer feedback. Because the public is unfamiliar with community solar, customers may not be prepared to enter into a long-term commitment,[59] so it is possible shorter lease terms would ease some of that anxiety.

SEPA also recommends keeping the purchase price as low as possible, noting that there is a sharp drop in interest when the price increases from $395 to $495 per panel. The relative price levels at which this shift in interest would occur would be different depending on the utility. Potential subscribers were also turned off by the combination of a panel subscription and a price premium, indicating they would accept one or the other, but not both.[60] Similarly, if the customer has to pay a high deposit to participate in an energy-based pricing program, that can act as a deterrent. As discussed in the previous section on cost recovery, utilities need to balance between keeping costs affordable to encourage investment and recovering the costs of the program from the participants in a timely and reliable way.

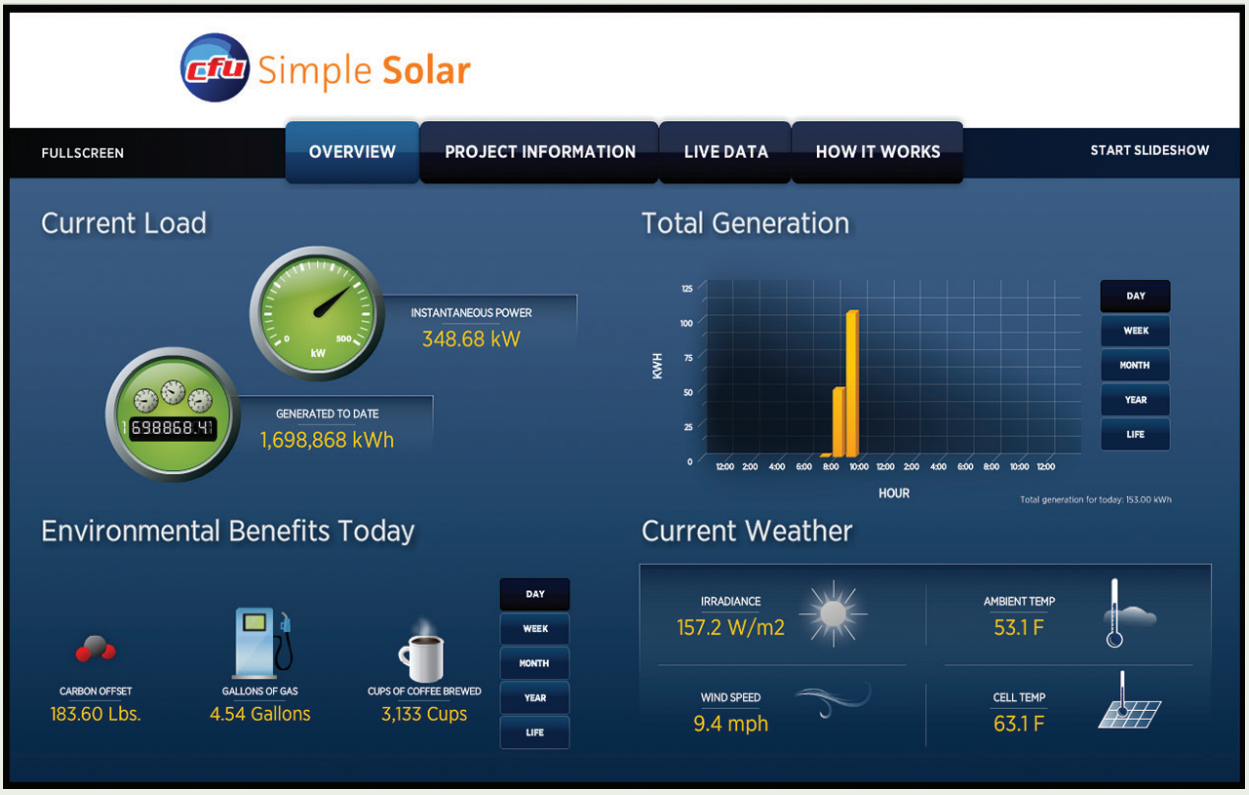
59 What the Community Solar Customer Wants: Identifying the right target audiences for community solar – and the marketing strategies that will win them over, Shelton Group, in partnership with SEPA (2016), p. 19.

60 Ibid.

Program Administration

Cedar Falls Utilities in Iowa developed its Simple Solar project in 2016 Participants pay a fee of $270 up front, and then receive a monthly bill credit based on their share of energy. These bill credits will be paid for 20 years. About 1,250 families, businesses, and organizations purchase power generated by the 1.5-MW Prairie Lakes Solar facility which is now fully subscribed.

The CFU website includes a Simple Solar dashboard.[61] This dashboard shows the total amount of generation produced per hour each day, the amount generated throughout the life of the facility, and shows the environmental benefits produced by the facility. For example, by mid-afternoon on Oct. 26, 2016, the facility had offset 393.44 pounds of carbon, and had generated enough electricity to brew 6,714 cups of coffee. The portal further allows the user to scroll through hourly, daily, weekly monthly, annual, and lifetime energy productions, and also includes graphical illustrations showing how the system works to generate power and provide electricity.



61 http://datareadings.com/client/moduleSystem/kiosk/site/bin/kiosk.cfm?k=2h4UV8j3

Mitigating Customer Turnover Risk: Sizing and Participation Terms

Related to customer marketing and undersubscription risk is the risk of early customer termination, also known as customer turnover. If participation levels are in a continual state of flux due to customer turnover, then this presents a financial risk to the utility and may increase program administration costs. There are several ways to address this risk.

Continuous Program Marketing

Public power utilities generally enjoy good customer relations, and maintaining continuous stakeholder relations even after the project has been fully implemented and subscribed is important. Utilities can do this a number of ways, including developing web portals that demonstrate the environmental benefits of your community solar project.

Customer Waitlist/Sizing the System

The program should be sized in such a way to allow for unsatisfied demand for participation that may be tapped if current customers leave the service territory. There will also need to be some consideration about developing a waitlist, both for new customers to replace existing customers who leave the program, as well as to gauge interest in developing additional projects. In the end, though, it may leave some customers disappointed, a substantial waiting list provides insurance against undersubscription and turnover.

Customer Exit Terms

The utility should decide early in the life of the project if there will be a penalty for early termination. If the project utilizes capacity-based pricing, the participant can sell back the share to the utility or transfer ownership to another utility customer. If the participant is simply moving within the utility's service territory, then there should be no problem transferring the credit to the new address. Under a rate or energy-based offering, customers who exit the program early leave utilities with unpaid debt, therefore an early termination fee (or unreturned deposit) may be a viable option.[62]

Los Angeles Department of Power and Water will permit customers to exit its community solar program after one year, but they cannot reapply for at least 12 months.[63]

City Utilities of Springfield, Missouri, community solar participants must pay a cancellation fee of $100 if they exit the program before 24 months.[64]

The table below provides an illustrative example of an analysis of the potential cost incurred by the utility due to early customer exit. It shows the present value of remaining program premiums in a given year of customer exit, assuming a certain solar energy price ($/MWh), customer usage (kWh per month), bill credit ($ per MWh) and associated escalation rate (% per year), and discount rate. The financial impact of customers leaving early should be carefully evaluated.

Program designers must understand that the relative risk of early exit is a function of when program participants leave, how easy they are to replace, the cost of solar relative to the cost of the utility's other power supply services, and of course the design of the program including the terms and conditions in place such as customer deposit requirements, early exit penalties, transfer of benefits, etc.

62 DeShazo et al, *Guide to Design Decisions,* p. 30.

63 https://www.ladwp.com/ladwp/faces/ladwp/residential/r-go-green/r-gg-commsolarprogram?_adf.ctrl-state=17ybtsior6_4&_afrLoop=1113972784327977

64 https://www.cityutilities.net/save/solar-initiative/

Program Administration

Solar Price ($/MWh)	Year of Customer Exit									
	1	2	3	4	5	6	7	8	9	10
45	$-	$-	$-	$-	$-	$-	$-	$-	$-	$-
50	$50	$20	$7	$-	$-	$-	$-	$-	$-	$-
55	$250	$190	$140	$95	$60	$30	$10	$-	$-	$-
60	$580	$495	$410	$335	$260	$200	$145	$95	$60	$25
65	$1,005	$890	$785	$680	$580	$490	$400	$320	$250	$185
70	$1,500	$1,370	$1,240	$1,110	$990	$875	$760	$655	$555	$460
75	$2,050	$1,900	$1,755	$1,610	$1,470	$1,330	$1,200	$1,070	$940	$820
80	$2,650	$2,490	$2,325	$2,165	$2,000	$1,850	$1,695	$1,545	$1,400	$1,255

Section 5

Other Technical Considerations

This final section covers other technical aspects of a community solar project, including siting, solar array options, and operations & maintenance considerations.

Site Selection

While a community solar project's public visibility presents an opportunity to promote it, program administrators will also want to choose a site that provides optimal solar production potential and minimizes costs for distribution system interconnection and operation. There should be as little shade as possible to ensure greater capacity utilization. It is also preferable for the surface to be level — this will also increase the facility's production and reduce installation costs.[65]

The utility should conduct a solar irradiation engineering study to determine the optimum tilt and orientation of the panels. South- and west-facing panels offer greater capacity factors, and west-tilting arrays in particular offer greater production at later time periods, which often (but not always) coincide with system or regional peaks.

Though marketing considerations can factor into site selection, CPS Energy in San Antonio suggests utilities should not overly concern themselves with this aspect of the project. CPS Energy wanted to place the arrays for their roofless solar program in a prominent area in an effort to better market the program. It offered various site suggestions over several months to the project developer, Clean Energy Collective, but all of these suggested sites proved to be inefficient for one reason or the other. The utility realized after some time that this was only slowing down the project. The array was ultimately constructed just outside the county and not in a prominently visible location.

Moorhead Public Service ultimately sited its community solar project between two existing wind turbines located near a retired power plant. MPS chose this site because the infrastructure was already in place. This was the most efficient location, though it did not have as much of a public relations advantage.

Solar Array Options

In addition to siting, the actual physical size and design of the array is another consideration. Most solar facilities employ fixed-tilt designs, meaning the arrays are permanently fixed in one direction. Another option is a tracking array, in which the panels are able to move and track the position of the sun. This maximizes solar production, as the arrays can face south during the early afternoon, then tilt west as the solar production peaks in that direction in the later afternoon. Furthermore, the tracking systems can be either single-track —– meaning they rotate on a vertical axis — or they can be dual-axis, pivoting both horizontally and vertically.[66]

While the tracking option maximizes production, it is also more expensive. Tracking arrays add as much as eight to ten cents per watt to a project, when the average price per watt is around $2, plus they are generally more expensive to maintain because they have moving parts.[67]

How to size your system is another important decision. Public power community solar facilities typically range in size from 20 kW to 5 MW, with the median around 1 MW. However, if there is considerable support for community solar in your city, and the population is large enough to support high levels of participation, then a larger facility may make sense. Factoring in economies of scale, it is much more economical to construct one large facility than several smaller ones.

It may also be possible to dedicate a portion of a larger utility-scale project to community solar subscription. For

65i DeShazo et al, Guide to Design Decisions, p. 10.

66 For more information see https://www.revolvesolar.com/whats-the-difference-between-single-axis-and-dual-axis-solar-trackers/

67 For the advantages and disadvantages of a tracking system, see http://www.solarpowerworldonline.com/2016/05/advantages-disadvantages-solar-tracker-system/.

example, Johnson City Power Board was awarded a solar generation project through the Tennessee Valley Authority's Distributed Solar Solutions program. Johnson City was awarded 5 MW, and the utility plans on allotting a small portion of that towards a community solar program.[68]

Permitting and Interconnection

Utility involvement in a community solar project can make the permitting and environmental review aspects of a program run much smoother than a project completely administered by a third party, especially if the utility engages stakeholders and explains what it is planning to do in advance. The utility will be able to make determinations about optimal siting locations where solar energy can more easily be integrated into the grid. In terms of permitting, this can also be streamlined if the utility owns the land, or even if the city owns the land. Acquiring title to the land will be made much easier, thus reducing some of the costs associated with the project.

68 https://www.jcpb.com/components/viewNewsRelease.asp?id=186

Operations and Maintenance

Just like any typical utility capital facility, the community solar facility will require regular maintenance. If the utility owns the facility, it will directly bear the costs of operations and maintenance (O&M); otherwise the third party developer will be on the hook for all O&M costs. Some of the matters discussed earlier have an impact on O&M costs. For example, maintenance costs for tracking systems will be higher than those for fixed-tilt arrays.

Decommissioning and Exit Strategies

There may be modest decommissioning costs associated with the project, and these will have to be factored into all preliminary benefit/cost calculations.

Additional Resources

The papers referenced through this guidebook are listed here for your convenience. There are also links to more resources.

Papers Cited

American Public Power Association, *Rate Design for Distributed Generation: Net Metering Alternatives,* 2015; http://www.publicpower.org/files/PDFs/Rate_Design_for_DG-_Net_Metering_final.pdf

Accelerating Adoption of Community Solar: Demonstration of a survey-based forecasting technique to optimize program design and marketing of community solar, Pacific Consulting Group (PCG), in partnership with SEPA (February 2016)

Kristin L. Bailey, *Insecurity for Community Solar: Three Strategies to Confront an Emerging Tension Between Renewable Energy Investment and Federal Securities Laws,* 10 J. on Telecomm & High Tech L. 123, 125 (2012).

Samantha Booth, *Here Comes the Sun: How Securities Regulations Cast a Shadow on the Growth of Community Solar in the United States,* 61 UCLA L Rev. 760 (2014)

Robert Borlick and Lisa Wood, *Net Energy Metering: Subsidy Issues and Regulatory Solutions* (Washington, DC: Edison Foundation: Institute for Electric Innovation, 2014)

Jim Cater and Paul Zummo, R*ate Design Options for Distributed Energy Resources* (Arlington, VA: APPA, 2016).

James Coughlin, et al. *A Guide to Community Solar: Utility, Private, and Non-profit Project Development.* National Renewables Energy Laboratory (2010)

R. DeShazo, Alex Turek, and Michael Samulon. *Guide to Design Decisions for Utility-Sponsored Community Solar.* UCLA: Luskin Center for Innovation (May 2015)

David Feldman, Anna M. Brockway, Elaine Ulrich, and Robert Margolis. *Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation.* Golden, CO: National Renewable Energy Laboratory (April 2015)

Interstate Renewable Energy Council, *Model Rules for Shared Renewable Energy Programs* (2013)

Eric O'Shaghnessy, Jenny Heeter, Chang Liu, and Erin Nobler. *Status Trends in the U.S. Voluntary Green Power Market Data.* National Renewable Energy Laboratory (2015)

Rocky Mountain Institute, *Community-Scale Solar: Why developers and buyers should focus on this high-potential market segment,* Insight Brief (March 2016)

SEPA, *Utility-Scale Solar: The Path to High-Value, Cost-Competitive Projects: How to Optimize the Economics of Utility-Scale Solar Photovoltaic (PV) Facilities* (2016)

What the Community Solar Customer Wants: Identifying the right target audiences for community solar – and the marketing strategies that will win them over, Shelton Group, in partnership with SEPA (2016)

Additional Resources

Links to Other Resources

Public Power Forward Website
http://publicpower.org/Topics/Landing.cfm?ItemNumber=45624

Infographic for Customers:
10 Things to Consider Before You Go Solar
http://appanet.files.cms-plus.com/2013/images/10%20Things%20to%20Consider%20Before%20Going%20Solar%20Outlined.jpg

Consumer Federation of America: Public Power and Rural Electric Leadership on Community Solar Initiatives
http://consumerfed.org/wp-content/uploads/2016/04/Community-Solar-Energy-White-Paper-4-15-16.pdf

Public Power Community Solar Case Studies
http://www.publicpower.org/Programs/interiordetail2col.cfm?ItemNumber=44432&navItemNumber=44433

Smart Electric Power Association
Community Solar Technical Assistance
https://www.solarelectricpower.org/discover-resources/community-solar-technical-assistance-opportunity.aspx

National Renewable Energy Laboratory Open PV Project
https://openpv.nrel.gov/

2451 Crystal Drive
Suite 1000
Arlington, Virginia 22202-4804

PublicPower.org