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The next big thing in renewable energy: Shared solar

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ABSTRACT

The U.S. shared solar market is poised for growth, boosted by initiatives supported by state and federal agencies, customers, contractors, and utilities. Full-scale adoption will require addressing political and economic barriers, which vary between states and program models. Investor-owned utilities will be working with regulators to define enabling policies in the coming years, while municipal and cooperative utilities will continue to pilot programs.

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1. Introduction

According to multiple forecasts, community shared solar is expected to grow exponentially over the next five years,[1,2] but there are a number of barriers that will first have to be addressed. This article defines community shared solar, characterizes its status in the U.S. including barriers to its implementation, outlines program design considerations, and offers predictions about what the future might hold for the shared solar market.

2. Background: what is community shared solar?

Solar energy in the United States has increased dramatically in the last 10 years, from 58 MW of annual installed capacity in 2004 to 6,201 MW in 2014.[3] Residential installations make up a significant portion of the overall solar growth, and have increased from 27 MW of annual installed capacity in 2005 to 1,231 in 2014 (Fig. 1). The total installed cost of residential solar systems has dropped by approximately 50% over the same time period.[4]

And public demand for solar energy continues to build. A recent study published by SolarCity and Clean Edge in collaboration with NASDAQ found that Americans overwhelmingly chose solar and wind over natural gas, nuclear, and coal when asked which generation sources were most important to America's energy future.[5] Solar topped the list, with 50% of respondents identifying it as one of their top three candidates for energy reliance. Still, solar photovoltaic (PV) energy represents only 0.2% of U.S. electricity generation, and only 0.3% of U.S. households have solar panels installed on their rooftops.

Despite becoming more cost-competitive and desirable as a source of generation, several barriers have limited the adoption of residential solar. First, much of the population, particularly in urban areas, rents or lives in multi-family households, where they are unable to put solar on their roof. The National Renewable Energy Laboratory (NREL) estimated that 49% of households are unable to host a PV system either because the occupants do not own the building, the building is a multi-unit facility, or the roof space is insufficient.[1] Additionally, the interconnection process can pose soft costs to customers, including lack of access to information, difficulties with application submission, and strin-

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[1] Feldman, D., Brockway, A.M., Ulrich, E., Margolis, R. (2015, April). Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation (Rep.). Retrieved February 8, 2016, from National Renewable Energy Association website: http://www.nrel.gov/docs/fy15osti/63892.pdf.

[2] Chwastyk, D., Sterling, J. (2015, October). Community Solar Program Design Models (Rep.). Retrieved February 8, 2016, from Solar Electric Power Association website: https://www.solarelectricpower.org/media/422096/community-solar-design-plan_web.pdf.

[3] GTM Research & Solar Energy Industries Association, 2015. US Solar Market Insight Report: 2014 Year in Review (Rep.). Retrieved February 8, 2016, from http://www.seia.org/sites/default/files/HOlFT6ym3i.pdf.

[4] Barbose, G., Dargouth, N., (2015, August). Tracking the Sun VIII (Rep.). Retrieved February 8, 2016, from Lawrence Berkeley National Laboratory website: https://emp.lbl.gov/sites/all/files/lbnl-188238_2.pdf.

[5] Solar City & Clean Edge (2015, March). U.S. Homeowners on Clean Energy: A National Survey (Rep.). Retrieved February 8, 2016, from NASDAQ website: http://www.solarcity.com/sites/default/files/reports/reports-2015-homeowner-survey-clean-energy.pdf.

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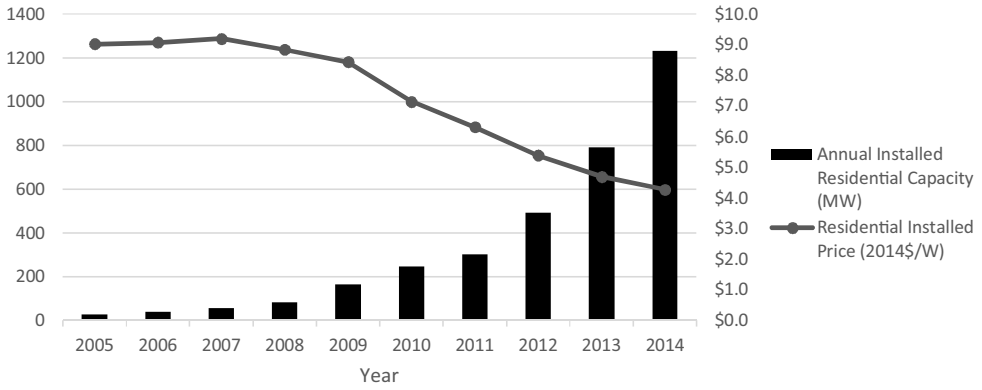

Fig. 1. Annual installed residential solar price[4] and capacity[3].

gent inspection requirements. Finally, solar incentives and interconnection and net metering standards vary from state to state, and even utility to utility, creating a disparity in program attractiveness between customers.

Community shared solar provides a way for all customers to access solar. Community shared solar or, more simply, shared solar, refers to a PV system that provides power and/or financial benefit to multiple community members. We distinguish shared solar from community solar, which can include community group purchasing of solar equipment (as in "solarize" campaigns) in addition to shared solar. While the terms have been used interchangeably in many publications, we will refer to shared solar here.

Shared solar offers many attractive benefits to utilities and subscribers. First, for utilities it can increase customer satisfaction and engagement, addressing customer demand for clean energy, reduce carbon exposure (in anticipation of regional, state, and local greenhouse gas reduction programs), and increase utilization of larger centralized (and potentially utility-controlled) renewable energy generation as opposed to small distributed generation resources, potentially enhancing overall grid power quality. For subscribers, depending on the model structure and economics, it can provide positive revenues and can serve as a hedge against rising electricity prices. Moreover, by providing access to solar to a broader pool of customers, society benefits from lower criteria pollutant emissions (leading to improved public health), lower greenhouse gas emissions, economic development/local jobs, reduced water consumption, and reduced dependence on fossil fuels. A caveat here is that, in many instances, the total cost of this form of generation may be higher than other generation resources or market power.

Different owner-operator models exist for shared solar programs. These programs can be sponsored by utilities, third-party developers, or special entities. Utility-sponsored programs involve system purchase and ownership by the utility. These programs are open to voluntary ratepayer participation and are financed through utility capital and/or ratepayer subscriptions. Customers participate by providing an upfront investment or ongoing payment to support system costs. They then receive a payment or bill credit that is proportional to their contribution and the overall system production. The participants do not necessarily own any part of the system, but instead own rights to the electricity produced by the installation. Generally, the utility would purchase energy from a solar developer through a power purchase agreement or would hire a contractor to build the solar array on its own behalf. Depending on how the utility is regulated and how it structures its program, it may or may not be able to benefit from tax incentives.

Special-entity-sponsored systems are supported by businesses created with the intent to produce community solar power. These can be established either by utilities or by customers. To take advantage of tax incentives available for community solar projects, some organizers have chosen to structure their projects as a business, or lean on existing business entities to help support the initiative.[6] Utilities can also set up a separate business enterprise to develop a community solar project or utilize an existing for-profit subsidiary. Developer sponsored models operate in a similar fashion, but systems are owned and operated by solar developers. These can be financed through third-party capital, utility capital, and/or ratepayer subscriptions.

Subscriber involvement in projects can vary, but typically involve one of the following:

1. Purchasing panels: customers pay an upfront fee for all of the future generation from a panel or a portion of a panel and get a proportional share in bill credits or financial credits
2. Leasing panels: customers make an upfront or ongoing payments in order to secure energy for a finite term
3. Investing in system: customers come together and each pay a percentage of project costs to receive a pro rata share of generation

3. The current state of community shared solar

Shared solar is still in its early stages of development in the country, with only about 100 projects on the ground. These tend to be limited in both size and location. Most projects are located in states that have passed legislation to encourage or mandate community solar projects. In other states to date, municipal and cooperative utilities have been leading the charge to develop shared renewables programs for their customers. Of the utility-sponsored shared solar programs operational to date, two-thirds are operated by municipal or cooperative utilities. Investor-owned utilities have tended to proceed more cautiously, with many responding to, or waiting to respond to, enabling legislation.

[6] Coughlin, J., Grove, J., Irvine, L., Jacobs, J.F., Phillips, S.J., Sawyer, A., Wiedman, J. (2010, November). A Guide to Community Shared Solar: Utility, Private, and Nonprofit Project Development (Rep.). Retrieved February 8, 2016, from National Renewable Energy Laboratory website: http://www.nrel.gov/docs/fy12osti/54570.pdf.

In an attempt to better characterize the current shared solar landscape in the United States, West Monroe Partners conducted a survey among investor-owned, cooperative, and municipal utilities to learn more about their interest in shared solar, existing programs, and opportunities or barriers that they have experienced firsthand. Our consultants spoke with stakeholders from 15 different utilities to gather data. While only a few of the utilities with which we spoke had already established community shared solar programs, from which they shared some lessons learned, all were familiar with the concept, and the vast majority were considering a community shared solar program in the future. According to a recent SEPA analysis, the cumulative capacity of planned community solar programs is more than 200 MW, more than twice the amount of capacity installed to date.[2]

A lack of regulatory clarity was cited among our utility respondents as the primary reason for not yet pulling the trigger on building a community shared solar project. This was a consistent message that we received from investor-owned utilities in states without clear enabling legislation. Some utilities also cited that they were awaiting additional incentives to make the economics more attractive. Many also recognize their lack of expertise in renewable energy project development, and are open to third-party development instead of siting and owning programs themselves. Some of the technical aspects of building and running the program, such as constructing the installations themselves and updating IT systems to accommodate virtual net metering, posed unique challenges for utilities as well.

The utilities that are considering community shared solar are generally looking for small systems; all of those surveyed by West Monroe had or were interested in deploying systems smaller than 1 MW. Unfortunately, the approach of "starting small" to test the economics means that the utilities miss out on economies of scale. With the initial burden of customer outreach/education, program design, and system setup, the first project will be encumbered by administrative costs that will be shared and decrease per system as scale increases.

The utilities that have already installed community shared solar projects are generally pleased with them and were able to share some lessons learned regarding program development. A key utility pain point was underestimating the time and cost involved in customer education and marketing of the program. These utilities noted that, should they decide to develop additional projects, they expect that they would be implemented at a lower cost.

4. The future state of community shared solar: potential market size

While solar PV penetration in the United States expanded tremendously over the last decade, a large portion of the potential market has remained untapped. As mentioned previously, an NREL report published in 2015 estimated that half of households are unable to support rooftop solar PV systems.[1] All renters were excluded, as well as owners of homes with more than four stories. Light detection and ranging (LIDAR) data was used to further estimate the percentage of residential buildings with rooftops suitable for solar. The report also estimated that nearly half of businesses are also unsuitable candidates for solar PV, because they operate within buildings with several establishments or have insufficient roof space to meet their energy demand (Figs. 2 and 3).

Until recently, these customers were unable to participate in solar programs. With changes in regulation and solar business models to support shared solar, the potential customer base could increase to all homes and businesses. The NREL report concludes that shared solar deployment is expected to increase by

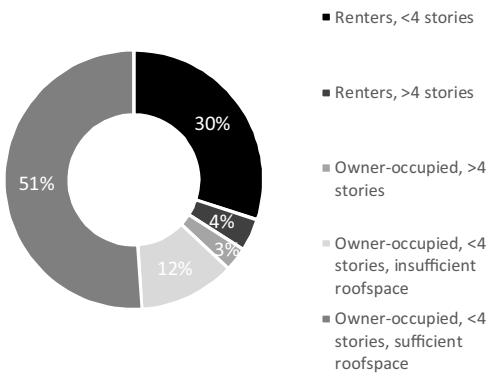

Fig. 2. Residential solar PV roof suitability[1].

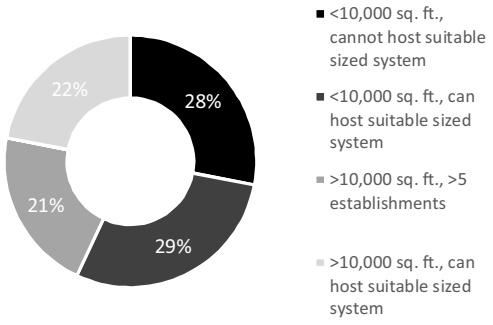

Fig. 3. Commercial solar PV roof suitability[1].

5.5–11.0 GW between 2015 and 2020, representing one-third to one-half of the distributed PV market within five years.

Though shared solar development has not taken off as quickly as anticipated by several analysts, there is growing interest and federal support. In 2014, the U.S. Department of Energy made several grants though its SunShot grant program to support projects focused on shared solar. In July 2015, the White House announced a new initiative, the National Community Solar Partnership, to accelerate the deployment of shared solar projects. And the first national trade association for community solar, the Coalition for Community Solar Access, launched in February 2016. In addition, there are a number of state legislative proposals on shared renewables and virtual net energy metering throughout the country.

5. Barriers to growth

While utility and customer interest in shared solar is growing, policy and economic barriers exist that inhibit program development. Project economics must be attractive for all relevant stakeholders – the utility, customers, and developers (and their partners) – in order for shared solar projects to be viable. In states with low retail electricity rates and low or no state incentives for solar, community solar projects are difficult to justify unless (1) customers are willing to pay a premium (with a longer payback period) or (2) the utility is willing to provide a sufficient subsidy. The cost and complexity of project startup can also be a deterrent to both utility-sponsored and community-sponsored programs. On the policy side, few states have virtual net metering rules in place, and the future of state incentives and rebates can be uncertain. Each owner/operator model is faced with a unique set of economic barriers, from varying net metering requirements, regulatory constraints, and tax incentives. Specific challenges can differ by state and ownership model.

5.1. Guidance on characteristics of subscriber or system

One of the initial barriers to solar program development from the owner/operator perspective is the lack of mandated or recommended guidance on program structure. Because the concept of shared solar is so novel in the market, little literature describing best practices on program design or subscriber characteristics exists. For example, system owners may choose to structure their programs so that costs are recovered up front or over time. Upfront recoupment reduces the risk associated with cost recovery, but the required upfront investment may deter some potential customers from participating. The varying policy landscape and incentives available to customers between states makes developing a one-size-fits-all recommendation virtually impossible. Many utilities are waiting on legislation that either allows or mandates shared solar before investing in a program. And, without incentives or payment structures that are appealing to customers, programs will not receive enough participation to make them viable.

5.2. Viable model for low and moderate income households

Shared solar has the opportunity to open up access to renewable energy to a wider set of customers beyond those who currently have access—individuals with high FICO scores who own their home, commercial entities with adequate credit ratings, and municipal entities with high credit and/or bonding authority. Much of the discussion within the National Community Solar Partnership has focused on new business and financial models to provide access to solar to low- and moderate-income households, but there has not been a clear suite of solutions to this challenge. Credit concerns and, in some models, a need for a large upfront payment put shared solar participation out of reach of many. While discussion continues on models to better serve the lower economic segments of the population, no clear solution currently exists.

5.3. Access to tax credits and incentives

The federal solar investment tax credit (ITC) provides a 30% investment tax credit for qualifying solar projects, which include shared solar systems. The credit applies to the company that installs, develops, or finances systems for commercial projects and to homeowner income taxes for residential projects. The ITC was set to expire at the end of 2016, but, at the end of last year, was extended through 2022 for PV and solar thermal technologies, with a drop to 26% after 2019 and 22% after 2020.

In addition to tax credits, businesses are eligible to depreciate solar assets on an accelerated schedule, over five years, under the Modified Accelerated Cost Recovery System (MACRS). Between the ITC and MACRS benefits, a solar array owner could see a reduction in costs on the order of 50%.

In order to take advantage of these large savings, however, the system owner must have a large enough passive income and tax basis. Non-profits (e.g., schools, municipalities, churches, and charitable organizations) and many regulated utilities, therefore, cannot directly take advantage of the tax benefits associated with solar. Even many private developers cannot directly take advantage of tax benefits because their tax basis is too low. A way around this challenge is to partner with a tax equity investor, or someone with enough tax basis to utilize the incentives. Unfortunately, tax equity partnerships are expensive and complex. In larger renewable energy deals (e.g., utility-scale solar or wind projects), the ITC and production tax benefits may justify the transaction costs (for due diligence and contracting) required of the tax equity investor. In contrast, for smaller solar projects, including nearly all shared solar projects, the transaction costs likely would not justify such a relationship. Securing available tax benefits, therefore, represents a barrier to shared solar projects.

State renewable energy policies, renewable portfolio standards and the like, are structured differently across the U.S. Typically, a state requires utilities within the state to procure a certain percentage of its total load through renewable energy. The utilities can do this through purchasing renewable energy certificates (RECs). These RECs, or, in some states that have a specific carve-out for solar energy, solar RECs (or, simply, SRECs), represent a potentially valuable commodity and an incentive for solar development. REC and SREC prices vary by state and remain uncertain, subject to market volatility and uncertain policy. For example, price volatility of SREC prices in states like New Jersey and Massachusetts have resulted in unstable project economics, which, in turn, can inflate financing costs.[7]

5.4. Virtual net metering policies and solar tariffs

Subscribers in a shared solar system derive value most directly through bill credits for their share of generation from the solar array to which they subscribe. In order to effectuate this bill credit, however, a policy must be established to designate how these virtual solar owners will be compensated for generation that they are putting on the grid.

Traditional net metering is a mechanism that compensates customers for generation supplied by their distributed generation (DG) system. Their bills are usually credited in the form of kilowatt-hours (kWh). When the customers' systems are producing more energy than their homes are consuming, their electric meters will "run backwards," requiring them to purchase less electricity from their utility. Forty-four states have enacted net metering policies to allow for the crediting of DG systems.[8] Most utilities oppose net metering because, in effect, the rest of their customer base subsidizes the customers taking advantage of net metering since transmission, distribution, reliability, and other costs are not accounted for. For this reason, in December 2015, the state of Nevada restructured its net metering laws, increasing fixed service charges for net-metered solar customers and lowering credits for excess generation from the retail rate to the wholesale rate for electricity.

Virtual net metering operates similarly, allowing a single renewable energy system to generate net metering credits that offset the load of multiple customers within a utility's service territory. California, Connecticut, Massachusetts, Maine, New Hampshire, and Vermont have each enacted group or virtual net metering laws, which allow utilities to distributing net metering credits to different individual accounts.[1] Unless the costs of transmission and distribution, reliability, and ancillary services provided by the utility are accounted for, netting the solar energy generated by a customer's share of a community solar project from that customer's electricity use on a one-for-one basis will be a hard pill for the utility to swallow. Many utilities are, therefore, advocating rate restructuring to better account for the full value of the services they provide to those with distributed energy resources. Solar feed-in tariffs and Value of Solar Tariff are alternative crediting schemes focused on either ensuring a certain level of positive incentive exists for solar, which may not directly

[7] Pierpont, B. (2013). What is Working and What is Not in State Renewable Portfolio Standards. Retrieved February 08, 2016, from http://climatepolicyinitiative.org/2013/07/11/whats-working-and-whats-not-in-state-renewable-portfolio-standards/.

[8] Durkay, J. (2014, September 26). Net Metering: Policy Overview and State Legislative Updates. Retrieved February 8, 2016, from http://www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx.

match retail electricity rates, or may attempt to account for the full costs and benefits of solar. California, Colorado, Delaware, Washington, DC, Massachusetts, and Minnesota have established statewide shared energy programs, which typically include virtual net metering or value of solar provisions.[1]

5.5. Operational and mechanical barriers

Developing a new shared solar program requires certain new systems and processes to be developed, which may present financial and operational challenges to program sponsors. Specifically, shared solar program necessitates (1) bill crediting to subscribers and (2) a mechanism for transferring shared solar shares if a subscriber were to move out of the sponsoring relevant service territory.

Billing is both a sensitive and financially critical process for utilities. It dictates their revenue and touches on privacy issues of its customers. Utilities generally have developed large computer systems to ensure accurate and timely billing of customers. Integrating new functionality into the existing billing structure can be costly and time-consuming. For initial shared solar projects, utilities may seek to avoid adjusting their existing billing systems, in favor of less costly but more time-consuming manual processing of bill credits. This may make sense initially, as the utility defers the costs of new bill credit functionality by manually crediting a few hundred subscribers each month. As shared solar programs grow in terms of numbers of subscribers, there will be economies of scale in automating the bill crediting process. But until a program reaches a critical mass, utilities may look to avoid investing in system upgrades.

In programs with longer-term subscriptions, there must be a mechanism for transferring subscriptions (for example, if a subscriber moves out of a sponsoring utility's service territory, and, thus, cannot receive a bill credit from that utility). Program rules should define how subscribers can transfer their subscriptions, and then an actual platform to implement the transfer must be developed. This could simply mean that the subscription is transferred back to the program sponsor (potentially for resale), or an electronic secondary market platform could be developed to facilitate direct customer-to-customer subscription transfers.

6. Program design considerations

As utilities, developers, and customers enter this new solar frontier, they will be faced with the task of designing shared solar programs. The first step in designing a new shared solar program is identifying its goals. Active engagement of stakeholders for feedback on program design is critical to ensuring the success of a new shared solar program; after all, much of the success of a shared solar program is dependent on the level of subscription. Identifying goals of the project will help inform the program structure that makes sense. Goals might include meeting renewable energy or environmental mandates, increasing customer access to clean energy, or creating economic value for subscribers or utility. Surveys, focus groups, or alternative outreach methods can be employed to solicit feedback on the key design elements. Once the goals are identified, key decisions need to be made, from defining the ownership model and subscription terms, applicability of incentives, and processing of bill credits, to determining the program management approach for the length of the program and where the solar array should be sited.

6.1. Ownership model

As previously discussed, many owner-operator models exist for shared solar programs. They can be sponsored by the utility, a third-party developer, or a special entity. The responsibility of each party, regardless of who the system owner is, can be seen in Fig. 4.

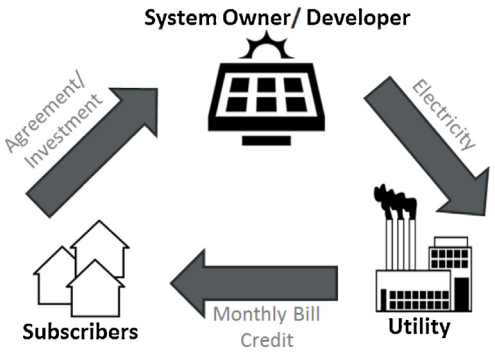

Fig. 4. Shared solar operating model.

Table 1 describes each model, the associated roles and responsibilities, and relative advantages and disadvantages of each.

Depending on the ownership model, costs and benefits associated with the project will flow to different stakeholders. The financing options and tax implications for the impacted parties should be fully understood before selecting the model.

6.2. Subscription model

The next critical decision for the program sponsor is the subscription structure. Like ownership model, there are a variety of methods to structure the subscription process for program participants. Panels can be bought or leased, or subscribers may be offered an option to invest in the system or buy energy or capacity. Table 2 details these customer participation structures with the pros and cons associated with each. The subscription structure should again be based on customer preferences, in order to ensure higher levels of subscription. Once a participation method is determined, the terms of the subscription should be defined, including the subscription limits (minimum and maximum subscriptions), length of the subscription term, and subscription transferability. Table 2 includes an outline of some of the different subscriber payment mechanisms.

6.3. System and site selection

Once a program structure has been established, the system owner will need to work with a developer and local utility to site the project, establish interconnection, and enter into a power purchase or net metering agreement. Site selection and acquisition should align with program design goals. For example, if visibility is important to subscribers, sites in close proximity to customer residences should be targeted. Costs associated with site preparation should also be considered during the planning phase. Rooftop systems often have increased cost associated with racking and roof preparation, and sites may need to be cleared for ground mount systems. Local permitting rules should be taken into consideration as sites are selected.

6.4. Subscriber enrollment

The subscriber enrollment process depends on customer education of shared solar and solar, generally, but will likely include upfront customer outreach and marketing, as well as a financial analysis from the customer perspective. Subscriber enrollment also has a technical component involving updating

Table 1
Comparison of shared solar ownership models.

	Utility-owned	Third-party owned	Special purpose entity—utility	Special purpose entity—customers	Non-profit
Description	Utility owns/operates a project that is open to voluntary ratepayer participation and financed through utility capital and/or ratepayer subscriptions	Developer owns/operates a project that is open to ratepayer participation. Financed through third-party capital, utility capital, and/or ratepayer subscriptions	Utility sets up a separate business enterprise to develop a community solar project or utilizing existing for-profit subsidiary	Individuals join in a business enterprise to develop a community solar project	A charitable nonprofit corporation administers a community solar project on behalf of donors or members
O&M	Utility or third-party	Third-party	Utility or third-party	Third-party	Third-party
Pros	Utility maintains control to adjust the system; can gain first-hand experience; can adjust for optimization of network requirements	Can take advantage of tax incentives; relatively simple for utility to participate	Can take advantage of tax incentives; utility branding; can adjust for optimization of network requirements	Can take advantage of tax incentives	Donors may get tax deduction directly
Cons	Utility exempt from income taxes, so cannot take advantage of federal tax incentives; more work	Lose connectivity with customers; financial/credit risk associated with third- party; costlier	Complex legal and tax implications	Financial/credit risk associated with third-party; costlier; complex legal and tax implications; requires customer organization	Owner cannot take advantage of tax benefits and utility does not have control
Customer recruitment and billing	Utility	Utility	Utility	Special purpose entity	Non-profit

Table 2
Comparison of shared solar subscription models.

	Buy panels	Lease panels	Invest in system	Buy energy/capacity
Description	Customers pay an upfront fee for all of the future generation from a panel or a portion of a panel and get bill credits or financial credits	Customers make an upfront or ongoing payments in order to secure energy for a finite term	Customers come together and each pay a percentage of project costs to receive a pro rata share of generation	Customers sign up for a fixed capacity (kW) or generation (kWh) per month, and receive a credit on their bills
Pros	Provides upfront funding for project; long-term benefits for customers; price hedge for customers; possible to pass tax incentives to customers	Provides upfront funding for project; long-term benefits for customers; price hedge for customers; easier to manage end of project	External funding; truly community owned	Affordable and flexible for customers
Cons	Resale issues; securities and tax law scrutiny; long-term commitment by host	Resale issues; lower ROI for customers than purchase	High threshold for participation; long-term commitment by host the site; financial risk to customers	May have lower return for customers; uncertain revenue stream for project owner

bill crediting systems to process subscriber deposits and enroll customers for on-bill crediting.

The policy landscape will generally dictate whether electricity costs will be credited to subscribers through net metering, or whether the utility will enter into a power purchase agreement (PPA) to purchase power directly from the energy producer. Interconnection with the grid will require completing and submitting an application, and typically involves being subjected to a technical evaluation and inspection by the local municipality and utility. The owner must have a billing system in place to processing subscriber deposits and enrolling subscribers for on-bill crediting through their local utility.

6.5. Program management

A shared solar program establishes a long-term relationship with subscribers; it requires project and program management for the lifetime of the program. Once a system is operational, there are a number of ongoing tasks that must occur to ensure program success.

First, as with any solar array, there will be ongoing project management involved. This will include performing operations and maintenance on the system and monitoring the project operations and ensuring desired performance. With many utilities not having experience with solar array ownership (or owning any other form of generations, for that matter), they may turn to third parties for assistance.

Second, because the program creates a long-term relationship with subscribers, the sponsor must manage that relationship. Subscriber management will include providing call-center support, ongoing customer satisfaction outreach, ensuring correct on-bill crediting, collecting any ongoing administrative/service fees, creating a mechanism for transfers of subscriptions, and reporting generation information.

7. Conclusion

Solar photovoltaic energy is growing rapidly in the United States, with its greatest future growth expected in the residential and commercial sectors. With the extension of the investment tax

credit, falling costs of PV and energy storage technologies, and the continuation of the policy and customer demand trends, shared solar demand will continue to grow in the coming years. There are a number of other drivers for shared solar growth, including the federal government's National Community Solar Partnership and several government-funded projects through the U.S. Department of Energy's SunShot program.

Shared solar offers benefits to all three stakeholder groups involved in a shared solar project: utilities, system owners, and customers. But, despite the win-win-win situation and growing knowledge and enthusiasm for shared solar throughout the country, a number of barriers will have to be overcome in order for the anticipated growth in shared solar to come into fruition.

First, especially in states with low retail electricity prices, additional incentives – in the form of RECs, SRECs, or state- or utility-sponsored generation incentives – will have to be established, extended, or enhanced in order to make the economics of these projects more attractive to system owners/developers. Tax incentives are also very important to project economics, and while the extension of the ITC[9] resolved a great source of economic uncertainty for solar projects, in many cases, creative new financial structures and arrangements must be developed that allow shared solar project sponsors to take advantage of tax incentives. With regard to subscribers, shared solar programs must be designed and marketed uniquely to a given set of potential subscribers in order to attract adequate participation; there is no one-size-fits all solution.

As public demand for renewables grows, regulators should reexamine rate policy to ensure a fair and equitable treatment of the benefits and costs of solar. Utilities should look to drive or support shared solar projects in their service territory and should market such programs to consumers, businesses, schools, and municipalities, while seeking technological control of the systems through smart inverters to ensure grid power quality. Utilities should also look toward pairing shared solar programs with other programs and products, such as demand response and energy efficiency programs (offering business and residential customers an opportunity to reduce their carbon intensity through local clean power) and energy storage (to address reliability). And utilities should drive innovation in customized IT solutions that will support the virtual net metering/shared solar bill crediting, customer production feedback web portals to make the experience similar to rooftop solar, and a clean marketplace for the purchase and sale/resale of shared solar subscriptions.

Shared solar has great potential, but a number of barriers continue to stand in its way. Investor-owned utilities will be working with regulators to define enabling policies in the coming years, while municipal and cooperative utilities will likely continue to pilot programs. Scale should increase, with increasing public demand. Innovative new structures and program designs will emerge, reducing cost and increasing participation. The speed at which shared solar will spread in the U.S. remains to be seen, but, based on our survey of utilities, we expect it to accelerate rapidly as state policies advance later this year.

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[9] Augustine, P. (2015, December 16). An Early Christmas Present for Wind and Solar Energy in the U.S.? Retrieved February 08, 2016, from https://blog.westmonroepartners.com/an-early-christmas-present-for-wind-and-solar-energy-in-the-u-s/.