

Community Shared Solar in Real Life

A summary of interviews with utility program administrators at nine community shared solar programs and surveys of subscribers.

Prepared for :



Dominion[®]

Prepared by:

Dan Chwastyk & Nick Esch



August 2016

Note

This report was prepared by the Smart Electric Power Alliance (SEPA) for Dominion Virginia Power and funded by the Office of Energy Efficiency and Renewable Energy (EERE), U.S. Department of Energy, under Award Number DE-EE0006914. The work presented within represents SEPA's professional judgment based on information SEPA gathered through primary market research.

Contents

- Summary 1
 - Utility Interviews 1
 - Subscriber Surveys 1
 - Summary Findings 2
- Utility Interview Findings 3
 - Avista Utilities – Community Solar 3
 - Consumers Energy – Solar Gardens 5
 - Hawai’ian Electric Company – Community Solar 7
 - Pacific Gas & Electric – Solar Choice 9
 - Rocky Mountain Power – Subscriber Solar 11
 - Sacramento Municipal Utility District – SolarShares..... 14
 - Tucson Electric Power – Bright Tucson 16
 - United Power – Sol Power..... 18
 - Xcel Energy (CO) – Solar*Rewards Community 20
- Subscriber Survey Findings 22
- Next Steps 28
- Appendix A 29
 - Utility Interview Questions..... 29
- Appendix B 31
 - Participant Survey Instrument 31

Summary

Dominion Virginia Power engaged the Smart Electric Power Alliance (SEPA) to conduct a study on existing community solar programs in order to discover insights into 1) existing utility program designs and performances, and 2) the experiences of customers in existing community solar programs. This work is intended to inform Dominion's development of a community solar program, helping to ensure that Dominion's proposed program benefits from the lessons learned by others.

The report was supported by a United States Department of Energy (DOE) Solar Market Pathways (SMP) grant (award No. DEEE0006914) awarded to Dominion via the DOE's SunShot Initiative. Dominion's SMP project aims to develop a collaborative, utility-administered solar strategy for the Commonwealth of Virginia. The goals of the Dominion's SMP grant are (i) to integrate existing solar programs with new options appropriate for Virginia's policy environment and broader economic development objectives; (ii) to promote wider deployment of solar within a low retail electric rate environment; and (iii) to serve as a replicable model for use by other states with similar policy environments including, but not limited to, the entire Southeast region. SEPA's community solar research effort lays the groundwork for a community solar program that will support all of these goals.

Utility Interviews

In March and April of 2016, SEPA interviewed program managers at nine utilities who currently offer a community solar program, or will imminently offer a program (Table 1). SEPA targeted investor-owned utilities with active programs as it was assumed that their experiences would be most applicable to Dominion, though a municipal utility, a cooperative, and some utilities still developing their programs were included so that a range of experiences would be discussed.

SEPA developed an interview guide in collaboration with Dominion. The guide touched on topics such as the community solar program design process, asset management, utility resources needed to support the program, and marketing and customer engagement questions, among others (the full interview guide is provided in Appendix A).

Interviewee	Utility Type	Program Status ¹
Avista Utilities	IOU	Active
Consumers Energy	IOU	Pre-launch
Hawai'ian Electric Co	IOU	Hold
Pacific Gas & Electric	IOU	Active
Rocky Mountain Power	IOU	Pre-launch
Sacramento Municipal Utility District	Municipal	Active
Tucson Electric Power	IOU	Active
United Power	Cooperative	Active
Texas Energy, CO	IOU	Active

Table 1. Utilities Participating in IOU Interviews

The interview guide was only loosely followed, in actuality. Instead of using it as a script, it was truly used to steer the interviews towards discussing the aspects of the programs that were the most challenging and ways each utility overcame the challenges. Summaries of each interview are provided in the next section of this report.

Subscriber Surveys

The interviews were followed by a survey of participants in community solar programs. This survey is the first such effort that asks participants from various programs about their experiences and their level

¹ The program status listed is as of April, 2016.

of satisfaction. Asking the same questions to participants in various programs creates a dataset that can be useful in comparing the effectiveness of different design elements of community solar programs.²

SEPA invited all utilities that 1) have had a community solar program for at least 6 months and 2) whose program has a capacity of at least 400 kW to participate in the survey. These criteria were partially selected to ensure that survey participants had spent enough time in the program so that they could provide informed responses. Note that there is not necessarily any connection between the set of utilities that participated in the interviews and the set that participated in the subscriber surveys.

Six utilities ultimately ended up distributing the survey to their program subscribers. The six utilities had a cumulative capacity of over 4 MW in their community solar programs.³ A total of 409 individuals from five of these utilities participated in the SEPA-designed survey. One utility executed a modified version of SEPA's survey on their own and provided SEPA with summary results. Including these responses, SEPA developed a database of 641 community solar participants.⁴ The detailed findings are provided in the third section of this report.

Summary Findings

IT TAKES A VILLAGE	<ul style="list-style-type: none"> Community solar programs are complex. A wide array of internal and external stakeholders should collaboratively participate in the design process. Collaboration can improve design, lessen the marketing challenge, and garner the necessary buy-in.
KNOW YOUR CUSTOMER	<ul style="list-style-type: none"> Customers respond to simplicity and flexibility. Financial and environmental motivations dominate the reasons why individuals participate.
BILLING IS A BEAR	<ul style="list-style-type: none"> Involving IT teams early in the design process can lessen the later pains of integration.
ECONOMIES OF SCALE MATTER	<ul style="list-style-type: none"> In order to keep programs affordable (and accessible to the broadest audience) economies of scale must be leveraged.
TAKE THE PORTFOLIO APPROACH AND DON'T BE AFRAID TO HAVE OFFERINGS COMPETE	<ul style="list-style-type: none"> Subscribers have shown an appetite for other clean energy services such as EV charging rates, efficiency, and community storage. Recognize that the community solar program may compete with existing green tariff programs. That's Ok.
DON'T OVER PROMISE	<ul style="list-style-type: none"> Subscribers who had a negative program experience overwhelmingly listed that this was the result of getting less of a financial reward than expected.

² It needs noted that since the subscribers self-selected to participate in each program and are not a random group, the customer survey does not follow experimental design.

³ The names of each utility that participated in the survey are not provided for confidential reasons.

⁴ Dominion's original SMP Request for Proposal asked SEPA to conduct surveys of at least 150 community solar subscribers.

Utility Interview Findings

Avista Utilities – Community Solar

Table 2. Key Avista Community Shared Solar Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
423 kW	2015	100% of Capacity	\$1,400 per 280 Watt Panel	Community Solar Credit of 4.9¢/kWh & WA State Renewable Generation Credit of \$1.08/kWh

“Don’t underestimate the time needed for marketing and selling the program (both internally and externally). Mass market strategies such as bill stuffers, email blasts, and social media work, but can be improved through thoughtful customer targeting, and good earned media coverage can’t be beat.”

“Next phase the costs should decrease considerably because there will be less learning curve costs”

Overview

Avista Utilities is an investor-owned utility generating and transmitting electricity to over 350,000 customers in Washington and Idaho. Avista has an organizational goal to be proactive in distributed resources trends. Based on this goal and the desire to meet customer demand for greater solar ownership access, Avista decided to pursue a community shared solar program in 2015. The program is considered a “win, win, win, win,” in that the customers win with more solar ownership options, the utility wins by engaging customers and learning about solar generation, policy makers win as the program helps to utilize Washington state incentives, and non-participating customers win as they experience no adverse financial impact due to the program.

Solar Asset

Avista’s solar asset utilized in the community shared solar program is fairly unique. The Washington State renewable production incentive can be used by community solar participants if the solar array does not exceed 75 kW. Avista wanted to make sure its customers could take advantage of this generous incentive (\$1.08/kWh), but also wanted to build at a larger scale to maximize accessibility.

In order to fulfill both needs, Avista consulted with Washington’s Department of Commerce and received confirmation that 423 kW of total solar could be developed at one site as long as six separate arrays were used – each having their own inverters, meters, and different customers. Avista located the solar asset on land already owned by the utility, eliminating land acquisition costs and concerns.

Avista contracted with Clean Energy Collective (CEC) to develop the program and also shares administration efforts. Avista owns the asset, and after the community solar program ends in June 2020 the solar asset will simply become a standard generating asset.

Economics

Participants in Avista's community shared solar program pay \$1,400 per 280 Watt panel. All of the costs for developing and implementing the program are captured via this payment. Customers can purchase up to 12 panels (which would require an upfront payment of \$16,800), which caps out the per person WA state incentive amount eligibility. Avista recognizes this is a sizeable cost for a participant to bear, though part of the cost can be attributed to the fact that Avista experienced a significant learning curve while implementing the program. Future phases may be cheaper. Avista also has a long term plan to provide different price points, so as to make the program more accessible to customers from all economic backgrounds. Part of the solution being explored is to utilize smaller panels which would have a lower cost.

Despite the high price point, Avista's program provides significant financial benefit to its participants. Participants receive two types of credits: a community solar credit of 4.9¢/kWh (wholesale rate) (); and the WA State incentive of \$1.08 per kWh. These credits are estimated to pay back the initial upfront payment in under 4 years. Over the first 10 months of operation, the actual generation credits are 15% above what was estimated and communicated to customers.

Development & Billing

The development of the program was labor intensive. A team of about 6 employees worked part-time for approximately 9 months to launch the program. The biggest issues were handling the program design, billing integration, marketing the program, and resolving all legal questions.

With regards to billing, Avista uses a semi-automated process. CEC monitors the solar asset's production and how much each participant "owns". Each month CEC provides a database that provides the proper bill credit for each participant. Avista then must load the data from the database into their billing system – which requires a few hours each month. Luckily, Avista's billing system had the pre-existing ability to add miscellaneous credits onto specific accounts as these were primarily used for allocated energy efficiency credits.

Consumers Energy – Solar Gardens

Table 3. Key CMS Solar Gardens Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
4 MW	2016	54% of Capacity	Multiple Options to pay for 500W panel <ul style="list-style-type: none"> • \$1,289 Upfront • \$40/Mo for 3yrs • \$20/Mo for 7yrs • \$10/Mo for 25yrs 	Community Solar Credit of 7.5¢/kWh

“Engaging universities as site hosts shows the program had buy-in from forward looking organizations. This has been useful in messaging the program”

“We provided four payment options to allow flexibility. This turned out to be a double-edged sword. The multiple payment options have caused confusion and created a marketing challenge. If we started anew we may limit the options. ”

Overview

Consumers Energy (CMS) is an investor-owned utility serving over 6 million customers in Michigan, primarily in the Lower Peninsula. CMS received strong feedback from customers and environmental groups to offer more solar in their territory. In a 2015 customer survey, 50% of CMS customers suggested they were interested in participating in a community solar program.

There was also substantial political support for solar assets to be built in Michigan. Prior to the Solar Gardens program, there was 70 kW of community solar in Michigan (run by Cherryland Electric Cooperative and Homeworks Tri-Country Electric Cooperative), and CMS had just over 3 MW of rooftop and utility-scale solar in its territory.⁵

Solar Asset

CMS developed agreements with Western Michigan University and Grand Valley State University to develop two solar projects on their campuses for use in the Solar Gardens program. CMS purchased an easement for 25 years on each university’s campus. The two solar projects are 1 MW and 3 MW, and were constructed and are owned by CMS – though CMS has plans to contract out the operations and maintenance of the asset. Because the two universities are land grant universities, there were no zoning restrictions. Still, it took CMS approximately 6 months to finalize the contracts (basics provided in Table 4 with the universities and obtain the land.

This capacity, 4 MW, was selected as this is quite sizeable for a community solar program (the average current program size is around 200kW) and demonstrates CMS’s commitment to growing solar in Michigan. Each of the universities will also participate in the Solar Gardens program as a subscriber. Suniva, a Michigan-based manufacturer, supplied the panels for the solar projects.

⁵ Capacity values are from SEPA’s Annual Utility Survey.

Table 4. Costs for 3 MW Solar Project

\$57,720	\$120,000	\$55,000	\$76,500
For 25 year easement	Over 6 years for the development of an education program	To build 3 small solar arrays, not associated with Solar Gardens	For host credit applied to universities' Solar Gardens subscription

CMS received approval from the Michigan Public Service Commission to build up to an additional 6MW of projects under the Solar Gardens umbrella. CMS will evaluate customer interest in the first 4MW of the program and build the additional capacity if demand warrants.

Economics

Solar Garden subscribers are given four options for paying for a 500W block of the asset: they can 1) pay a one time upfront fee of \$1,289; 2) pay \$40 per month for 36 months; 3) pay \$20 per month for 84 months; or 4) pay \$10 per month for 300 months (which is the life of the program). The monthly payment options are equivalent loans. The equivalent annual interest rates ranging from 7.6% to 8.4%. Participants also pay a \$50 fee to reserve their spot in the program. CMS has since seen this fee to be a barrier to enrollment and is considering eliminating it.

Subscribers receive a credit of 7.5¢/kWh for all the electricity generated by their share of the solar asset. This credit accounts for 1) the cost of the energy being offset, 2) the avoided need for additional capacity, and 3) avoided line losses. The credit does not account for avoided distribution costs, environmental benefits, or others.

The Solar Gardens program is not completely cost contained. If there is unsubscribed capacity, CMS has the approval from the Michigan Public Service Commission to pass those costs along to the rate base. Other expenses associated with the development of the program are not fully recouped from the subscription payments. For example, CMS's IT team spent approximately 1 year updating their SAP billing system to include the Solar Gardens credit on the bill. CMS was largely able to subsidize the program due to the overwhelming support for new solar in MI.

Marketing

CMS contracted out the marketing of the program to 3Degrees, of whom CMS spoke highly of. 3Degrees has executed a broad outreach campaign that has included email blasts, bill inserts, door to door sales, and phone calls to a targeted set of customers. All of these efforts have gained earned media from local news organizations. 3Degrees has reported there is a need for 5 to 7 customer touch points in order to result in an enrollment.

The main messages used in CMS's marketing have been that there is no rooftop required, and that the program has far reaching environmental benefits. CMS has made it very clear that this program is not intended to provide a financial benefit. Interestingly, though this message has been trumpeted, a large number of low income subscribers have shown interest in the program. This is evidenced by the fact that 15% of all Solar Gardens applicants are unable to participate because they have had a shut off notice in the last 9 months (which is a CMS criteria for participation).

Hawai’ian Electric Company – Community Solar

Table 5. Key HECO Community Shared Solar Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
~0.2 MW (pilot) 32 MW (Phase I)	Pending regulatory approval	Pending regulatory approval and program launch	\$1.67/W upfront, \$65/kW enrollment, 1.14¢/kWh O&M fee \$1.92/kW monthly administration fee	Community Solar Credit of 13.475¢/kWh

“Our program is designed to eliminate any cross-subsidies on non-participants, however could we have tried for more simplicity? The program has quite of a few elements of complexity, including the billing structure and rigidity of our enrollment contract. These complexities ensure we are compliant with state and federal securities regulations.”

“Our community solar program is certainly not for everyone – nor is it intended to be. But it provides a great complement to our existing solar and DER programs.”

Overview

Hawai’ian Electric Company (HECO) is an investor owned utility that, along with its subsidiary utilities Hawaii Electric Light Company and Maui Electric Company, supplies electricity to 95% of Hawaii’s population. Solar is an abundant resource on the islands. With abundant insolation and relatively high electric rates, solar makes a lot of sense at HECO.

In the summer of 2015, HECO developed and filed for regulatory approval for a pilot community solar program of around 200 kW. Shortly after, HECO received legislative direction requiring the utility to file a tariff for a broader community-based renewable energy (CBRE) program. In October of 2015, HECO adhered to this direction filing their tariff to Hawaii’s Public Utility Commission (HPUC). The HPUC has opened an investigative docket to evaluate the CBRE tariff.

Economics

HECO’s community solar program has a multifaceted financial structure. Participants have two upfront payments due. The first is \$1.67/kW for an interest in the community solar pilot and \$65/kW for a program cost reimbursement fee (enrollment). There are also two monthly recurring charges, \$1.92/kW for an administration fee and 1.14¢/kWh (based on NREL’s O&M benchmark cost of \$20 per kW) for operation and maintenance of the community solar facility.

Participants are credited at 13.475¢/kWh produced. This is 41% less than the average Hawaiian Electric retail rate in April of 2016 (~23¢ per kWh). The credit is also less than the bill credit new participants in the grid supply rooftop solar program receive (15¢ to 28¢ per kWh depending on island). The community solar credit was designed to imitate a wholesale market rate for solar power to ensure that non-participating customers do not pay a premium for energy from the pilot program. Since there is no actual wholesale market in HI, Hawaiian Electric’s lowest solar PPA rate was used as a proxy.

Hawaiian Electric’s program does not market a set participant payback period.

Securities

Most utilities interviewed for this write-up expressed some concern about their community solar program being considered a security. HECO is the only utility interviewed that has dealt with this risk head on by applying for a no-action letter for the Community Solar pilot from the U.S. Securities Exchange Commission. The no-action letter would indicate that the SEC would not take any action against HECO for sale of interest in Community Solar Pilot based on the terms of HECO's participant contract and pilot's marketing materials. The pilot program is also set up to be compliant with the intrastate exemptions should a no action letter be issued by the SEC.

Important to note, the no-action letter is applicable solely to HECO's participant contract for Community Solar Pilot. Upon regulatory approval of broader CBRE program design, HECO also plans on applying for a no-action letter for the program from the SEC indicating that the SEC would not take an enforcement action against developer for violation of securities laws based on such developer's use of the form of the Model Customer Agreement. Thus, if a developer pursues a CBRE program and uses terms that differ from those in HECO's participant contract, the developer's program would not necessarily be exempt from securities laws. HECO requires developers pursuing their own contract to provide evidence of federal and state securities compliance, such as a no action letter from the SEC or a legal opinion that indicates that that developer's offering is in compliance with securities laws under the available exemption claimed.

Pacific Gas & Electric Company (PG&E) – Solar Choice

Table 6. Key PG&E Solar Choice Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
Scalable up to 272 MW	2016	10.5 MW	Community Solar Rate of 10.9¢/kWh to 13.2¢/kWh	Community Solar Credit of 7.7¢/kWh to 9.9¢/kWh

“Our two solar choice programs [PG&E’s Solar Choice and Regional Solar Choice] may seem to compete with one other, but the different offerings have different costs and values and will appeal to different customers. It’s necessary to have a portfolio of options.”

“Targeted marketing has been our most successful way of getting the word out.”

Overview

Pacific Gas & Electric (PG&E) is one of the three investor-owned utilities (IOUs) serving California. PG&E serves over 5 million households in Northern and Central California. PG&E and other parties put forth a proposal to the California Public Utilities Commission (CPUC) in 2013 for a shared solar program, and the passage of California Senate Bill 43 later that year drove the CPUC to issue, in early 2015, the Green Tariff Shared Renewables Program Decision. This Decision requires all California IOUs to jointly develop 600 MW of community solar programs. PG&E has responded with two programs: PG&E’s Solar Choice and Regional Solar Choice. The former enables all PG&E customers to purchase up to 100 percent of their usage from a pool of new solar projects, and is the focus of this section. The Regional Solar Choice program enables PG&E customers to subscribe to a portion of the output of a single project by working directly with a solar developer. Because that program was awaiting a CPUC decision (“Phase IV”) to clarify certain aspects at the time of this interview, it is not covered in this write-up.

Solar Asset

In early 2016, PG&E signed new contracts totaling 52.75 MW for this program, per a CPUC directive to procure a minimum of 50 MW in advance of customer enrollment. These projects, which range in size from 500 kW to 20 MW, are expected to come online by late 2017 or early 2018. In the interim, participants will be served by solar generation from PG&E’s fleet of existing solar facilities that are of similar size and location.

Economics

Participants in PG&E’s Solar Choice program will pay a modest charge on top of their base rate. The total rate is broken down into four line items (*note that current 2016 values are provided; these values will change over time*):

- Solar Generation Charge (9.55¢/kWh) – This is the pass through of the PPA charge. The Solar Generation Charge will be the weighted average PPA price for the portfolio of solar assets serving the program. It is expected that as more solar assets are brought online, at lower expected PPA costs, this charge will decline.

- Power Charge Indifference Adjustment (0.3¢/kWh to 2.3¢/kWh) – This charge ensures that above market stranded generation costs are not shifted to non-participants when one switches to the PG&E Solar Choice program. The charge varies by rate class.
- Program Charge (~1¢/kWh) – This charge covers all costs associated with running the program, including marketing and program administration. Embedded in this charge is also a credit that acknowledges the value that solar provides the entire customer base. This charge varies by rate class.
- Generation Credit (7.7¢/kWh to 9.9¢/kWh) – This is the credit that participants receive. The value is based largely on the avoided generation costs.

For residential participants in PG&E's Solar Choice program, these charges and credits will initially result in about a 3.5¢/kWh charge on top of their base rate. The charge for commercial participants varies based on their commercial type.

Billing

Updating PG&E's billing system to accommodate the new set of rates was the single most challenging administrative task, especially due to the fact that most of the charges and the credit for the program vary among rate class. PG&E had one project manager dedicated approximately 25 percent of her time to this task over the course of a year. She was supported by what was estimated as more than 50 staff who all dedicated a small portion of their time to the project (though it should be noted that no one was hired specifically for the IT updates to this program; the assignments were distributed to PG&E's existing personnel). The updated billing system can now easily accommodate future rate changes in PG&E's Solar Choice program, and the staff time commitment for operating the program should be minimal.

Marketing

PG&E's Solar Choice exists in California, which is noteworthy because California is a market with a lot of rooftop solar competition, solar awareness among customers, and media scrutiny towards utilities. In order to get the word out to potential customers, PG&E has largely relied on targeted email campaigns. Customers who have previously self-selected for other optional programs, such as PG&E's ClimateSmart program, demonstrated high community involvement, or adopted EVs were seen as likely early adopters and initially contacted. While it is early in the program, these targeted email campaigns appear to be successful.

While PG&E largely received positive press during the launch, there was some negative press as well. This is fairly unique. All other utilities included in this write-up expressed that all earned media was positive. There certainly was press discussing the positive customer reactions to the program, but PG&E noted that some press missed the fact that the Solar Choice programs introduce additional solar generation – apart from what is required by RPS and beyond simple unbundled RECs – and instead focused on the cost premium. A contributing factor is that California's customer-owned, solar rooftop models are well established and marketed on the fact that they can save customers money.

Rocky Mountain Power – Subscriber Solar

Table 7. Key RMP Subscriber Solar Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
20 MW	Planned for Fall of 2016	Pending	Community Solar Rate starting at 11.7¢/kWh	Virtual Net Energy Metering

"Community solar programs are confusing. You need to know about rate design, renewable generation, IT, customer service, among others. Confusing is usually the enemy of progress at utilities.

The only reason our program has been successful is because we involved stakeholders early in the design process. We held workshops with the consumer advocate, environmental energy organizations, city representatives and others to collaboratively design the program. Through these workshops we gained their support and trust. This support and trust allowed us to easily obtain commission approval and eliminated many of the hurdles others face when implementing a new utility program."

"Updating our existing billing system was by far the most labor intensive portion of developing the Subscriber Solar program – it took approximately half the budget of our first launch year. Part of the reason was the fact that we designed the program with a unique community solar rate for each rate class. If we involved our IT team early in the design process, we may have been better prepared to tackle this issue."

"In order to compete with other solar ownership options, you need to provide a program that is economical for your customers. We found we were able to offer a much better price point for the 20 MW project than for smaller sized assets."

Overview

Rocky Mountain Power (RMP) is a subsidiary of the investor-owned utility PacifiCorp. RMP serves over 900,000 customers in Utah, Wyoming, and southeastern Idaho. In 2015, RMP received approval from the Utah Public Service Commission to offer RMP's first community solar program, labeled as Subscriber Solar. Subscriber Solar will be available to customers in the fall of 2016. The Subscriber Solar program was largely motivated by communities who wanted to be able to offer their residents solar ownership. A large, centrally located community solar project that could be optimally located was deemed the best manner of meeting this demand.

Prior to launching the program, RMP facilitated a series of workshops with local stakeholders. The consumer advocate, local environmental groups, industry representative groups, energy directors from cities, and others were invited to discuss and determine the most agreeable program design. These workshops were conducted over several months and were completed prior to RMP filing a docket with the utility commission.

Solar Asset

At 20 MW, the solar array used for Subscriber Solar is currently one of the two largest individual solar arrays dedicated to community solar – the other array, which is also 20 MW, is used in Salt River Project’s community solar program. The contract to develop the solar asset was awarded to juwi through a competitive bidding process. RMP has entered in a power purchase agreement to obtain the electricity for their program.

RMP received proposals from developers offering solar projects of varying sizes in their solicitation. RMP selected the 20 MW project as economies of scale were gained at this size, particularly through spreading out the interconnection cost. Additionally, RMP believed it highly likely that they would be able to sell out a 20 MW program, which would require approximately 20,000 subscribers, based largely on the fact that they currently have 40,000 customers on their more costly green tariff program, labeled as the Blue Sky program.

Economics

Subscriber Solar participants sign up for 200-kWh blocks of solar electricity. They are charged a community solar rate that is applied to the kWh produced by their share of the solar array. The community solar rate has two components, described below:

$$\text{Community Solar Rate} = \text{Generation Charge} + \text{Delivery Charge}$$

Generation Charge: Accounts for the solar PPA and the costs of administrating the community solar program. This charge is fixed; it will not change over the duration of a participant’s subscription. Currently the generation charge is 7.7¢/kWh (5.5¢/kWh for the PPA and 2.2¢/kWh for administration). Larger, industrial customers pay a slightly lower generation charge to acknowledge their flat load.

Delivery Charge: This charge accounts for standard transmission and distribution – the cost of maintaining the poles and wires. The charge is not fixed; if RMPs standard retail rate increase the Delivery Charge will also increase. Currently the delivery charge is ~4¢/kWh.

The Generation Charge was designed in a way so that if Subscriber Solar is fully subscribed within 3 years, the 2.2¢/kWh charge will cover the entire budget of the program development and management. Thus, non-participants are expected to incur no costs of the program. Though it is unexpected, it is certainly possible that the program will not reach full subscription within 3 years. If this is the case, RMP has received permission from its commission to recover the proportional costs of any unsubscribed portion from the rate base.

Marketing

RMP is taking a cautious approach to marketing prior to the solar asset being energized. One of RMPs biggest concerns is that they may sell out too quickly, and are afraid that wait listing too many subscribers could create customer discontent. To date, RMP has only issued two press releases, which each garnered additional press exposure. This has resulted in over 500 emails from customers expressing interest in the program.

In the future, RMP plans to use a targeted marketing strategy. They will approach customers who have already shown an interest in clean energy options by leveraging marketing being sent out to demand-side management participants and green tariff participants. RMP has also developed a list of high usage residential customers – because RMP has a tiered rate structure these customers stand to financially benefit most from the Subscriber Solar program. RMP has also been contacted by homeowners' associations and residential real estate companies, who have asked them to present the program to their customers.

Sacramento Municipal Utility District – SolarShares

Table 8. Key SMUD Solar Shares Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
1 MW (existing) 10 MW (planning)	2008	630 customers (fully subscribed)	Community Solar Rate of 14.9¢/kWh	Virtual Net Energy Metering

“It was left up to the developers to identify and secure the land for the projects. This was done to simplify the project to SMUD. However this slowed the program down and resulted in PPAs that may have been lower if SMUD secured ideal sites and passed lease options to developers”

“We can lower the risk of the program if we are able to obtain shorter PPA terms, for example 10 years. Shorter terms results in greater flexibility, which aligns with customer interests”

Overview

Sacramento Municipal Utility District (SMUD) is the public power utility that serves approximately 600,000 customers in and around Sacramento, CA. SMUD was a very early mover in community solar. They were the third utility to offer such a program when their SolarShares program launched in 2008, and they were the first to offer a subscription-based program. Previous programs all required participants to pay a onetime upfront fee. SMUD is currently planning a new community shared solar program. This write up focuses on the original program.

Solar Asset

SMUD resorted to a power purchase agreement to obtain solar power for SolarShares program. The project size of 1 MW was targeted as it was much larger than existing community solar programs at the time, and thus would advance the belief that community solar could be a mass market program. Additionally, though 1 MW was large for the community solar world at the time, it is very small as compared to SMUD’s entire generation capacity. Thus there was little concern about stranded assets. The actual financial effect of not fully subscribing the solar asset would be minor.

Economics

Solar Shares participants pay a premium rate of 14.9¢/kWh to participate – SMUD average residential retail rate in 2008 was approximately 10.5¢/kWh. Thus the program was offered at a >4¢/kWh premium, which is high compared to other subscription based programs developed later on, but is quite reasonable considering SMUD’s program was launched nearly a decade ago.

However, the premium did not fully cover the costs of the program. When the program was launched, SMUD had to pay an additional 14¢/kWh to 15¢/kWh for the wholesale electricity. At the time there was significant political and stakeholder support for the program, thus this cross subsidy was not a concern.

Billing

SMUD faced two distinct billing challenges: how to incorporate the community solar billing in the billing I.T., and how to clearly present the program on the customer’s bill in a manner that customers would understand. In a way, these two challenges had clear solutions that contradicted each other. I.T.

preferred the virtual net energy metering tactic for crediting (as compared to having a separate community solar credit line item), while customer service preferred having a separate community solar credit line item. In the end, SMUD selected the preferred path of the I.T. team and credited customers via vNEM. This still required 1 to 2 FTEs from I.T. a year to update SMUD's existing system.

Another billing consideration is that SMUD offers time of use rates. Since rates are higher during the day, when the solar asset is producing electricity, time of use customers would prefer to vNEM as compared to having a single community solar rate.

Tucson Electric Power – Bright Tucson

Table 9. Key TEP Bright Tucson Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
23 MW	2011	1,300 (fully subscribed)	Community Solar Rate of ~11.1¢/kWh (2¢/kWh premium)	Virtual Net Energy Metering

“Our billing didn’t match up perfectly with our marketing. We marketed the program based on a \$3 per 150kWh premium, which is roughly 2¢/kWh, but on the bill we combined this premium with other generation costs on a single line item. This has caused some customer confusion.”

Overview

Tucson Electric Power (TEP), a subsidiary of UNS Energy Corporation, is a regulated investor owned utility serving 414,000 electric customers in Tucson, Arizona. TEP’s Bright Tucson Community Solar program was conceptualized back in 2009, prior to leasing financial models when the only solar option was purchasing an expensive rooftop system. TEP was faced with public pressure to do more to promote customer involvement in a sustainable future. In response the program was drawn up in 2010 and on March 1st, 2011 TEP’s program was opened up to customers. This community solar program offers customers the opportunity to purchase blocks of solar energy at a small premium from TEP’s solar projects located in the Tucson municipal area.

Customers who decide to subscribe to the program can sign up for enough 150 kWh blocks of solar generated electricity to offset 100% of their electricity consumption. The program length is 20 years and designed for overall simplicity and customer flexibility. Subscribers can leave the program at any time and can change the number of blocks once every 12 month period.

Solar Assets

All solar assets that are used in this program are already paid for and owned by TEP and the REC’s count towards their RES compliance. In total the Bright Tucson Community Solar program has 23 MW of solar capacity subscribed. The breakdown of this capacity is as follows:

- 5 MW subscribed by 1,238 residential customers
- 3 MW subscribed by 10 commercial customers
- 15 MW subscribed by a city and county customer

TEP’s program is fully expandable in that it can open up another utility owned solar project to match customer demand, allocating the generation from the new program to subscribed customers.

Marketing

In the initial launch of the program a great deal of time was spent on how to market it. In total there were about 10 teams within TEP working together on the program. To aid in customer comprehension of the program, TEP decided to market the 150 kWh blocks as a \$3 premium on their bill. Initial marketing strategies included billboards, radio spots, and other mass marketing strategies such as email

blasts and bill inserts. The program was a success early on due to pent up demand for a solar option and a strong marketing strategy. However in 2013 the marketing funding was cut by the regulatory commission. Since then the marketing strategy has been grassroots, consisting primarily of local sponsorships such as Boys and Girls Scout events, educational forums such as the Children's Museum, and periodic bill inserts. Program participation level has remained steady.

Economics

When the program was launched, in 2011, power purchase agreements for solar energy in AZ were 12¢/kWh to 14¢/kWh. TEP was required to begin purchasing solar due to the Renewable Energy Standard that is supported by a fund paid by all TEP customers. The premium paid by subscribers for this program is not revenue for TEP, rather the funds collected through the premium go to TEP's Renewable Energy Budget, which is used to develop new solar assets – supporting additionality.

Each 150 kWh block subscription adds about a \$3 charge to the subscriber's monthly bill, or roughly a 2¢ per kWh premium. However, the calculation of this premium rate is not simply a fixed charge and was marketed as such for customer comprehension.

When signing up for the program a subscriber locks into the current base fuel rate, which makes up about a third of their current bill. For the early adopters of the program in 2011 the base fuel rate was 2.8¢/kWh, and today it is around 3.1¢/kWh to 3.3¢/kWh. In short, a subscriber will pay the fixed base generation rate plus the program's 2¢/kWh premium in addition to the other charges of their bill, which are still adjusted by the commission in rate cases. Therefore if TEP's base rate continues to rise and the customer remains fixed at that base generation rate the subscriber could see a financial benefit over the 20 year lifetime of the program.

United Power – Sol Power

Table 10. Key Sol Power Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
20 kW	2009	48 (fully subscribed)	Lease of 210 Watt Panel for \$1,050 each	Community Solar Credit of 12¢/kWh

“Tying the crediting program to our net energy metering policy has caused challenges. We are currently contemplating changes to this policy. Because the community solar credit is based on net energy metering, we cannot market the program until the policy changes are resolved.”

Overview

United Power is a cooperative utility that serves almost 69,000 customers just north of Denver, Colorado. United Power launched Sol Power in 2009, making it the first active community solar program in Colorado. Sol Power was launched in response to United Power members who indicated that they wanted alternative options to the cooperative’s rooftop solar rebate program. United Power decided to pursue their community shared solar program because it would be a solar offering available to 100% of their customer base and it was less expensive and posed less risk than their solar rebate program.

Solar Asset

The Sol Power program has two 10kW projects with a total capacity of 20 kW. Both projects are built on utility land and owned and operated by United Power. In May of 2009, United Power paid for and built the first 10 kW ground mounted project. Sol Power was designed as a “Grow as you Go model” where the sale of panel leases from the initial project were used to fund the second 10 kW array, which was built in August of 2010. United Power is currently looking to expand the program by another 20 kW.

Economics

Each 10 kW project consists of 210 Watt panels that were available for a 25 year lease for an upfront payment of \$1,050. Despite the fact the United Power was unable to capture the 30% investment tax credit, at \$5/W Sol Power was priced lower than most other solar installations at the time it was developed. United Power was able to provide this discount, partly because the program was partially funded by a \$50,000 Colorado Solar Innovations grant received in 2008.

During the 25 year program, subscribers receive a community solar credit of 12¢/kWh generated by their portion of the project. Notably, the community solar credit is greater (by 1¢/kWh) than United Power’s average retail rate. This is a unique characteristic among community solar programs. The 1¢ per kWh premium was deemed necessary because participants in the Sol Power program are unable to receive the utility’s rebate offered for rooftop solar. This premium is recovered by the cooperative by selling the renewable energy certificates to Tri-State, their wholesale energy supplier. United Power is also considering changing their overall net energy metering policy. If this does occur, the community solar credit would likely change accordingly.

Utility Ownership

At one point, the array was hit by a lightning strike and the inverters were lost. Replacing the inverters and getting the project back online took two weeks. During the time that the project was down, United Power compensated the subscribers of the program as if the disruptions had not occurred by crediting them for the estimated production of the project. United Power was able to do this because they owned and operated the project.

Xcel Energy (CO) – Solar*Rewards Community

Table 11. Key CO Solar Rewards Statistics

Capacity	Year Launched	Subscribed Customers	Customer Payment	Customer Benefit
18.1 MW	2012	1,000	Depends on Community Solar Developer	Residential Community Solar Rate of ~7.5¢/kWh

“Initially we made the RFP very simple to ensure developers would respond. The bids from the developers were consistent and we wanted more diverse responses. Additionally we realized that using only LCOE to evaluate proposals was not the best practice, and started accounting for the experience of the developer.”

Overview

Xcel Energy is an investor owned utility serving 3.5 million customers in Colorado and operating in 7 other states. Xcel Energy’s Colorado utility is also known as Public Service Company of Colorado. In 2010, Colorado was the first state to pass a community solar policy with the Community Solar Gardens Act [HB 10-1342]. This legislation defined community solar gardens (or community solar projects) and required the state’s investor owned utilities to accept a defined amount of community solar capacity from third party community solar developers. The legislation also defined a few parameters that these programs must adhere to:

- Project size is limited to 2 MW or less.
- Subscriptions to the program are owned by 10 or more customers.
- Customers are limited to purchasing 120% of their historical use.
- Each project is required to have a 5% “carve out” for low to moderate income customers.

Xcel had helped craft this legislation and began working on their Solar*Rewards Community program once the legislation was signed into law, officially launching the program in October 2012. In 2015, new community solar legislation (HB 15-1284) was passed to expand customer access to community solar building off of the success of the Community Solar Garden Act.

Solar Assets

There are currently 18.1 MW of installed community solar capacity in the Solar*Rewards Community program. Xcel Colorado has three phases of its program, the first two (2012 and 2013) each yielded 9 MW. In the third phase, Xcel has elected to accept 29.5 MW of community solar capacity through an RFP issued in 2015.

In Xcel’s Solar*Rewards Community program, all solar assets are owned and operated by third party community solar companies. There are currently four with active projects: Clean Energy Collective, SunShare, Ecoplexus, and Community Energy Solar. In addition to owning and operating the asset, these companies are responsible for customer acquisition, including ensuring that at least 5% of each project’s participants qualify as low to moderate income.

Economics

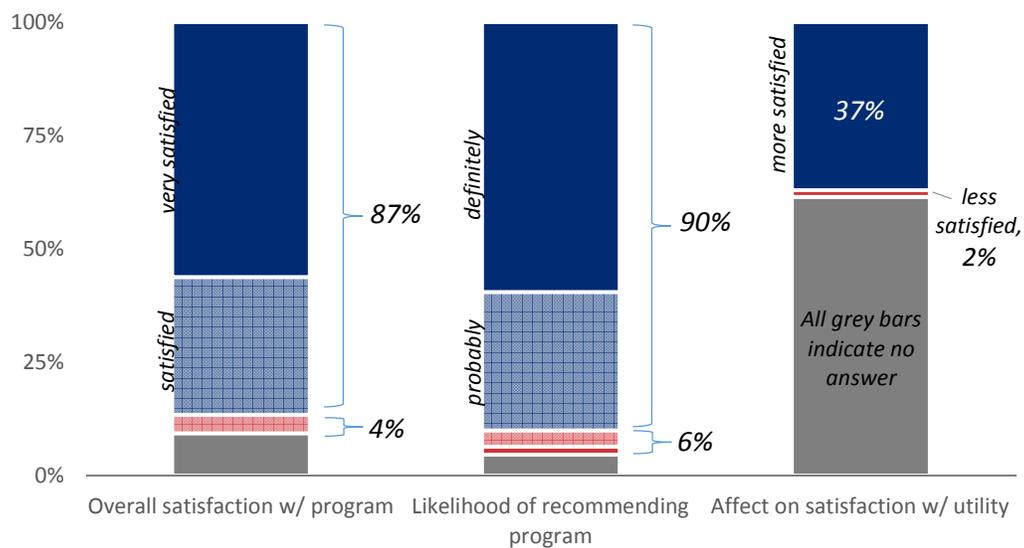
Solar*Rewards Community subscribers enter into a contract with a community solar company and therefore the customer payment structure for each community solar program varies by project. However, the way in which these subscribed customers are credited is the same, each receiving a monthly bill credit based on their share of the garden's production. The credit is equal to the subscriber's share of the garden production, multiplied by the Total Aggregate Retail Rate (TARR), less a delivery fee, with the residential bill credit coming out to about 7.5¢ per kWh. This monthly credit appears as a separate line item on the customer's utility bill. Each year, the TARR is recalculated from the prior year's data. More information on how this rate is calculated can be found in the Colorado Tariff Index.

Subscriber Survey Findings

A total of 641 subscribers in six existing community shared solar programs participated in our survey. The response rate for all those invited to participate in the survey was approximately 40%. This roughly corresponds with a sample confidence level of 95% +/- 4%.⁶ High level findings are presented below.

People like community shared solar. Most community shared solar subscribers (87%) are largely satisfied with their programs – and even more (90%) would recommend the program to their friends and neighbors. This general level of satisfaction was fairly consistent among all programs – the lowest rated program still had 76% of subscribers indicating they were satisfied. Note that these percentages include participants who didn’t respond to the question in the calculation. If this group is omitted, and we only consider respondents who were either satisfied or dissatisfied, the percentages listed above all significantly increase.

Additionally, while a majority of respondents indicated that the community solar subscription has not affected their relationship with their utility, a significant portion (37%) indicated their subscription made them more satisfied with their relationship. Noteworthy is that this result is not statistically affected by whether the utility or a 3rd party provider administers the program (34% with utility providers and 38% with 3rd party providers). Only 2% of subscribers indicated their subscription made them less satisfied with their utility.



Of the few who indicated that they were dissatisfied, all suggested the source of their displeasure was because the financial return was less than expected. Some sample comments from this group (which is notably a minority of respondents) include:

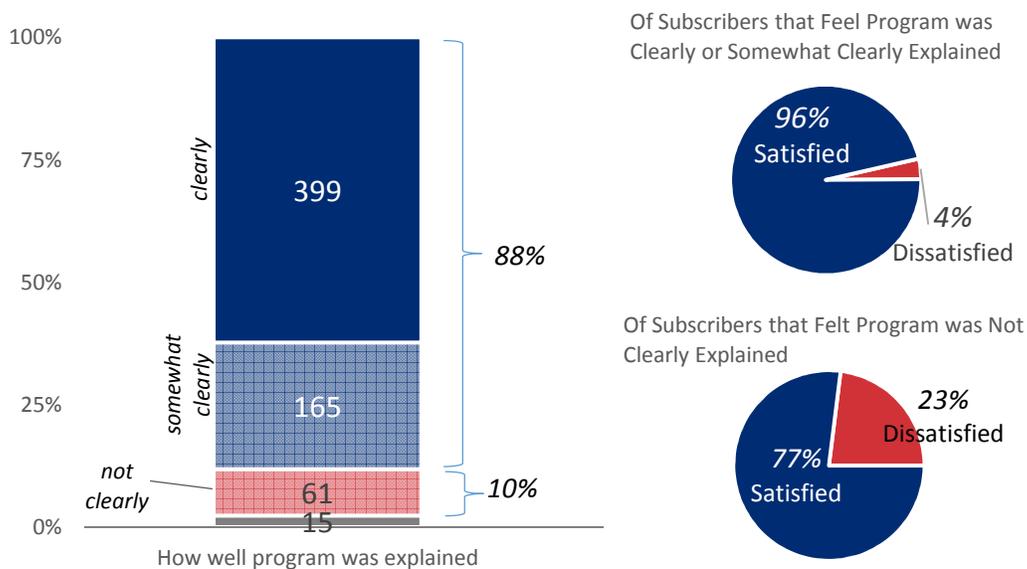
⁶ Note that since each program has a unique population of subscribers, the concept of statistical significance for the aggregate subscribers is not truly relevant. Still, the illustrative confidence level and interval at least suggest that this sample size is substantial.

“I thought the savings would be averaged monthly. I don't trust that I will be given the savings advertised.”

“The amount of credits projected in the offering brochure are greatly inflated compared to what we have received.”

“I thought this was going to be an investment, not a credit on my bill. My reduced income over the last several months was greater than the small check I received.”

Community solar programs are complex, and initial efforts often involve clearly explaining the concept to potential subscribers. Most subscribers (87%) felt like the program was fairly explained to them before they signed up. Not surprisingly, of the subscribers who felt the program was not explained well (10%), a greater number were dissatisfied with their experience (23% for this group as compared to 4% for the group who felt the program was explained well)

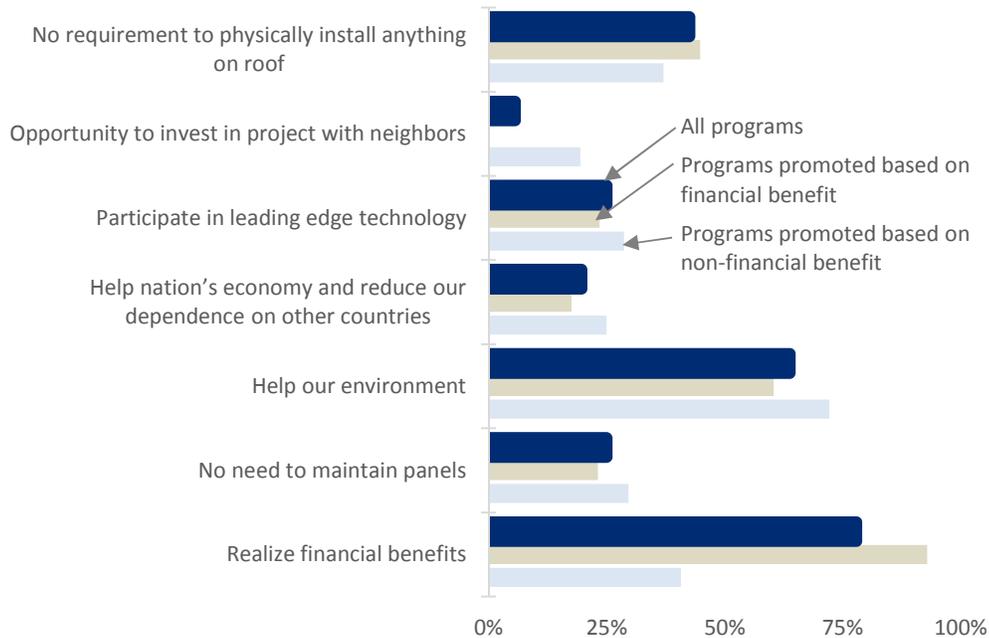


As other research has shown, community solar customers are each unique, each subscribing to programs for varied reasons. We asked community solar subscribers what were the top 3 reasons that motivated them to originally join the program. The most important motivators were the expected financial benefits (selected by 78% of subscribers) and the environmental benefits (selected by 64%).

There was a significant difference in responses when you looked at how the programs were originally marketed. We examined motivating factors for subscribers in two general types of programs: programs that promoted financial benefits in their marketing and programs that did

not mention financial benefits in their marketing. Subscribers in the former programs were far more likely to select that they were motivated by financial benefits than those in the latter group (93% compared to 41%), while subscribers in both groups were statistically equally as likely to be motivated by environmental benefits.

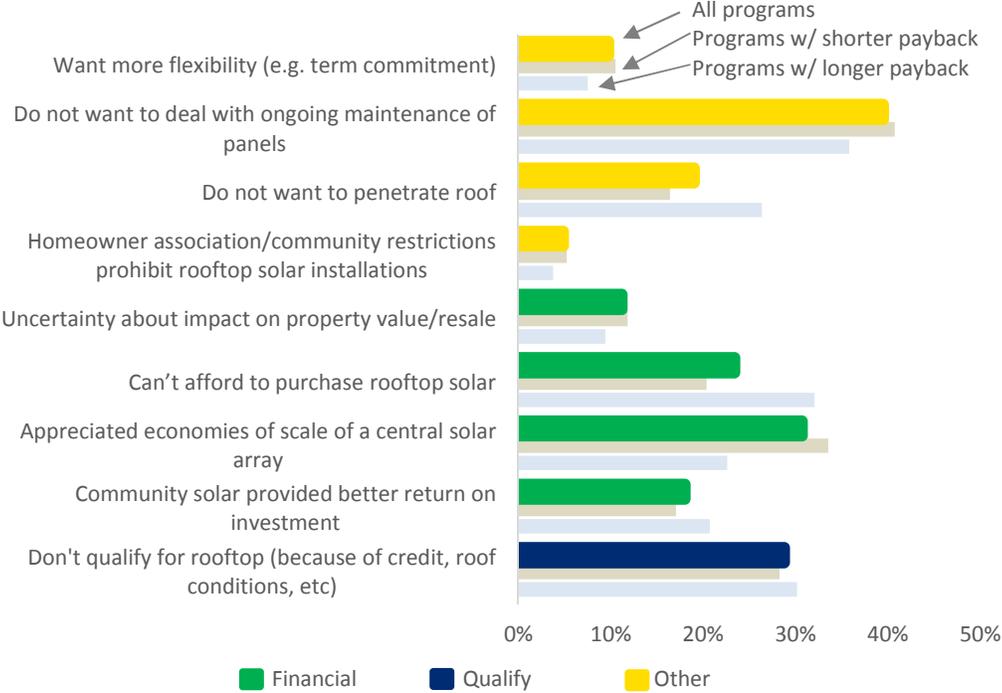
Perhaps unsurprisingly, a program gets the subscribers they ask for.



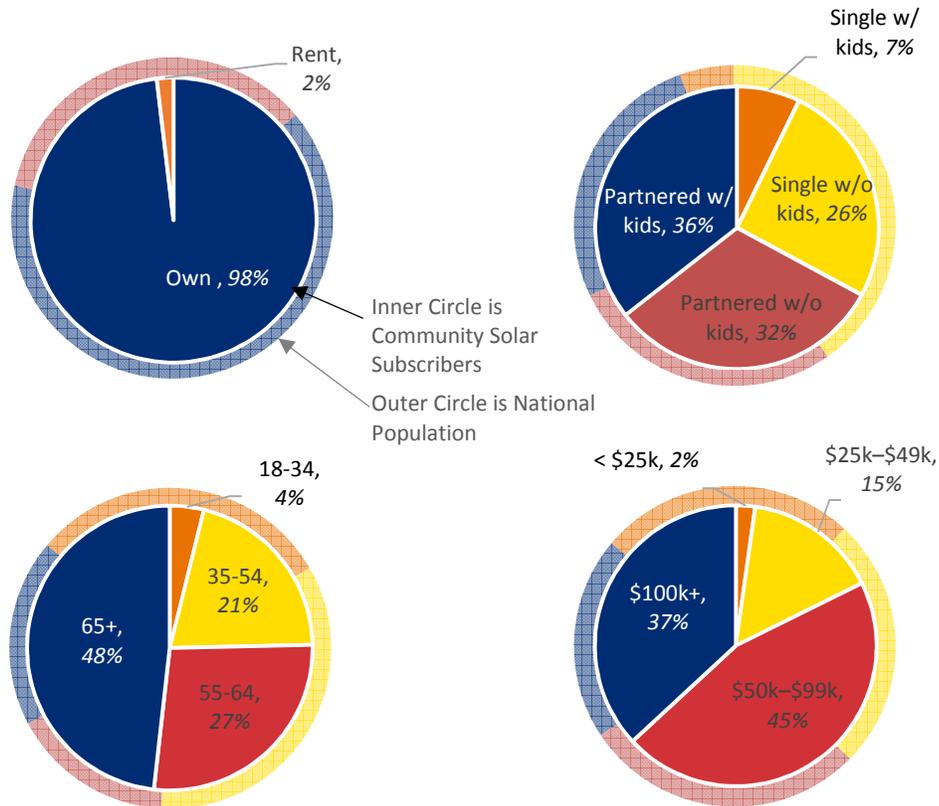
To some degree, community solar and rooftop solar programs compete for the same customers (though both models provide their own unique benefits and there is plenty of space for both). We asked community solar subscribers, who had a roof that could host an array, why they pursued the shared solar program as compared to an on-roof private array.

These respondents' top three reasons were that they did not want to deal with maintenance of the panels (selected by 40%), they appreciated the fact that community solar could provide economies of scale (selected by 31%) and that after researching rooftop solar they found out that they did not qualify for an installation (selected by 29%).

We had anticipated seeing the response pattern to this question vary based on the financial proposition of the community solar program – specifically anticipating subscribers in programs that offer shorter paybacks (less than 5 years) to respond that the financials of the program were more influential than subscribers in programs with longer paybacks. In actuality, there was remarkably little variation among the programs (the same percentage of respondents in both groups cited at least one financial factor).



Though their motivations vary, there seems to be some consistency among subscribers when it comes to their demographics. Subscribers of existing community solar programs are far more likely than the national average to: 1) own their home (98%), have a spouse or partner (68%), be older (75% are 55 or older), and have a high household income (~80% earn more than the average U.S. household).



It should be noted that only 6 utilities participated in this study, and their customer bases and their type of community solar programs are not necessarily representative of the entire U.S. Still, there is a high level of consistency in demographics among the 6 programs. Respondents who did not wish to provide demographic information are not included in the charts above.

Respondents were given the opportunity to provide additional commentary concerning their experience with their community solar programs. For the most part, the comments were largely positive including compliments to utility staff and statements of appreciation for offering the program. The remaining comments can be roughly categorized as comments that ask for clarification regarding the program; request the program provide subscribers more information (on items such as panel production and credits); provide negative reactions to the program; or consist of a hodgepodge of items that are largely unrelated to the community solar program. The range of comments received further demonstrates the uniqueness of each community solar customer and the importance of initial and continuing customer education. Examples of these comments are provided below.

Positive comments (43% of all comments)

"We live in an historic neighborhood; this makes solar a possibility for us. Thanks."

"I love this program. My brother wishes he had signed to buy a panel. I also love telling everyone how much my bill is reduced! Thank you."

"Thank you for bringing this program to our community! I am so pleased to have this option!"

Requests for more information comments (18% of all comments)

"Would like more data on total array output and its actual contribution to the local grid."

"Perhaps a monthly email adding up the energy credits so far compared to my investment."

"Is it possible to see if the panel that we have is ever down for maintenance? And if so, why?"

"I would like more information on the life of the panels and the cost of the electricity they produce. Are they cost effective in this area?"

Negative comments (13% of all comments)

"The way that the credit is presented on the bill is confusing."

"I really think you should have allowed participants to own the panels outright, don't cut us off [after the contract term]"

Clarification on program design comments (9% of all comments)⁷

"If we move from present address or are dead what happens to our membership?"

"I truthfully don't understand exactly what it does and would like to learn more about what our participation in the program does. I would like more information about how OUR participation helps and what it does."

⁷ Percentages do not add up to 100% as no examples of comments considered to fall in the hodgepodge category are provided.

Next Steps

This report presents SEPA's primary research into the community solar market and is intended to help Dominion Virginia Power discern if they should pursue a community solar program within their service territory and, if so, how this program should look. SEPA focused on what factors defined a successful community solar program from the vantage of utilities who have a program (the interviews) and the vantage of subscribers in existing programs (the survey).

It is SEPA's recommendation that Dominion pursue a program, and pursue stakeholder workshops as an immediate next step. These workshops serve multiple purposes. First and foremost, they provide the forum for key stakeholders – the environmental advocates, the consumer advocate, solar developers, internal IT representatives, among others – to discuss key program design issues such as the project economics, the effect on non-participants, project ownership, target audience, and a low income set aside. Doing so ensures that the final program is most suitable for Dominion's region and helps to garner buy-in from the participating stakeholders. This buy-in can go a long way towards improving the chance of regulatory approval. And finally, these workshops provide a forum to educate the key stakeholders on the basics of community solar and why Dominion is pursuing a program. The output of the stakeholder workshops should be a program plan that Dominion can file for regulatory approval.

At the same time, Dominion can get a head start on developing plans for integrating the IT component of the program with their existing customer information system and marketing the program to their target audience. These plans will be largely influenced by the program design that results from the stakeholder workshops and thus the plans cannot be finalized until after the workshops. Yet multiple utilities have indicated these items as the most significant challenges they faced when implementing their programs. In the extreme cases the cost of overcoming these challenges was up to \$1 million in budget and a year in time. It is wise to begin considering them as early as possible.

Appendix A

Utility Interview Questions

Program, Process, and Utility Questions

1. What were the drivers (regulatory, need for power, community interest) and the process to decide that the organization wanted to move forward with community solar?
2. Why did you choose an ongoing payment structure as compared to an upfront payment structure (or vice-versa)?
3. How did you determine your program's capacity?
4. Did you target pre-selling a specific number of panels, or a specific number of interested parties before moving forward with construction of the solar project?

Asset Management Questions

1. What is the ownership/contractual structure of the solar asset? PPA, PPA-flip, Utility own? Completely dedicated to CS or is any output handled through different contract structure?
2. Apart from the physical construction of the asset, what requirements needed to be met before construction of the asset (i.e. zoning permits, site development, site acquisition)?
3. Were any land use issues encountered in the development of the asset (including property tax issues)?
4. How did you address the stranded asset risk associated with having short term commitments for a long term asset? (if applicable)

Incremental Resources and Internal Operations Questions

1. Approximately how many utility FTE were required to develop the program, including asset development, program design, etc.? How many FTEs now that it is launched? Customer acquisition costs?
2. Did you partner or outsource for any components beyond solar asset development (including on-going O&M, billing, etc.)?
3. Do customers change rate class to join the program?
4. How is billing / crediting data integrated into your existing customer billing system? Did you require a new system?
5. How have you handled the data management associated with crediting consumers for energy production?
6. How have issues such as payment delinquency been handled?

Consumer Engagement Questions

1. Were focus groups or surveys conducted prior to implementation?
2. How much was spent on customer education and marketing?
3. What marketing tactics were used (radio, on-bill messaging, etc.)?

4. Has an effort been made to engage low-income consumers in particular? If so, what were these efforts?
5. How have you handled ongoing consumer engagement (i.e. creating an app for usage tracking, etc.)?
6. Have different methods been used to engage residential vs. commercial customers?
7. What has been customer response? Is subscription higher or lower than expected? Any theory as to why higher or lower?
8. Do you have plans for program expansion?
9. Is there anything noteworthy to share on program termination?

Other Questions

1. Did you encounter any tax or securities law challenges when implementing your program?
2. Did your legal team have any concerns with the program? If so, how were they resolved?
3. What has been the stakeholder reaction? Including that from your commission, internal staff, subscribers, rate base, etc.
4. If you were to start the program over, what would you do differently? (Important)
5. What have been your major lessons learned after launching the program? (Important)

Tailored Questions for Special Program/Utility Type

Programs in Planning Stage

1. Is there anything that you adjusted in your program design or approach based on recent discoveries?

Appendix B

Participant Survey Instrument

1. Overall, how satisfied are you with [Community Solar Program Name]?
 - Very satisfied. If I were to do it over again, I would sign up for a similar program.
 - Satisfied. If I were to do it over again, I would sign up for a program with minor program changes.
 - Dissatisfied. If I were to do it over again, I would not participate.

 2. Would you recommend the [Community Solar Program Name] to a friend or family member?
 - Definitely recommend
 - Probably recommend
 - Probably not recommend
 - Definitely not recommend

 3. Looking back, at the time of signing up to participate, do you feel like the [Community Solar Program Name] was explained to you clearly, somewhat clearly, or not too clearly?
 - Clearly
 - Somewhat clearly
 - Not too clearly

 4. How did you hear about [Community Solar Program Name]? (select all that apply)
 - Direct Mail / Email
 - Bill Insert
 - Website
 - Call
 - Friend/Neighbor's Recommendation
 - Social Media
 - Annual Meeting / In Person Event
 - Don't remember
 - Other _____
-

5. What percentage of your electric bill do you believe your current level of participation covers on average?
- 10% or less
 - 11-24%
 - 25-49%
 - 50-74%
 - 75-99%
 - 100%
 - More than 100%
 - Don't know

MOTIVATOR QUESTIONS

6. What were the primary motivators that caused you to participate in the [Community Solar Program Name]? (Please select top 3)
- Financial benefits
 - No maintenance
 - High level of program flexibility
 - To protect our environment and save natural resources
 - Local workers construct solar array
 - To protect our nation's economy and reduce our dependence on other countries
 - Participate in leading edge technology
 - Opportunity to invest in project with neighbors
 - No requirement to physically install anything on your roof
 - Another Reason (please describe: _____)

7. Do you currently participate or have you considered joining any other renewable programs?

	<u>Participate</u>	<u>Considered</u>
Own a fully electric vehicle	<input type="checkbox"/>	<input type="checkbox"/>
Participate in a green energy plan	<input type="checkbox"/>	<input type="checkbox"/>
Purchase renewable energy credits	<input type="checkbox"/>	<input type="checkbox"/>
Purchase carbon offset	<input type="checkbox"/>	<input type="checkbox"/>
Own rooftop solar panels	<input type="checkbox"/>	<input type="checkbox"/>

8. If you considered rooftop solar panels, why did you instead choose to participate in the [Community Solar Program Name]? (Please skip if you didn't consider rooftop panels or rent)
- Community solar provided better financial savings
 - Credit score prohibited ability to purchase rooftop solar
 - Appreciated economies of scale of a central solar array
 - Can't afford to purchase rooftop solar
 - Homeowner association/community restrictions prohibit rooftop solar installations
 - Do not want rooftop installation
 - Do not want to deal with ongoing maintenance of panels
 - Your rooftop is not appropriate for solar installation (e.g. too old, shaded, poorly oriented)
 - Uncertainty about impact on property value/resale
 - Want more flexibility
 - Some other reason (please describe: _____)

ADDITIONAL QUESTIONS

9. How has participation in the [Community Solar Program Name] affected your relationship with your utility?
- More satisfied
 - No change
 - Less satisfied
10. Are you satisfied with the electricity production data of the solar array that is available to you?
- Very satisfied
 - Somewhat satisfied
 - Not satisfied
11. Is the billing and crediting process for the program clear and consistent with your expectations?
- Yes
 - Yes, for the most part

- No

12. Are there any optional services you would be interested in seeing being provided in addition to the [Community Solar Program Name]?

- Recognition for participation (certificate, logo or decal, yard sign, etc.)
- Community battery storage ownership
- Energy efficiency audits
- Demand response program
- Elective vehicle charging
- Other _____

13. Do you have any feedback on [Community Solar Program Name]?

DEMOGRAPHIC & HOUSING QUESTIONS

14. Are you participating in the program as a commercial or residential customer?

- Commercial
- Residential
- Prefer not to answer

15. Do you own or rent your home?

- Own
- Rent
- Prefer not to answer

16. Which of the following best describes the type of home you currently live in?

- A mobile home
- Unattached single family home

- Attached single family home (townhouse)
- Apartment building or condo
- Something else? (please describe: _____)
- Prefer not to answer

17. What is your household living situation?

- Multiple roommates
- Single with kid(s)
- Single without kid(s)
- Married or partnered with kid(s)
- Married or partnered without kid(s)
- Prefer not to answer

18. What is your age?

- 18-34
- 35-44
- 45-54
- 55-64
- 65+
- Prefer not to answer

19. For classification purposes only, which category best describes your household income last year?

- Less than \$25,000
- \$25,000–\$49,999
- \$50,000–\$74,999
- \$75,000–\$99,999
- \$100,000 or more
- Prefer not to answer