A Guidebook on Designing, Developing, and Implementing a Community Solar Program for Local Governments and Partners

The Upper Peninsula Solar Technical and Research Team (UPSTART)
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Authors: Emily Prehoda, Brad Barnett, Richelle Winkler, Chelsea Schelly, Brett Niemi, Robert LaFave, and LeAnn LeClaire (UPSTART team members)

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Executive summary

This guidebook summarizes….

Findings

UPSTART makes the following recommendations for local government and public utilities to consider when designing a community solar program:

Introduction to Community Solar

The U.S. Department of Energy declares that a clean energy revolution is taking place across America. The U.S. has experienced expansion in the renewable energy sector, with the solar industry growing at a record pace[1]. However, the dominant model for solar energy is large utility scale systems or smaller residential systems. More recently, there has been growing interest[2] (Lerch 2017) in a shift to an alternative model that is characterized by decentralized, renewable energy systems. Yet, adoption of solar technology at the household level faces a number of barriers including high upfront hard costs[3], poor sites for installation[4], and operations/maintenance concerns/needs[5]. Community solar is one such model that attempts to place control and ownership of the system and resources in the hands of community members, while also seeking to mitigate the challenges experienced in residential adoption.

Community solar is a relatively new application in the solar PV industry[6]. As a result, many states do not provide supportive policies for community solar[7]. State's existing regulatory structures, however, may allow local governments and public utilities to access community solar for their communities. Alongside this, recent federal initiatives promote community solar as a tool to assist and increase low-to-moderate (LMI) solar adoption[8].

Alongside varying institutional and policy support, implementing community solar presents several other challenges to local governments and public utilities. Municipalities can lack the resources and expertise to spearhead, organize, and design a community program. Turning to partnerships with organizations outside the community for guidance can lead to skepticism in the community, which in turn can influence the success or failure of a project. Finally, existing community solar programs have trouble filling participation and may require additional marketing and customer acquisition costs. This guidebook serves as a roadmap to help local governments and public utilities to navigate community solar program design in a way to mitigate challenges.

About this Guidebook

In this guidebook, community solar is described as a voluntary program where community subscribers pay for a portion of a locally-sited solar photovoltaic (PV) array and receive

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[1] See https://www.seia.org/solar-industry-research-data
[2] Lerch, Daniel, ed. *The Community Resilience Reader: Essential Resources for an Era of Upheaval*. Island Press, 2017.
[3] Hirshberg, Alan and Richard Schoen (1974), 'Barriers to the widespread utilization of residential solar energy: the prospects for solar energy in the US Housing Industry', *Policy Sciences,* **5**(4), 453-468.
[4] Mills, Bradford F. and Joachim Schleich (2009), 'Profits or preferences? Assessing the adoption of residential solar thermal technologies', *Energy Policy,* **37**(10) 4145-4154.
[5] Rai, Varun, D. Cale Reeves and Robert Margolis (2016), 'Overcoming barriers and uncertainties in the adoption of residential solar PV', *Renewable Energy,* **89**, 498-505.
[6] The first community solar program in the U.S. was piloted in 2006 in Ellensburg, Washington.
[7] With the exception of: California, Minnesota, Maryland, etc. Available in SEPA report, 2018.
[8] Paulos, Bentham (2017), 'Bringing the benefits of solar energy to low-income consumers: A guide for states and municipalities', Clean Energy States Alliance. https://www.cesa.org/assets/2017-Files/Bringing-the-Benefits-of-Solar-to-Low-Income-Consumers.pdf, accessed on 15 March 2018.

credit on their electricity bill proportional to the power produced[9]. This guidebook relies on a social feasibility study model to inform local governments, public utilities, and partners how to design community solar programs that are tailored to their specific community needs. It begins by describing the expected timeline of the project design. It then continues into the different phases of developing and designing a community solar program. First, local governments must properly assemble a team that brings the necessary knowledge, skills, and resources for project success. Once the team establishes goals for the project, they begin to devise the social feasibility study. Steps to conduct a social feasibility study are provided. Program design and program structure considerations are included. The guide then describes specific case study site information and findings so that others may learn what to expect and how to navigate challenges that come up during community solar program design. General recommendations are provided for local governments and public utilities to consider when designing a community solar program.

Using this Guidebook

Local governments, public utilities, and their partners can use this guidebook to develop community solar programs that are inclusive to LMI households. Additionally, it provides direction to determine which income qualified programs and energy efficiency measures will best serve the community. The remainder of this guidebook is separated into program design elements, determining program structure, and program implementation. It relies on specific examples from the Upper Peninsula Solar Technical and Assistance Resource Team's (UPSTART) case study sites to highlight key steps in each process. It should be noted that designing a community solar program requires reflection and modifications throughout the process.

DEED Funding and Acknowledgments
Example of Program Design Timeline

1. Stages (1-.....)
    i. Define skills/roles
    ii. Constantly evolving- addition of new members

Program Design

Organizing a team

Community solar attempts to forward local ownership of energy resources. As such, assembling a team should begin with the local government or public utility interested in designing a community solar program. Local governments should determine a shared understanding of the project goals, which can help shape the community solar program

[9] See https://sepapower.org/resource/community-solar-program-designs-2018-version/

type as well as team needs. Once goals are established, the team can seek out and extend partnerships to others (i.e. utility, nonprofits, research institutions, etc.) who possess the knowledge, resources, and/or skills to help achieve program goals.

Once the team is in place, it is important to define partner roles. A program manager or equivalent will be helpful in keeping the team on track to meet incremental goals, satisfy deadlines, and orchestrate external meetings to help the team meet their needs. Other team member roles can include liaison between the team and broader community leaders, media outlets, or the entire community. This project utilized data from a social and technical feasibility study to determine the program structure; this required the addition of a researcher(s). Researcher roles and goals must align with local government needs first and foremost. Additionally, the team had to obtain permission to conduct the feasibility study by utilizing proper human ethics research protocols.

Where will the system go?

Determining potential sites for the community solar array can be tricky. It is important to work with the community to determine potential locations. Following this, the technical design can determine how big the system could be, if its location is viable for energy production (i.e. shading, orientation, soiling, etc). This is just a preliminary phase, as final system size and location will also be determined by the social feasibility study.

Program structure process

Who will program serve?

Community solar has many different program design and ownership structures. In line with project goals, a local government or public utility should also define who the program target participants will be. This will help to shape which community solar model is chosen. Community solar attempts to increase access and affordability of our energy systems. Yet, a majority of community solar programs exist and operate within affluent communities[10]. Some possible targeted participants include:

- Low-to-moderate (LMI) income: there are many existing federal and state definitions for LMI households. A first step is to select a definition that fits program

[10] National Renewable Energy Lab. Feldman, David, Anna M. Brockway, Elaine Ulrich, and Robert Margolis. 2015. Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation. National Renewable Energy Laboratory and U.S. Department of Energy. Available at: www.nrel.gov/docs/fy15osti/63892.pdf; also Lotus Engineering and Sustainability. 2015. "Analysis of the Fulfillment of the Low Income Carve-Out for Community Solar Subscriber Organizations". Available at: https://www.colorado.gov/pacific/sites/default/files/atoms/files/Low-Income%20Community%20Solar%20Report-CEO.pdf; see also Smart Electric Power Alliance. 2015. Community Solar Program Design: Working Within the Utility". Available at: https://sepapower.org/resource/community-solar-program-design-working-within-the-utility/.

goals. UPSTART utilized the U.S. Department of Housing and Urban Development definition[11]. These population typically do not have a tax liability to be able to access existing tax incentives for solar (30% Renewable Energy Tax Credit).

- Non-profits: These organizations cannot access existing tax incentives (30% Renewable Energy Tax Credit and/or 100% Bonus Modified Accelerated Cost Recovery System depreciation) for solar.
- Renters: These households either do not remain in the home long enough to make solar a viable option or are restricted by their lack of ownership to install a system. Additionally, many existing utility regulatory structures do not allow a plug and play model of solar [12].

As a result these populations struggle with affordability and subsequent accessibility to solar PV technology. It is important to also consider the utility context within which the local government operates. In our particular case, the Villages are municipal utilities that are surrounded by investor-owned utility service territory. There are members of each village that do not receive power from the municipal utility and recruiting them to directly participate in the community solar program violates the state regulated utility service agreement. Therefore, our targeted audience was already predetermined- all village utility customers. Within our predetermined target participants, we can then attempt to structure the program to satisfy our goals including LMI households. Local governments that do not own or operate utility infrastructure can attempt to circumvent this issue by establishing a partnership with nearby investor-owned utilities to allow customer participation.

Social feasibility study

Many projects merely address technical and broader economic feasibility. Doing so can often overlook the social impacts a community solar project can have on the surrounding community. Previous projects that failed to account for the interests and concerns of affected communities risked the success of the project[13]. Utilizing a social feasibility study in community solar program design can help local governments and public utilities to better understand how to design programs that satisfy project goals, but more importantly fit community needs. Existing community solar programs that included a social feasibility study felt they influenced the project's success by identifying concerns early on that could later be addressed in the project design phase[14]. Social feasibility studies can also help the project team to better identify key stakeholders, determine key community considerations, and to translate project information to the community. While there are many benefits to

[11] See https://www.huduser.gov/portal/glossary/glossary_l.html for a full understanding of the definition; see also XXX for other LMI definition options.
[12] Mundada, Aishwarya S., Yuenyong Nilsiam, and Joshua M. Pearce. "A review of technical requirements for plug-and-play solar photovoltaic microinverter systems in the United States." *Solar Energy* 135 (2016): 455-470.
[13] Wüstenhagen, Rolf, Maarten Wolsink and Mary Jean Bürer (2007), 'Social acceptance of renewable energy innovation: An introduction to the concept', *Energy Policy,* **35**(5), 2683-2691.
[14] see https://www.nppd.com/innovation/solar/sunwise-community-solar/

working with the community in a social feasibility design, local governments and public utilities may not possess the skills or resources to successfully determine community considerations and needs. This is where partnering with a research institution can come into play.

Local governments and public utilities should first conceptualize what they hope to achieve from the social feasibility study. For example, (1) a project could be considered socially feasible if the results indicate that the community generally supports the potential community solar program; (2) maybe a large number of community members report willingness to participate in the community solar program; (3) the study produced a large amount of participation from the community in providing feedback. Once the team decides what the feasibility aims will be, then they can begin to craft the study design. A starting point begins with exploratory social science research design that incorporates the use of qualitative interviews, community meetings, and a community survey. Each are described below.

- Interviews: Qualitative interviews provide insight into several considerations that are unknown to the research team. This is typically conducted with key stakeholders in the community. It is key to develop interview questions and interviewee selection with input from non-academic research team members in order to provide local context and ensure that important community stakeholder representatives' views are incorporated in the study. Community team partners can first help to identify who these individuals might be (and conversations with those stakeholders can lead to introductions with other potential stakeholders). Key stakeholders can be other community leaders who know the community well. The interviews are meant examine how residents and business owners might feel about a community solar project in their community, what problems/obstacles/hurdles might come up in if the municipality pursues a community solar project, and what cultural, economic, social, or institutional factors could impact the success of a project. UPSTART's interview protocol can be found in Appendix A.
- Community meetings: Community meetings can be held as a follow up to the interviews. These allow for larger community discussions regarding the potential community solar project. Municipalities can design the community meeting to solicit feedback from the broader community. The community solar team can share preliminary information about the proposed community solar project, to gain insight and understanding into how community members feel about the possibility of beginning a community solar project, and to learn more about potential opportunities and obstacles for designing a project that meets community interests. Community meeting questions can be developed from feedback obtained during the interview stage. A community meeting gives community members an opportunity to learn about the project and incorporate as many community members as possible into the decision-making process. Opening a dialogue with the community can help to reduce local skepticism and increase community empowerment by allowing participation. Community meeting protocol can be found in Appendix B.

- Community surveys: A community survey can be employed to further inform the team's project aims. The survey can be crafted from interview and community meeting results to determine community member's interest in participating in the community solar program, determine potential perceived barriers to participating in the program; provide another channel to voice concerns and generally stay involved in the decision-making process. All of these work together to help the team develop a preliminary business model that to be presented to the community for further feedback. UPSTART's survey protocol can be found in Appendix C.
- Evaluate existing projects: While community solar is still a new application of solar PV technology, several projects exist across the country. It is important to understand the range of different projects and to learn about the challenges, successes, and failures experienced by these projects. Several resources exist[15] to serve as a starting point, but it is equally important for local governments and public utilities to conduct their own evaluation of community solar; especially in regions with similar demographic characteristics and climate conditions.
- Financial analysis: Ultimately, at the end of a social feasibility study, local governments, public utilities, and community members are going to want to know: (1) how much it will cost and (2) how long until they get their money back. This all comes down to the size of the system, installation costs, how many people are willing to participate (estimated from the social feasibility), and final program design.

Reporting out

Community energy projects are generally more successful when local governments or public utilities involve the community throughout the entire process. A first step in reporting out to create a preliminary program design from the feasibility study. Then, schedule a post study community meeting where team members can deliver the study results as well as provide an outline of the potential program design. This allows community members to generally see where the community lies in terms of community solar program support, as well as provide feedback on the program design.

Program Implementation

Identify Program Funding

As mentioned above, high upfront costs can be a barrier to solar PV adoption. Depending upon the community solar program ownership structure, participants may be unable to

[15] See https://sepapower.org/resource/community-solar-program-designs-2018-version/; See also https://www.mtu.edu/social-sciences/research/reports/lanse-cs-report2.pdf; see also https://www.nrel.gov/docs/fy11osti/49930.pdf

take advantage of solar tax benefits. It is important to find appropriate and sustainable sources of funding to help finance the system as well as other soft program costs (program administration, customer acquisition, marketing, etc). In some cases, a municipal budget may not be enough to fund a community solar program. Many community energy projects begin with some portion of grant-funding that they ultimately turn into a revolving clean energy fund[16]. Some options to consider can include:

- Partnerships: Using a partnership with the utilities or other third parties can be important sources of funding. These entities may have internal initiatives for corporate responsibility, such as engaging low-to-moderate income communities. They could be source of funding for a community solar program.
- Tax equity: Similar to third party partnerships, a tax equity partner could finance the community solar program up front, own the system, and monetize and pass along existing tax benefits. This allows the local municipality to realize benefits with zero upfront capital cost for the local government. The investor also realizes a favorable return on investment and may be more likely to invest in future projects.
- Grants: Existing foundations provide initiatives to help fund and forward clean energy and energy efficiency goals. Some of these can be accessed by local governments.
- Low interest loans: Community solar programs are increasingly targeting low-to-moderate income populations. To make financing more feasible to these populations, some external funding entities can provide low or no-interest loans. Additionally, some banking institutions maintain a local funding pool to help promote sustainable development initiatives in municipalities[17].

Designing, building, and commissioning the system

- Site location
- RFP
- Selecting best bid
- Who is in charge of O&M
- The variation in time it takes to build the system

Determine the Program Administrator

Alongside securing program funding, it is important to determine who will administrate the community solar program. Local governments, utilities, or third parties such as solar installers/developers can fill this role. An important step is to first determine the

[16] See Dubuque, Iowa and Pennsylvania as examples: https://dced.pa.gov/programs/solar-energy-program-sep/.
[17] See https://www.cdfifund.gov/Pages/default.aspx

municipality or public utility's capacity for program administration. This is especially significant if you're program utilizes different customer financing options: upfront, on-bill, or a combination of these. Other potential program administrative roles include customer acquisition, marketing, outreach and education opportunities, and general system operation and maintenance. These roles can be divided among the local government and public utility, depending upon capacity and staff availability.

UPSTART Case Study Example

UPSTART established an overarching goal: to extend community solar access to low-to-moderate income households in two Upper Peninsula Villages. In both cases, village administrators were interested in the possibility of starting a community solar project but did not want to move forward without understanding whether the broader community would support such a program and how it might be designed so that it would be accessible and attractive to all community members. Each village partnered with researchers at Michigan Technological University, the nonprofit power company that provides the village electricity (WPPI Energy), and a regional planning and technical assistance agency (the Western Upper Peninsula Development and Planning Region). Team membership is comprised of academic researchers with expertise in sociology, energy policy, engineering, and energy law, in addition to representatives the from local government, the utility, and the regional planning agency. The research project idea and specific research questions originated from leaders in the community.

We tasked ourselves with 1) conducting a technical site analysis and building an engineering design for a community solar array to assess the project's viability in these villages and 2) conducting a social feasibility study by engaging the community to identify both support for and sociocultural barriers to the project. By designing the program this way, we hoped to help the local government to design a community solar program that was accepted by the community and suited community needs first.

The case study sites are the neighboring Villages of L'Anse and Baraga, Michigan (Figure 1). The case study community by was defined by existing village utility service territory. Both villages operate their own municipal electric utilities. These are remote, rural communities, located about 5 miles apart. Each village has a population of roughly 2,000. At a first glance, these cases do not seem to present viable locations for community solar programs. There are characterized by low-to-moderate income households (43% and, 66% respectively) (MSHDA, 2017), presenting a hurdle to participation. There is a large tribal presence, with almost 50% of Baraga's population identifying as American Indian (alone or in conjunction with another race, U.S. Census, ACS, 2016). Also, there is relatively low solar radiation (3.4-4.4 kWh/m^2/day, NREL, 2017) and lower electricity costs ($0.10-$0.13/kWh, Village of L'Anse and Village of Baraga Utility). Making the potential return on investment moderate or even low.

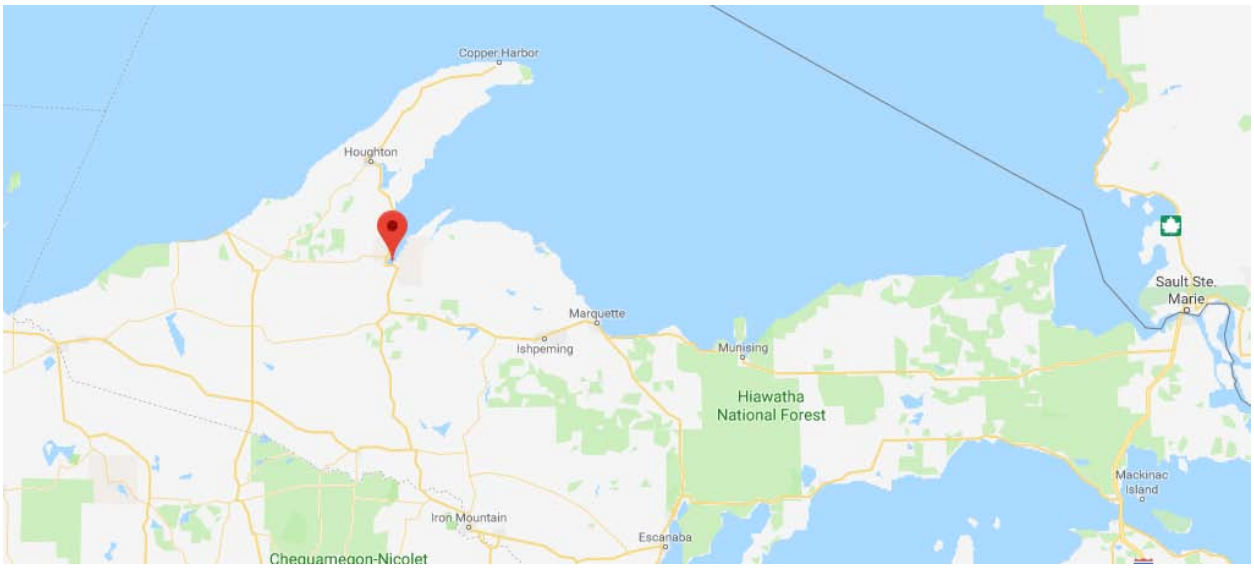

Figure 1. Obtained from google maps. The Villages of L'Anse and Baraga are located 5 miles apart in the Keweenaw Bay in the Upper Peninsula of Michigan.

UPSTART Study Results

Community Solar Qualitative findings

L'Anse

Overall, the L'Anse community expressed positive feelings and support for our proposed community solar program. The community felt the program was important to help the community be forward thinking and strive for a cleaner future. They felt that this project would make the community's needs and interests a priority, something not quite experienced in the past. Finally, they felt that this project would instill community pride, maintain their young population, and overall increase education.

Many considerations emerged from this portion of the study: trust with the utility, environmental/sustainable thinking, local ownership, affordability, and leadership. Trust was a big cited factor in support for the program. Others focused on the environmental benefits from utilizing cleaner energy sources. All income levels in the community must be able to participate in this program. Local ownership with the potential to provide community training was a positive for the community. Minor concerns such as more information and transferability were outweighed by all the potential positives that could influence community member's support for community solar. We compiled these considerations into three main themes: (1) environmental benefits, (2) economics/affordability, and (3) local empowerment. Focusing program design and structure around these three themes should provide the greatest success in L'Anse.

Baraga

The community generally felt positively (beyond economic reasons) about the idea of Baraga doing a community solar project. The study uncovered several important considerations that overlap with the Village of L'Anse, as well as novel findings compared to L'Anse. They liked the idea for a combination of reasons, primarily combining environmental benefits with social benefits.

Economic concerns are huge and may ultimately be the deciding factor on participation. Stakeholders felt residents will want specifics on the cost to buy into the program, the payback period, whether or not the investment is guaranteed (or is there potential for loss?), and to clearly understand the economic risks and benefits. Many respondents associated energy efficiency projects with solar PV in general. Respondents indicated a lack of knowledge surrounding the energy efficiency programs or projects available from the village utility or other sources (state or federal funding). Baraga community members were generally seen to have an ingrained culture that is resistant to change. Respondents felt that there was not enough awareness of solar electricity. which could ultimately reduce peoples' willingness to adopt community solar. Inertia could be a real problem; people need to be willing to go out of their way to do something different. Also, building trust in the community is a process that takes time. Many stakeholders did not understand the dynamics between WPPI and the Village. There was some distrust on who ultimately will benefit from this project. Respondents liked the possibilities for community empowerment, pride, and developing local control associated with community solar. Many felt that businesses or industries could be attracted to the village if they were aware of a community solar program availability. Finally, sustainability is important. While respondents cited economics as the main driving factor for program adoption, they felt others might adopt beyond financial motivations.

Community survey

Both surveys were successful at achieving reasonable demographic representation of each Village. In L'Anse, women were generally underrepresented and low-to-moderate income populations were significantly underrepresented. In Baraga, tribal members and community members under 55 were underrepresented. Both villages generally supported community solar and were in favor of each Village starting a community solar program. The Village of L'Anse community members were likely to subscribe if multiple financing options were available while Baraga respondents varied on which financing option they supported; respondents who favored a high up-front cost, did not favor on bill-financing and vice versa. In L'Anse, support for community solar varied by income, age, and knowledge of renewable energy systems. In Baraga, predictors of community solar support

include its potential benefits for the community, knowledge of community solar, higher income, younger community members, and status as a tribal member. In both cases, community members felt they need more information to be comfortable with moving forward with a community solar program. Finally, energy efficiency measures were included in both community surveys. Village of L'Anse community members reported taking weatherization efficiency steps but were interested in doing more such as energy audits and water heater efficiency upgrades. While the Village of Baraga community members were generally unfamiliar with energy efficiency programs, illustrating an area to provide more information and how to access particular available programs.

LOTUS Energy Efficiency Report

Integrating energy efficiency into the program enrollment and structure can increase accessibility to energy efficiency programs for LMI communities. However, the upfront investment into energy efficiency projects can create a barrier to entry for LMI populations. This can come in the form of an on-bill financing purchasing option with 0% interest. With a structure such as this, it is possible for community members to realize energy efficiency savings on a monthly basis. The Village utilities do not provide natural gas service, which means the focus will generally be on energy efficiency to reduce electricity consumption. However, electricity does power heating appliances that utilize natural gas. Interviews with village stakeholders show that a majority of the villages' residents rely on natural gas to heat their homes; however stakeholders also point to the use of electric home heaters as a supplement. Electric home heaters have a high energy consumption. Different households and businesses may have already enrolled in different energy efficiency programs. The community survey gave a brief glance into which energy efficiency programs were utilized most, as well as which programs community members knew about.

Financial models

There are two significant findings in regards to financing options from this feasibility study: (1) existing community solar programs are more successful when they offer multiple financing options to participants and (2) our specific community survey respondents are in favor of a program with multiple financing options to meet the needs of all community members.

Financial Model	Payment Plan for Shareholders		Estimated Years to Payback per Share	Estimated Savings Over Program Length ($)
Option 1: Pay Upfront (25 years)	- Upfront payment of $375 - Estimated annual credit of $27		13.9	300
Option 2: Pay Upfront-Full, Shorter and Recontract Program Options	Full Program (25 years)	- Upfront payment of 375 - Estimated annual credit of $27	13.9	300
	Shorter Program (5 years)	- Upfront payment of $110 - Estimated annual credit of $27	4.1	25
	Recontract Program (20 years)	- Upfront payment of $300 - Estimated annual credit of $27	11.1	240
Option 3: Minimal Down Payment plus On-Bill Financing (25 years)	- Upfront payment of $25 - Monthly payment of $3 (10 years) - Estimated monthly credit of $2.25		14.2	290
Option 4: No Down Payment- Full Financing (25 years)	10 year Payment Plan	- No upfront cost - Monthly payment of $3.50 - Estimated monthly credit of $2.25	15.5	255
	25 year Payment Plan	- No upfront cost - Monthly payment of $1.50 - Estimated monthly credit of $2.25	0.0	225

Recommendations and Considerations for Local Governments and Public Utilities

Recommendation 1: Build flexibility into the entire process

It is important to recognize that the community solar program development process is not linear. It requires constant reflection and iteration. This begins at the team development stage, all the way through program design and implementation. Throughout the process, different needs can arise that current team members cannot fill. Community feedback may require necessary changes to the feasibility study and/or program structure. Over time, changing community needs can result in changes to the community solar program. Building flexibility into the community solar development process can bring the program more success.

Recommendation 2: Emphasize community involvement

A characteristic of community solar is to promote local ownership of energy systems for and by the community within which they operate. Therefore, it makes sense to involve

community members at every stage possible. Community members can provide accurate feedback on what sort of program would work in their community. They can be used to recruit program participants through peer-to-peer marketing in a worker co-op or volunteer model. Local governments can build into an RFP that a portion of the labor for the community solar installation must come from training community members. This can provide valuable skills for underemployed community members to seek employment in general construction jobs or specifically the solar industry. Finally, the community solar array can be a source of an educational program with the community school system- to teach students about energy use and solar energy.

Recommendation 3: Provide a program that is affordable

Many community solar programs are still only accessible in affluent communities. This can be directly linked to the affordability of the program. It is important for local governments and public utilities to design a program that capitalizes on all available options to decrease program costs. Additionally, program administrators should include a way to qualify low income participants beyond a FICO score (i.e. history with electric bills).

- Partnership with developer and/or tax equity investor
- Provide multiple financing options- especially those that can be accessed by income qualified households or non-profit facilities
- Partner with community organizations or businesses to build a donation option in the model
- Consider utilizing an anchor customer: Selling a large portion of individual shares may be difficult without utilizing an anchor customer who purchases a larger portion.

Recommendation 4: Program design components

Every community is different with respect to the program design considerations. It is important to listen to community feedback to incorporate these considerations into the community solar program design. The following describe some components that often surface during community solar program design. Local governments and public utilities may encounter other considerations not included in this list.

- Transferability: A common concern in many existing programs, customers want to know what will happen to their subscription if they move away, can no longer afford the subscription, or simply do not want a subscription. Local municipalities and public utilities should account for the many different scenarios in the design of the program.

- Easy of participation and transparency: Complicated community solar program design and sign up can create confusion and frustration for customers. Make the participation process as easy as possible for customers. Community members can also make a more informed decision with more information about the potential project. It is important for municipalities provide as much information as possible to help community members either accept or reject a project.
- Length of program, size, & number of subscriptions: These design components can directly influence the affordability of the system. The length of program can be varied to consider and suit different participation interests. A larger solar array can capture benefits of lower costs from economies of scale. And the number of shares will determine the amount of benefits experienced by each customer. Municipalities can choose to limit number of subscriptions to allow great distribution of community solar benefits.
- Operation and maintenance: Some municipalities may not have the capacity, skills, or knowledge to operate and maintain the community solar array. Municipalities can consider contracting with the solar developer for these services or provide utilize training (i.e. through developer) to allow under and unemployed community members job opportunities in the community.

Recommendation 5: Integrate Energy Efficiency measures

Energy efficiency is quick way to realize ample energy savings. A first step is to include energy efficiency into the community feasibility study. This can help to determine if there is a high demand for energy efficiency measures in homes or businesses. Weatherization is the low hanging fruit and most commonly suggested measure in home audits. Especially with the long, cold winters in these areas, continuing to focus on home weatherization could produce the most significant energy efficiency savings in these areas. Public utilities could establish a volunteer weatherization team to target LMI households. The Villages' energy efficiency programs should focus on weatherization measures to reduce heat loss from homes. A recommendation would be to supplement the survey findings with a broader community toolkit to both educate community members on available opportunities as well as learn which energy efficiency measures households need to address to reduce energy costs. Taking this a step further, municipalities should consider how to integrate energy efficiency programs into the community solar program design.

Appendices