L'Anse Community Solar
Social & Economic Feasibility Study

December 12, 2017

Community Solar Applications Class
Michigan Technological University
Social Sciences Department

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Purpose of this Study

The purpose of this project was to analyze the social and economic feasibility of developing a community solar program in L'Anse, Michigan. We aim to provide information collected from L'Anse community members and from reviewing existing community solar projects so that decision makers and community members can make informed decisions about whether to proceed with a community solar project and how they might design a program that is affordable and accessible to L'Anse residents.

Too often participants in decision making processes find that the background information they need is not readily available. As a result, they spend considerable time coming up to speed on the issue. In the end, only people who already know a lot about the issue become involved. This report provides information to potential decision makers about community solar and how it might be applied in L'Anse with the context they need to ask insightful questions and explore options. Also included are several recommendations that our team believes would help L'Anse to move forward with a community solar project.

Who Performed this Study?

This report was developed by students in Michigan Technological University's Fall 2017 Special Topics course in Community Solar Applications, including:

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The project is part of a larger study by a project team labelled UPSTART- Upper Peninsula Solar Technical Assistance Research Team. The UPSTART team consists of members from the Western Upper Peninsula Planning & Development Region (WUPPDR), WPPI Energy, and the Village of L'Anse, as well as Michigan Technological University (MTU). The team's work is partially funded by the Michigan Department of Agriculture and Rural Development and by the U.S. Department of Energy's SunShot program. Members include: Bob LaFave (Village Manager, L'Anse), Brett Niemi (WPPI Energy), Brad Barnett (WUPPDR), and from MTU Jay Meldrum, Emily Prehoda, Chelsea Schelly, Roman Sidortsov, and Richelle Winkler.
We sincerely thank the many people who have provided information and helped us to collect and understand the information included in this report. In addition to the UPSTART members listed above, these include: Zoé Ketola & Jon Pyles who reviewed legal and tax implications; Susan Tollefson (L'Anse Area Schools Superintendent); Jake Oelke (WPPI Energy); Ian Olmstead (Peninsula Solar); Debbie Stouffer (Baraga County Chamber of Commerce); Debra Parish (KBOCC); John Soyring; and the people of L'Anse who participated in this project and submitted feedback. Only the students mentioned above and Richelle Winkler are responsible for the content of this report. Its contents do not necessarily represent the views of any other individuals or organizations.

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Executive Summary

This document summarizes the results of a social and economic feasibility study of community solar in L'Anse, Michigan. The goals of the study were to determine a) whether L'Anse utility customers would be likely to buy shares; and b) how to best design an accessible, affordable program for L'Anse residents and businesses. The study team reviewed multiple existing community solar projects for best practices, investigated costs and various economic scenarios, and conducted a community-wide survey, interviews with key informants, and focus group discussions in L'Anse.

Findings show that L'Anse customers do support the Village moving forward with a community solar program and that customers may be willing to purchase enough shares to support a 100kW system. The environmental and community benefits are as important as making a financial return; but the financial benefits to shareholders should outweigh the costs. There are significant affordability concerns and considerations that need to be taken into account. L'Anse customers will require options with low upfront costs and easy no-interest financing. The project would benefit from a lower price per unit and increased affordability if a 100 kW system, rather than a 50kW system, were built; but it would be imperative to gain commitment from one or more anchor customers who are interested in purchasing approximately half of available shares.

The research team makes the following additional program design recommendations.

1. We recommend selling 400 shares in a 100kW system with a program length of 25 years. This amounts to about 250W per share, somewhat less than 1 solar panel. Each share would be expected to produce about 285kWh ($27 worth) of electricity each year.
2. Partnering with one or more anchor customers who are interested in purchasing a large number of shares in order to increase the project size to 100 kW while reducing the risk that shares wouldn't sell.
3. Working with a private developer would allow L'Anse to reduce costs by taking advantage of tax credits. We recommend selecting a local/regional based developer to keep the project as close to the local community as possible.
4. Creating a participant's board to make decisions about program design, partnerships, choosing a developer, marketing, and overseeing implementation could increase community buy-in and maintain trust and local control.
5. There should be a clear and easy-to-follow plan for transferring shares from one customer to another in case a customer moves out of the service area, passes away, or otherwise leaves the program.
6. Allowing people to donate shares to non-profit organizations that do community-based work (including schools, churches and social service organizations), which could increase the community impact and help to market the project. It could also mean that such share purchases would be eligible as a tax write-off if donated to a non-profit.
7. Offer a worker-coop model such that one or more community members could work to support the project in exchange for shares.
8. Offer energy efficiency participation incentives and explore possibilities to integrate energy efficiency programs with the community solar program.

9. Offer multiple purchasing program options to customers, including options with little to no upfront cost and 0% interest on-bill financing, with eligibility determined by utility payment history. The team explored several options, all of which would generate excess funds for customers, while allowing the Village to pay for the solar system without impacting electric costs for whose who don't choose to subscribe. We recommend the Village offer some combination of options similar to these for purchase plans.

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

Introduction

This report summarizes the results of a social and economic feasibility study of community solar in L'Anse, Michigan. The Village of L'Anse partnered with Michigan Technological University (MTU) and the Western Upper Peninsula Development Region (WUPPDR) to explore the feasibility of developing a community solar program in L'Anse. The goals were to determine (a) whether or not L'Anse utility customers would be likely to buy shares, and (b) how best to design a program that is affordable and accessible to L'Anse residents and businesses. Upon reviewing these results, the community will need to make decisions about how to proceed. The Village will not move forward with the project if there isn't community support. The program would be voluntary and would not impact rates for any customers who don't elect to participate.

Community solar programs offer one solution to combat some of the problems associated with large scale fossil fuel based electric generation and distribution systems, including carbon emissions, affordability, and lack of local control. Solar photovoltaic electricity, which converts sunlight into electricity, is rapidly being adopted because of its declining costs, zero greenhouse gas emissions, and ease of scalability. Community solar programs are especially popular because they are available to renters (as well as homeowners), decrease upfront investment of time and money, are locally situated within communities and allow for localized decision-making, and enable individuals to participate without installing a system on their own house.

Community solar programs are becoming increasingly popular across the United States, with 108 MW installed in 2016 (SEIA, 2017). However, most community solar programs are successful only in relatively high-income communities, where residents can afford an upfront investment, or in states with subsidized participation. Like many communities across Michigan's Upper Peninsula, and rural communities throughout the United States, L'Anse faces challenging sociodemographic and economic conditions. The median household income in L'Anse is $38,911 compared to the national median of $49,576 with an estimated 20.9% of children living below the poverty line. It is estimated that at least 43% of households in the Village of L'Anse (417 of 975 in total) have incomes below the State of Michigan's HUD "Low Income Limit." Only 14.8% of L'Anse residents have a college degree, compared to 27.0% nationally. Community solar programs can offer access to clean, renewable energy while reducing long-term energy costs, but an initial investment is required and community members must be interested and able to participate to make a project successful. In the case of L'Anse, designing a program that reaches the low to moderate income (LMI) demographic in the area is a main priority.

Researchers from MTU conducted and analyzed results from interviews, focus group discussions, and a short survey of Village of L'Anse utility customers to gain insight and understanding into how community members feel about the potential community solar project. Students at MTU evaluated existed community solar projects to understand the range of community solar program design elements around the country and to draw lessons from successes and failures of these projects. The team then developed and evaluated four financial models to present options for affordable community solar financing. The purpose of this report is to present results of our social and economic feasibility analysis and to make recommendations, based on these results, for how the Village might proceed with developing a community solar program.

What is Community Solar?

The US Department of Energy defines community solar as a voluntary, community owned, solar-electric program, where members receive the energy produced by a centralized array (United States, Guide). Customers subscribe to, or purchase shares of, a solar garden located within the community and then receive a portion of the money earned from the production of solar energy based upon their contribution.

Solar in general is gaining popularity in the US. It still lags behind other renewable energy sources including hydroelectric, wind, and biomass in terms of energy produced; however, it is the fastest growing renewable energy source in the US and is projected to grow by 7.5% per year from 2012 - 2040 (Hoffman, 2015, p. 2). In comparison to fossil fuels, solar electricity has strong environmental benefits. It produces significantly lower amounts of greenhouse gas and particulate matter (air pollution), and it saves water. Meeting the US Department of Energy's SunShot solar deployment goals of 14% of all US electric generation by 2030 and 27% by 2050 would prevent $167 billion in health and environmental damage, resulting in the saving of 25,000 lives (Environmental).

A National Community Solar Partnership program was established in 2015 to encourage the growth of community solar throughout the US to make solar accessible to more people, because only 22 to 27% of residential rooftops are suitable for solar panels in the US. With this in mind, community solar offers an opportunity for residents to access renewable energy even if they cannot or prefer not to install panels at their own properties (United States, Guide). Community solar can allow for improved access to renewable energy because customers can purchase shares without needing to be familiar the details of the system. Professional solar developers can be responsible for the design and maintenance of the system, reducing the complexity for consumers. Additionally, due to economies of scale, larger solar developments can have a reduced cost per kilowatt hour compared to personal panels or traditional grid-based electricity. This can lessen the cost of electricity for both residential consumers as well as small and large businesses compared to traditional electricity costs (United States, Guidebook).

There are upfront costs to those who wish to participate as shareholders in community solar installations, but these are fairly minimal when compared to the cost of installing solar panels on one's own property and shareholders earn back more than the initial investment over the life of the program. According to EnergySage, powered by the U.S. Department of Energy, the average cost to homeowners of installing solar panels on one's own home is about $10,045 to $13,475 (after tax credits) for a 5 kW (5000 watts) system. By contrast, it is much more affordable to purchase a share in a community solar installation.

The social benefits of community solar include a transition in power from a centralized conventional energy production system to a locally governed system. It provides the opportunity for individuals to become engaged in collectively determining their energy source

and define the future of energy generation. This encourages citizens to become more engaged in their local governments and strengthen their communities. Furthermore, community solar allows for the democratization of energy by making solar a viable energy source for those who were previously excluded from the solar market, whether due to property or financial restrictions (Hoffman, 2015, p. 11).

For these reasons, community solar is expanding throughout the US. Minnesota, Massachusetts, California and Colorado are currently the leaders in community solar. State legislation that supports community solar is one of the major contributors to the development of these types of projects. For example, the Made in Minnesota Solar Incentive Program, administered by the Department of Commerce, works with multiple utilities in the state of Minnesota where organizations, companies and individuals can apply to start a community solar program and receive incentives or rebates (Made in Minnesota).

L'Anse Proposal

The Village of L'Anse is a municipally owned electric utility which partnered with WPPI energy to provide lower-cost electricity to customers. The Village is considering a community solar program for Village electric utility residential and business customers. Should L'Anse decide to implement a community solar program, the project would be built in the new L'Anse Industrial Park, located off of Lambert Road. The Industrial Park is an ideal location as the Village owns the acreage, there is ample space for a community solar array, and because there is plenty of sunlight to allow the panels to produce electricity. Based on study results described below, we recommend a system size of about 100 kW (enough power to meet all of the electric needs of about 30 homes). This size would allow the community to take advantage of price drops with greater economies of scale without commiting to a larger system than L'Anse customers demand.

Customers (commercial, industrial, and residential) who are served by Village of L'Anse utility would be eligible to purchase shares in the system. Those who purchase shares would then earn returns on the money made from the energy generated as it is sold to consumers. Utility customers who choose not to participate would not see any additional costs or rate increases to support this program. This report recommends multiple program design options that the Village of L'Anse might consider for selling shares. We recommend the Village offer subscription options ranging from purchasing shares for an upfront cost of about $375 to spreading the cost of shares out over 10- to 25-year periods, financing share purchases on-the-bill at 0% interest. This means that monthly payments could be added to the electric utility bill that customers already receive. Once the system is producing and selling into the grid, the bill would also show a positive credit balance whose amount would depend on the number of shares purchased, the amount of electricity generated that month, and purchase agreement rates at which the electricity is sold. This credit would offset a customer's charges/costs. More specific recommendations for program design are described in detail starting on page 19.

Reviewing Existing Programs

In order to understand the range of different community solar programs being implemented around the country and to draw lessons learned from others' successes and failures, the team reviewed the programmatic details of ten community solar cases across the United States (Table 1) as well as various articles and reports (Appendix A). The chosen ten programs include two different models for community solar: special purpose entity (SPE) models where the project is developed by a business enterprise made up of individual investors; and utility-sponsored models where the utility owns or operates a project which is open to voluntary ratepayer participation. These ten programs offer a variety of possible designs for community solar projects, and therefore give an overview of different project design options. The team examined details of each program including subscription models (for payments and credits), tax implications, regulations concerning the transferability of shares, system size, and length of term. This section summarizes the primary lessons we learned from this case review.

Payments & Credits: Subscription Models

The most common subscription model is based on an upfront payment option that allows participants to pay for their shares all at once and receive the according credits afterwards without having to pay any further installments. The upfront cost depends on incentives the project receives, the number of shares sold per watt, and on the length of the project's term. For most of the ten evaluated projects, this upfront cost ranged between $400 and $600 per share. The new project in Marquette, MI, for example, follows this model with a cost of $499 per panel.

Many of the projects also offer payments in installments, where subscribers pay for their shares gradually over a previously agreed-upon period of time. Some of these gradual payment options do not include any upfront cost, while others include a small upfront cost. The Cherryland Cooperative project in the Traverse City, Michigan area, for example, offers a payment option without any upfront cost, which allows participants to pay for their subscription over a period of five years at a rate of $10 per month. This payment option seems to be especially appealing to low-to-moderate income participants who are often deterred by upfront costs. Similarly, the Coyote Ridge Community Solar Program offers the option to pay $48 per panel upfront followed by a monthly subscription of $3.55 per panel.

Fremont's Community Solar Farm in Nebraska came up with yet another financing option. Participants in this project have two choices. One of their options is to purchase one or more 315-watt panels for $180 each, which are allowed to cover up to 80 percent of a customer's total consumption. Fremont's utility handles the panels' maintenance and operation for which participants pay a 3-cent per kWh maintenance fee for 20 years. Alternatively, participants can choose to purchase a block of 150 kWh of output at the cost of 6 cents per kWh instead of purchasing panels. This price of 6 cents is fixed for 20 years and is one cent higher than current rates, and would not be subject to price increases resulting from inflation.

The credit which participants receive usually depends upon their shares' monthly output. The kWh produced by the shares usually appear on the participants' monthly electric bills in the form of credits. The credit per kWh can either be the value of the current kW price or it can be the value of a previously agreed-upon price.

Table 1: *Community Solar Programs We Reviewed*

Project Title	**Location**	**Website**
Cherryland	Northern Michigan (participants from Benzie, Grand Traverse, Kalkaska, Leelenau, Manistee, Wexford Counties)	https://cherrylandelectric.coop/
Coyote Ridge Community Solar; myLocal Solar	Colorado	https://www.pvrea.com/mylocalsolar
Fremont's Community Solar Farm	Fremont, Nebraska	http://www.fremontne.gov/DocumentCenter/View/4535
MBLP (Marquette Board of Light and Power) Community Solar	Marquette, Michigan	http://www.mblpcommunitysolar.org/
MI Community Solar	Lansing, Michigan	https://micommunitysolar.org/
Minnesota State Program:		https://mn.gov/commerce/industries/energy/solar/mim/
Co-op Example 1	Minnesota	
Co-op Example 2	Minnesota	
Municipal Example	Minnesota	
New Richmond Solar Garden	New Richmond, Wisconsin	http://www.nrutilities.com/solar-garden
River Falls Community Solar Program	River Falls, Wisconsin	http://www.rfmu.org/communitysolar

Low-to-Moderate Income Involvement

Most projects struggle to include low-to-moderate income households. The aspect which seems to encourage low-to-moderate income participation the most is the above-mentioned gradual payment option, where participants pay in installments that either reduce, or - at best - eliminate

any upfront cost. The greater the variety of financing options offered, the easier it becomes for people from all income levels to participate. A further deterrent for the participation of low-to-moderate income households seems to be the length of most community solar projects. Therefore, it is helpful to offer short-term participation options and the ability to leave the program any time.

Beyond that, there seem to be a number of possible arrangements that can help low-to-moderate income households to participate in community solar projects. The nonprofit organization GRID Alternatives, for example, supports low income communities nationwide to create affordable community solar programs. Coyote Ridge Community Solar and the myLocal Solar projects in Colorado are among the programs GRID Alternatives partnered with. Among other things, they offer job training to people who are interested in solar energy and would like to help with installing the solar panels. This hands-on training not only helps individuals develop skills in the field but can also increase employment opportunities in the renewable energy market.

The programs evaluated also demonstrate the importance of marketing the financial benefits of participation in a community solar program effectively. Since the return on customers' investments is not necessarily very high, and because the programs usually run for a rather long time, it is more effective to emphasize the avoided cost, rather than potential profits. Moreover, it seems like a fair and well-working idea to evaluate applicants' eligibility for particular financing options based on their utility payment history rather than on FICO credit scores, just like the utility of River Falls, Wisconsin, did for their community solar program.

It is also possible to implement the option of donating a share or panel to low-to-moderate income households or non-profit organizations. To promote this option, it is possible to offer free advertising to businesses which choose to donate. The projects in New Richmond and River Falls, both in Wisconsin, offered this deal successfully. Additionally, incentives could be offered to participants (for example LED bulbs), either right on the spot when they subscribe or at annual raffles or drawings for participants.

Tax Implications

There are a number of different tax implications for community solar projects. There is a federal income tax credit of 30% available to taxpayers who invest in energy efficiency or renewable energy projects. Community solar projects take advantage of this credit in different ways. For example, the Cherryland project in Northern Michigan used the 30% federal tax credit to decrease the entire cost for the development of the system and passed these savings along to participants by lowering the buy-in cost. Two projects with municipally-owned utilities in partnership with WPPI Energy in Wisconsin took a similar approach, but because they are non-profit organizations and so do not pay taxes, they could not take the federal income tax credit themselves. Instead, they partnered with a private solar developer who took the tax credit and passed on savings to shareholders.

Recent projects in Lansing and Marquette, Michigan take a different approach. Because their utilities are non-profits and cannot directly take the tax credit, they encourage shareholders to individually apply for the tax credit on the shares they personally purchased on their own annual income tax forms. Possible tax implications for the Village of L'Anse are discussed in more detail later in this report.

Transferability

One critical factor that must be included in community solar program design is what to do if a shareholder moves out of the community, passes away, or otherwise no longer wants their share(s). There are a number of different ways to handle the transfer of shares from one shareholder to another.

When participants move to another property within their utility's service territory, they can simply remain in the program at the new address. However, purchased shares cannot be kept when moving outside of the utility's service territory. The projects we reviewed included several common ways for handling the transfer of shares:

- If a participant owns and is selling a building, that participant could include the value of his/her solar lease in the building sale price.
- Participants could also donate the remainder of their lease to another utility customer, including an individual, business, church, school, favorite charitable organization, etc. When donating to a 501 C3, it may be possible to include the contribution as a tax deduction.
- Participants can sometimes sell their shares to another customer within the service territory
- Organizations sometimes keep a running list of interested parties waiting for purchasing options after shares sell out.

System Size

The projects we reviewed were built with a range of sizes. The community solar garden in New Richmond, Wisconsin, for example, includes 807 solar panels (254 kW) which was designed for approximately 100 to 200 subscribers by a utility serving more than 4,850 customers. About 3% of the utility's customers were therefore expected to subscribe to the project. Even though this might not seem like a high percentage of customers was expected to participate in the program, the New Richmond utility had difficulties selling all available shares. Two cooperatives in rural Minnesota represent smaller scale systems. One of these cooperatives has 96 solar panels producing 40 kW with 122 members, and the other consists of 112 panels producing 66 kW with 31 total members. The latter one could only sell 66.5 out of the 112 panels, though.

It is important to note that many evaluated projects had difficulties selling shares. It seems as if subscribers are often times not willing to purchase as many shares as expected. Furthermore, the above-mentioned projects only offered an upfront payment option. These relatively high

initial costs might have deterred possible subscribers. The second cooperative example from Minnesota which had difficulties selling shares did at first only offer a 20 year contract. Since a big part of the population was older and concerned about the length of the program, a 5 year contract option was added later on which resulted in several more sold shares. While the cost per watt generally decreases the bigger a project gets, due to economies of scale, it is crucial to size a project carefully so that it is not over- or under- built.

Length of Term

Additional variations in program design include program length, with the lease for most programs ranging from 20 to 25 years. The River Falls Community Solar Program in River Falls, Wisconsin, for example, includes a 20-year lease, and the Marquette Board of Light and Power (MBLP) Community Solar program includes a 25-year lease. The length of a program is usually related to the guaranteed lifespan of the installed solar panels and can also have an effect on payment models. For example, monthly installments could decrease with a longer term. As mentioned above, one of the evaluated cooperatives in rural Minnesota with a large elderly population struggled to sell shares for a 20-year term. Therefore, a 5 year contract option was added which allowed the project so successfully sell more shares.

Lessons Learned

Altogether, reviewing these projects offers some lessons that could inform project development in L'Anse. Projects that offered multiple purchasing options, including financing over a longer time period, attracted more participants to the program and had less trouble selling shares than those that required full payment upfront. Furthermore, it appears to be effective to offer different contracts with different lengths of terms in order to reach out to customers who are older or who are unsure about how long they might stay within the community. Different options as well as the chance to cancel participation at any given time do not only help to attract older participants but also participants from various income levels. Allowing people to donate shares to lower income residents or to non-profit organizations is another way that projects have been successful. Partnering with community organizations, such as churches, schools, or community service organizations in this way can help to market the program and to ensure the project benefits a wide spectrum of community members. All options to benefit from tax credits should be considered carefully and a variety of transferability options should be offered. Above all, the most crucial point seems to be collaboration with the community in planning the program design to ensure as much participation as possible.

L'Anse Community Solar Survey

The research team distributed a short survey to all Village of L'Anse electric utility customers in September 2017. The purpose of the survey was to get a general sense of L'Anse residents' feelings about community solar and their likelihood to purchase shares under various program design scenarios. We also wanted to know how income would impact responses and to get a

sense for what other factors might be related to support of/opposition to community solar, such as community pride, trust, experiences and attitudes about energy efficiency, knowledge of solar, and demographic factors such as age and length of residence in the community. The complete survey is available in Appendix B and the complete survey results can be found in Appendix C.

Participation in the survey was voluntary and participants were able to skip questions if desired; responses are confidential and not binding. A paper copy of the survey was initially sent out to all customers with their utility bills at the end of September. Customers could return the surveys to the L'Anse Village Office in person or by mail. Alternatively, they could complete the survey online. Respondents were requested to return their surveys by October 7, but surveys were collected until November 8. As an incentive for completing the survey, residents were offered a $5 Baraga County Gift Check, which can be used at most businesses in Baraga County. On October 8, our MTU student team visited many residents of L'Anse walking door-to-door through about 30% of L'Anse residential neighborhoods. The team offered to collect completed surveys, answered questions about the survey and the community solar project, provided extra copies of the surveys along with self addressed envelopes, and hung a second copy of the survey and envelope on doorknobs when residents weren't home. We took notes on our experiences that day and the interactions from the conversations we had were used for qualitative data analysis, described below.

In total, 161 residential customers and 13 commercial customers responded to the survey, which represent 17.4% and 11.7% of all L'Anse customers, respectively. Therefore, nonresponse bias is an important issue to consider. It is likely that those who did not respond to the survey are less supportive than those who took the time to submit. Item non-response is also an issue -- for important individual questions such as whether residents would purchase shares, there was significant non-response, narrowing the overall response rate for residential customers who responded to those questions to about 14%. Still, there is good internal consistency within the survey for answers to similar questions, leading us to believe that respondents understood the questions and responded accordingly. The survey was generally successful at achieving a reasonable demographic representation of the population of L'Anse. Average household size is accurately represented. Women are slightly underrepresented in the survey, while lower to moderate income residents and residents in the 18-29 and 45-59 age ranges are significantly underrepresented in the responses. Conversely, people in the 60-74 year age range and middle/upper class residents are overrepresented.

Once the surveys were returned, the responses were coded and analysed using the data analysis package Stata. The data were sorted and compared using several factors such as age, income, and length of residence. Frequency counts and means were the primary methods for analysing the data. To answer the more complicated questions, indexes were created, which combined the responses from several questions into one value that could then be compared against other factors. For example, an index regarding community solar support was created based on several questions related to various aspects of support for community solar and likelihood to purchase shares. The resulting index value was used as a measure of one's

support for community solar on a normalized scale, which could then be compared against the resident's age or income.

General Support for Community Solar

Based upon the survey results, the people of L'Anse generally support community solar. Of the 154 people who responded to the survey question asking if they were in favor of the Village of L'Anse starting a community solar program, 92 were in support, 12 were against, and 50 were uncertain.

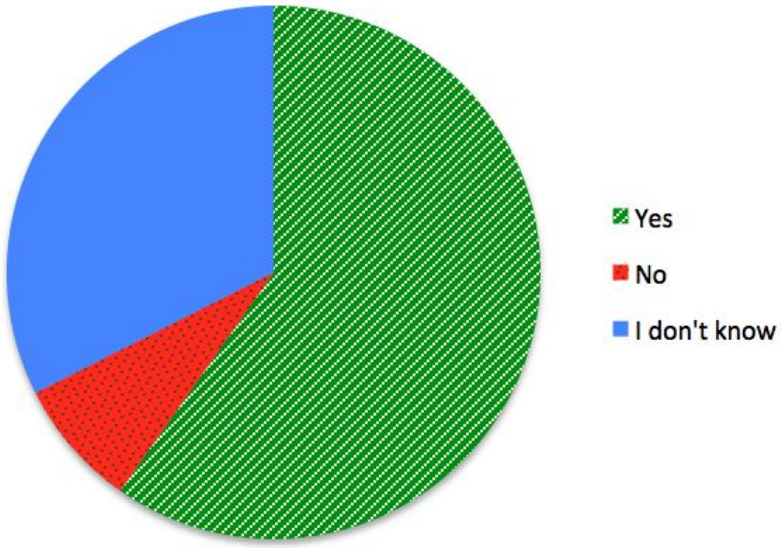

Figure 1: *Survey Response Concerning Those In Favor of The Village of L'Anse Starting a Community Solar Program*

One question asked whether residents thought that "purchasing shares is a good investment for [their] household" -- 44% agreed or strongly agreed while 25% disagreed. The mean value on this question is greater than 2, showing that people tend to agree that purchasing shares could benefit them. When asked if residents think having power from renewable energy sources is important, they responded even more positively -- 63% agreed, while only 11% disagreed. These results are displayed in Table 2.

Table 2: *Survey Responses Belief that Purchasing Shares is a Good Household Investment*

	Strongly Disagree	**Disagree**	**Neither Disagree Nor Agree**	**Agree**	**Strongly Agree**
Frequency	20	18	47	50	17
Percent	13.16	11.84	30.92	32.89	11.18

These were direct questions about whether the Village should implement this project or about attitudes regarding specific aspects of the project. The index of support for community solar includes these questions but also questions about likelihood to purchase and about presumed community impacts of community solar. It represents multidimensional support for community solar in a continuous and normalized measure such that levels of support can be compared between different groups. Values above zero on this factor indicate greater than average support, whereas values below zero indicate less support. Figures 2-4 show how survey respondents' support on this index varied by age, length of residence, and income.

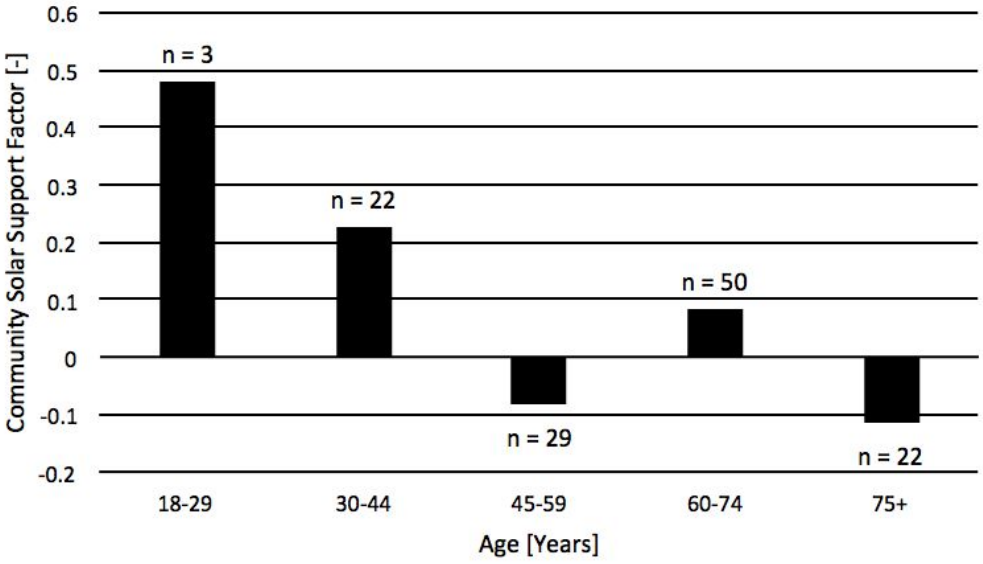

Figure 2: *Support For The Village of L'Anse Starting a Community Solar Program by Age*

The community support factor is significantly higher for younger householders (under age 45) than for older householders, especially for those over age 75. It is important to note that both ages 18-29 and ages 45-59 were underrepresented, and only three responses among ages 18-29 are included here. Still, the pattern of greater support for community solar among younger residents is clear.

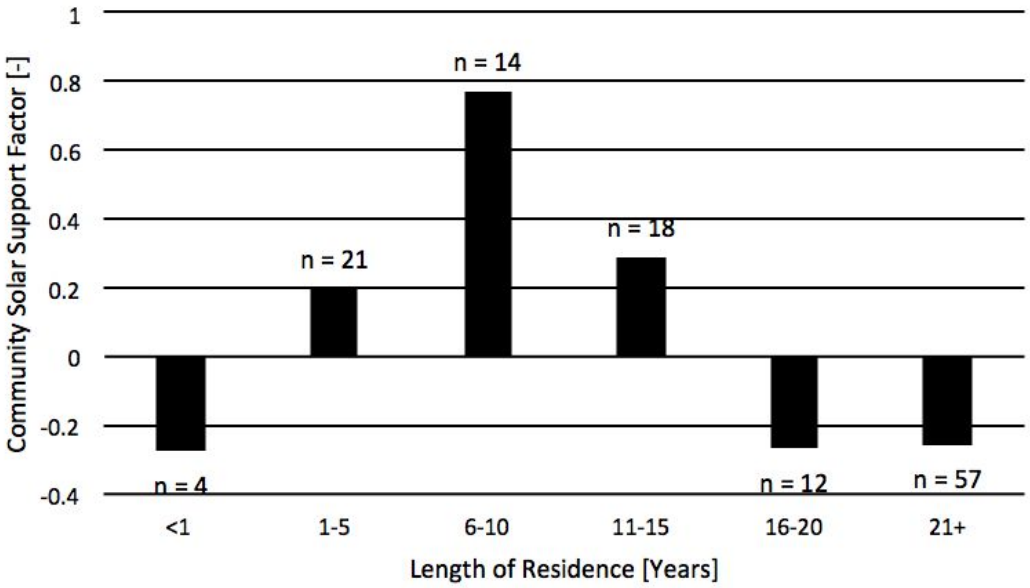

Figure 3: *Support For The Village of L'Anse Starting a Community Solar Program by Length of Residence*

Community members who had lived in the Village for 6-10 years were most supportive of a community solar project. Those who had lived in the Village for 16 or more years were both more numerous and generally significantly less supportive of community solar. However, this is correlated with older age, so it is difficult to say whether advanced age or length of residence would be driving this pattern.

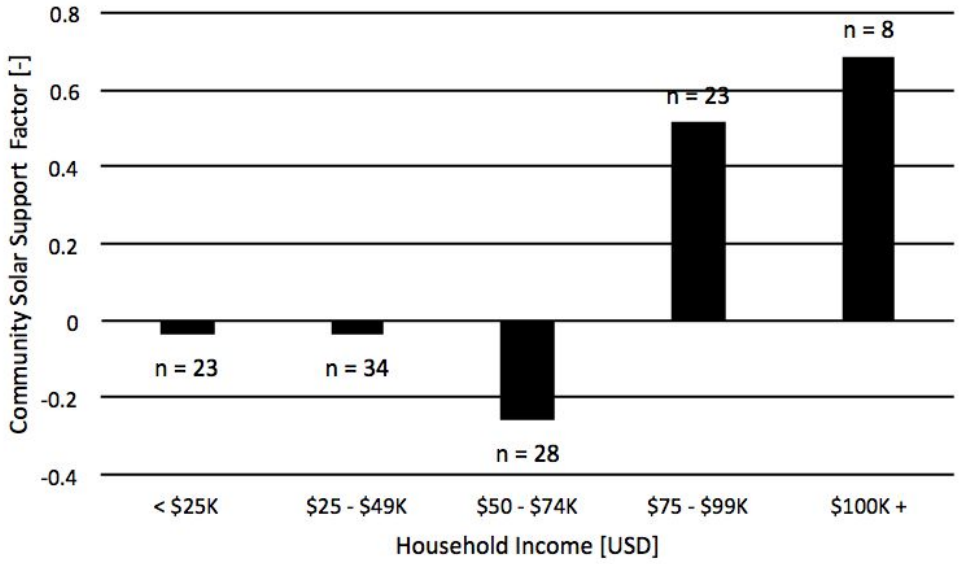

Figure 4: *Support For The Village of L'Anse Starting a Community Solar Program by Household Income*

Households with annual incomes less than $50,000 showed an average level of support for community solar (near zero). Those with moderate income were less likely to support community solar, while those with higher incomes (greater than $75,000) were more likely to support community solar. To generalize further, higher income respondents were more likely to demonstrate support towards community solar.

Selling Shares

The number of shares that could be sold depends on the program design. Results suggest that upfront cost could be a barrier even for those supportive of community solar. For instance, 68% of respondents agreed that an upfront cost of $500 was too expensive, and 52% answered they wouldn't be able to afford it. Of the respondents who said "yes" that they are in favor of the Village developing a community solar program in L'Anse, 49% said they would not be able to afford a $500 upfront cost.

Respondents were more likely to say they would purchase shares if financing options were available. If asked to pay $350 for a share at once, survey respondents indicated they would purchase a total of 106 shares. However, if small monthly payments could be made and the same annual payback were received, then respondents said they would purchase 184 shares. Likewise, paying $100 upfront and then receiving a smaller payback is also a popular option with 198 shares sold. The economic feasibility of these options will be discussed later in this report. Still, the evidence clearly suggests that upfront cost could be a key barrier.

Table 3 summarizes these results. It also includes a row estimating the total number of shares that might be sold in the greater L'Anse community if we extrapolate the responses of the 17% sample to the full number of customer accounts. The extrapolation assumes that 50% of customers have no interest in community solar and so did not respond to the survey for that reason and would not purchase any shares. It then assumes that survey respondents reasonably represent the other 50% of customers. We expect that this extrapolation is optimistic, because non-respondents may be even more biased against community solar than we assumed here, and because even respondents themselves likely overestimate the number of shares that they would buy when presented with the real option. Such overestimating behaviors in planned behavior and attitudinal surveys is common (Heberlein 2012). For these reasons the extrapolated row (labelled "Total Possible Shares in the Community") might be considered an optimistic scenario.

Table 3: *Survey Responses to Purchasing Shares Under Specific Financial Models*

Number of Shares	Option A: Pay $350 upfront ~$25 annual credit	Option B: Pay $6 per month x 6 years ~$25 annual credit	Option C: Pay $100 upfront ~$10 annual credit
0	61	44	42
1	27	18	27
2	7	18	11
3+	12	25	27
Responses	107	105	107
Total Shares for Respondents	106	184	198
Total Possible Shares in Community	311	541	582

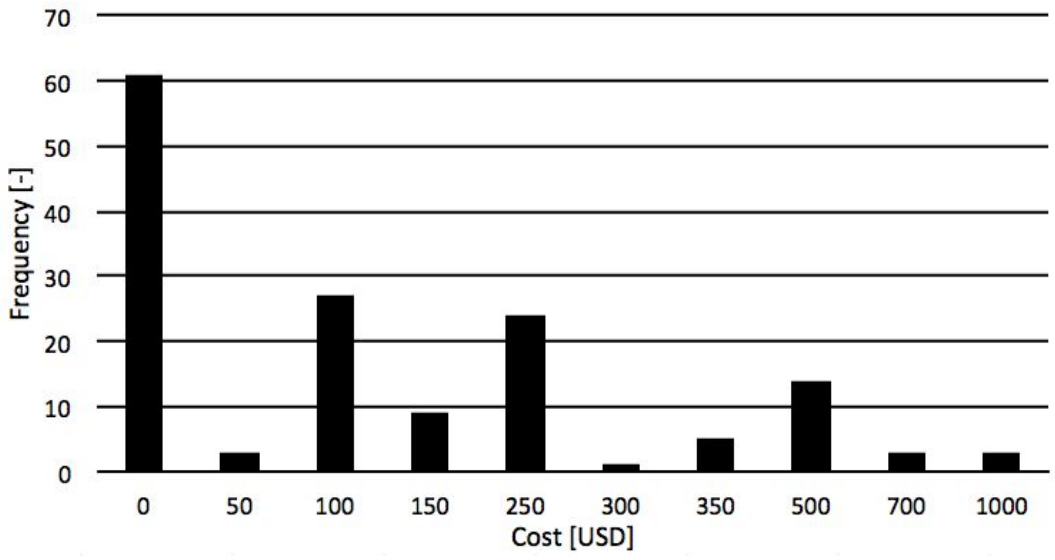

Figure 5: *Upfront cost that L'Anse residents are willing to pay for one share.*

Survey respondents were also asked to indicate how much they would be willing to pay upfront for a share that would return annual credits of about $25/year. Of the 150 responses, 41% would not be willing to make any payment for a share. For those who were willing to make a one-time payment, the average price they would be willing to pay is $273.59 with a standard

deviation of $212.95. However, values respondents were willing to pay varied by the household's reported income level. Households with an annual income greater than $50,000 per year who said they would purchase one or more shares were willing to pay an average price of $326.83, while households with an annual income less than $50,000 reported an average price of $226.32. The results are summarized in Table 4.

Table 4: *Average Price that Residents are Willing to Pay for Shares of Solar.*

Annual Household Income ($)	Number of Responses	Mean Price ($)
< 25,000	15	237
25,000 - 49,999	23	220
50,000 - 74,999	16	213
75,000 - 99,999	19	345
> 100,000	6	575

Non-Economic Opportunities & Barriers to Participation

Some possible reasons that could discourage support for community solar would be if people are pleased enough with a primarily fossil fuel based energy mix, if they don't understand solar technology or think that it doesn't work in northern, snowy climates, if they plan to leave the community, or if they don't trust the local utility. The survey asked questions to address these factors and generally found these not to be significant barriers. Table 5 shows the percent marking each response. Respondents felt that it was important their electricity comes from renewable sources, and they generally understood that the L'Anse area gets enough sun to make solar viable. Still many respondents did not feel they have enough information to be comfortable with this idea. Plans to stay in the Village may reduce interest for about 22% of respondents. Finally, 60% of respondents agree they trust their Village as an electricity provider, while only 10% disagree.

Table 5: *Survey Responses to Context Questions About Community Solar*

	Number of Responses	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
It is important that my electricity comes from renewable sources	148	4.05	6.76	25.00	36.49	27.70
The area does not get enough sun to make this work	147	12.24	25.17	46.58	10.88	6.12
I don't know enough of the details to feel comfortable with this idea	150	8.00	22.67	32.00	29.33	8.00
I don't plan to live in L'Anse long enough to make it worth the investment	145	16.55	27.59	33.10	12.41	10.34
I trust my Village as an electricity provider	149	5.37	4.70	30.87	47.65	11.41

Looking at relationships between variables representing respondents knowledge and familiarly with solar/community solar and the support for community solar index described above, we found moderately strong correlation (r= 0.57). We also explored relationships between community-oriented attitudes (attitudes about how community solar might impact the L'Anse community to make it a better place to live; increase community pride; attract more residents/businesses; plans to stay in the community long term; and trust in Village utility provider) and support for community solar and found strong correlation (r=0.845). This indicates that people who were personally interested in community solar opportunities also thought that it would promote community development. This suggests that educational programs that raise awareness and understanding and marketing approaches that tap into community spirit might increase local support.

Energy Efficiency is Important to Respondents

Beyond a community solar program, the team also explored the community's perspective, interest, and activity on energy efficiency improvements. There could be opportunities for integrating efficiency and community solar programs. Findings show that respondents had generally already taken efficiency steps and/or were interested in doing more. Especially many people seem to have caulked/added weather stripping to seal windows, doors, and ducts. Only

27% of respondents have wrapped their water heater with insulation (or hot-water heater blanket) but 40% would like to do it, so there is a high demand for this measure. There is also a demand for energy audits from trained professionals.

There is little evidence of relationships between efficiency responses and demographic factors, except for a difference by income level in how people responded to a question which asked about energy audits from trained professionals. A majority of low-to-moderate income households answered with “No, and I have no interest in it” whereas the majority of higher income respondents answered with “No, but I would like to”. This suggests that there is considerable interest among L’Anse residents for energy audits, but that LMI households may be concerned about their affordability or being able to afford to implement auditors’ suggestions.

Exploring relationships between support for energy efficiency and support for community solar, we see that people who mostly answered with “No, and I have no interest in it” for energy efficiency tended to also be less supportive of community solar.

Qualitative Results

Qualitative methods allow researchers to gain a deeper understanding of the complex reasons behind people's’ attitudes and a more nuanced understanding of feelings. Qualitative research aims at uncovering meaning through first hand experience and actual conversations. The team collected qualitative data through interviews with key informants, focus groups/community meeting, observations and conversations in the community, and open-ended survey questions. The purpose was to gain insight and understanding into how community members feel about the potential community solar project. Ultimately researchers attempted to uncover issues and considerations that could impact project adoption in L’Anse.

The team conducted five interviews in summer 2017 with stakeholders from organizations with some kind of community service role including small business, health and social services, or general community relations. The interviews were audio-recorded and partially transcribed for analysis. Researchers hosted a community meeting on August 22, 2017 in the L’Anse Area Schools Cafetorium where they facilitated discussions with community members. The facilitators presented the proposed community solar project for L’Anse, answered questions raised by the community, and solicited feedback from meeting participants. Notetakers stationed at ten small group discussion tables took detailed notes reflecting related discussion. These notes, as well as notes from full-group interpretation were used for analysis. The survey, described above, included open-ended questions to obtain feedback from Village of L’Anse utility customers. Additionally, team members generated observation notes from personal communications with Village of L’Anse residents throughout the months of September-November. For all of these sources of data, researchers analyzed the notes looking for common themes that provide deeper understanding of L’Anse community members’ interests and concerns related to community solar.

Qualitative Findings

Overall, residents shared generally positive feelings regarding the potential community solar project. People expressed interest because they felt it would lead the way to a clean future and position L'Anse as a forward-thinking leading community. L'Anse could become a leader in clean energy. Some customers felt previous decisions for the community were not necessarily made with the community's best interests in mind. However, introducing this type of project is reflective of the current village manager, and village utility's, willingness to put the community first, keep the benefits local, and promote affordability. Reasons for supporting the project included instilling pride in the community, presenting an opportunity to maintain the young population, and increasing community education. Additionally, due to the nature of a community solar program, community members maintain freedom to choose energy sources. Full qualitative analysis results can be found in appendices D and E.

The key themes the community raised included trust with the utility, environmental benefits/sustainable thinking, local ownership, affordability, and leadership. Some results found village and utility trust appeared to be the biggest factor in influencing willingness to adopt a community solar project. Respondent's cited a previous energy efficiency project, commissioned by the village, that did not fully benefit residents.Other respondents emphasized the environmental benefits that can be obtained from the project, allowing the village to become a regional leader in green energy and sustainable thinking. Resident's cited the continued operation of a "dirty" renewable energy plant, L'Anse Warden Biomass, as reflective of the community solar project's potential. Affordability is a paramount concern; the project needs to be accessible to people of modest means. Overall, many respondents support the project if it does not raise electric utility rates for village customers. Moving forward with the project has the potential to instill trust and pride in the community and shift the Village to environmentally friendly forms of electricity.

Residents were in favor of a locally owned project, training village residents, and decreasing return on investment time. Some respondents felt more information was needed, regarding costs and power generation in winter months, to make a final decision. Respondents cited age as a major concern. As the Village is an older community, it might not make sense for those residents as they may not have enough time to recoup the investment. Researchers observed gender differences surrounding support for a community solar project. At times, women did not seem to want to make decisions and deferred to the man of the household, while most men were interested in providing feedback (both positive and negative) on the community solar project.

Overall, respondents were positive about the idea of moving forward with the community solar project. Residents liked combining environmental benefits with potential economic returns and local empowerment. The combination of these three themes is important, as interview, focus

group, and survey results illustrate some residents were more or less interested in each, but bringing them together should provide the greatest success.

Overall Findings & Recommendations

This study aimed to determine (a) whether or not L'Anse utility customers support moving forward with a community solar project, and (b) how best to design a program that is affordable and accessible for L'Anse residents and businesses. This section summarizes the overall findings and makes related recommendations for how the Village of L'Anse might proceed with program design.

Recommendation 1: Move Forward (Cautiously)

The team's findings suggest that L'Anse utility customers do support moving forward with a community solar program. Based on this study, we believe that a program could succeed in L'Anse, but only with careful attention to affordability concerns and careful planning. While residents responded positively to the idea of community solar, the evidence also pointed to the possibility that it could be difficult to sell shares if very affordable options are not built into program design. Despite feeling that the project would be positive for the community, significant upfront costs may simply be too expensive for a large number of L'Anse customers. The elements of program design that we recommend below aim to address that concern, and we feel that it is economically feasible to design terms that are affordable. We recommend that the Village continue working to develop a community solar program, but to do so carefully and only if they can implement a program with affordable financing options.

Program Design

Program design includes determining options for how the project is to be financed, how benefits will be distributed, and how decisions will be made regarding the PV system. Design factors also include some of the ways that the community can be involved in the array without necessarily purchasing shares through conventional means, such as work-for-shares opportunities or the possibility of donating shares. Of course, it is important to determine the length of the program, the size of shares, and the number of shares available to each customer. Other considerations include who is responsible for building and maintaining the system, transferability of shares, and securities and tax implications. Of primary concern to our project is making it accessible to people of modest economic means.

Recommendation 2: Size, Length & Number of Shares

We recommend a 100 kW system, with 400 shares available for purchase. Purchasing options included later in this report are based on a system that fits this description, with possible program lengths ranging from 5 - 25 years. The majority of manufacturers provide a 25-year warranty on solar panels (Maehlum, 2014).

At 100 kW, with 400 shares, the size of each share amounts to 285 kWh of power, or somewhat less than 1 solar panel. Each share would be expected to produce about $27 worth of power each year. The maximum number of shares available to each customer should be based on the amount of electricity used by each customer, with the number of panels corresponding to their average monthly electricity usage. Alternatively, the Village might choose to set the limit at a maximum of 3 shares each for residential accounts, which would approximate just over the average residential electric demand.

Recommendation 3: Partner with an Anchor Customer

The program models discussed in this report are based upon a 100 kW system, divided into 400 shares. Survey results indicate that selling approximately 200 shares at the necessary price point would be doable, but to sell all 400 would be difficult without significant investment from one or more anchor customers. The models we show were generated based on the assumption that the Village could partner with one or more anchor customers who would be in a position to buy roughly half of the initial shares, and who would be willing to be flexible with the number of shares they own, to acquire more should others default. Such “flex” customers would also have the opportunity to buy shares that either went un-recontracted (see Option 2 in “Financial Models”) or were defaulted on. This could help the Village reduce the risk of offering 0% interest on-bill financing.

Recommendation 4: Work Closely with a “Local” Private Developer

We recommend that L’Anse partner with a relatively local or regional private solar developer. The key reason for this recommendation has to do with the eligibility of solar developers for federal tax incentives. Further explanation of how both federal and state tax incentives can be applied to community solar projects can be found in Appendix F. Taking tax incentives would reduce the cost of building and maintaining the system, and savings could potentially be passed on to L’Anse customers. In such a scenario, the developer would own the system for a number of years and then pass ownership onto the Village. An ownership model based on partnership with a local developer would be ideal for several reasons. First, the model allows the project to take advantage of tax benefits, explained below. Second, qualitative findings suggest that L’Anse community members prefer a scenario in which the installation is locally-owned.

This section reviews general tax implications, but the material contained herein is for information purposes only and does not constitute legal or tax advice. If the parties involved decide to proceed with the project, we encourage them to seek independent legal and tax representation and council.

The primary subsidy is a federal investment tax credit, which affords individual taxpayers a federal income tax credit equal to 30% of qualified solar electric property expenditures (Internal Revenue Code, section 25d). Though this tax credit is typically afforded to individuals who purchase solar PV systems for their own private residences, it has been applied to community solar projects as well. In community solar projects, there are two ways this has been applied -- it

has been taken by individual shareholders in their own personal income taxes, and it has been taken collectively by community solar projects, with savings passed on to shareholders in the form of lowering the initial investment cost shareholders pay. For example, recent projects in Marquette and Lansing do not take a collective tax credit, but rather individual shareholders may be eligible to qualify for the credit for any shares in a community solar system that they purchase. Individuals would need to explore this possibility with the Internal Revenue Service and apply for the credit in their personal taxes. This credit would only be applicable to individuals who have a high enough tax burden that they could use the credit to offset costs, and may exclude low-to-moderate income households from being able to take advantage.

Alternatively, the tax credit can be applied so that a private collective organization, rather than individual shareholders, can claim the 30% tax credit. In order to do this, the project must have a commercial owner that qualifies for the credit. Neither the Village of L'Anse nor WPPI Energy would be eligible to take this credit because they are non-profit organizations, but a private owner/developer would be eligible. The private owner/developer could then pass along savings from this tax credit to the community by reducing the cost of building the system. We recommend that L'Anse follow this approach if they can find an appropriate developer interesting in cooperating on the project. However, it should be recognized that this may increase transaction costs and the developer may wish to retain some of this tax credit.

In addition, there are two state of Michigan tax incentives that may be also be applicable to the project in L'Anse if it were owned by a private developer. Renewable Energy Renaissance Zones (RERZ) is an option overseen by the Michigan Economic Development Corporation (MEDC).This option affords tax relief to "renaissance zones" which would not be required to pay Michigan Business Tax and/or Corporate Income Tax, state, education tax, personal and real property taxes, and local income taxes. The tax abatement afforded to these localities can last for up to 15 years, and is generally phased out in 25% increments over the last three years of this period.

Another option is the Nonrefundable Business Activity Tax Credit, which allows businesses involved in alternative energy development, research, and manufacturing to claim a nonrefundable credit from the Michigan business tax. Certification by the Michigan Next Energy Authority is required in order to take advantage of this credit. It cannot be applied within an RERZ (Dept. of Energy).

Another thing to consider when thinking of ownership is Renewable Energy Credits (RECs). A community solar system feeding into the grid would generate RECs, which are market-based instruments in the United States that represent property rights to certain attributes of renewable energy generation. Each REC is intended to indicate that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource, and was fed into the shared system of power lines which transport energy. In the state of Michigan, utilities are required to have enough credits to meet at least 15% of their electric generation to meet the Renewable Portfolio Standards (RPS). RECs can be bought and sold in a market system and they can become

valuable depending on supply and demand. Currently, RECs have little monetary value, because the value of RECs depends on the markets created by the RPS, varying state by state. In 2016, REC prices averaged around $0.35/MWh (National Renewable Energy Laboratory, 2017). RECs generated by community solar projects can be held by participating customers, retained by the utility or the installer, or sold on the market and their value returned to shareholders.

Recommendation 5: Transferability of Shares

Many options exist for ways that shares can be transferred from one utility customer to another, in the event that a subscriber moves away, sells their home or business, or no longer wants to participate in the program. We recommend including options that account for these scenarios in the design of this program. Some possibilities include:

- Participants donating the remainder of their lease to another utility customer, including an individual, business, church, school, favorite charitable organization, etc. When donating to a 501 C3, it may be possible to include the contribution as a tax deduction.
- An option in which participants can sell their shares to another customer within the service territory
- An option in which organizations sometimes keep a running list of interested parties waiting for purchasing options after shares sell out
- If a participant owns and is selling a building, that participant could include the value of his/her solar lease in the building sale price

Recommendation 6: Partner with Community Organizations for Share Donations

We recommend including an option to allow individuals to donate shares to LMI households or nonprofit organizations. Donations to nonprofit organizations have the potential to incur tax benefits, such as write-offs to 501(c)(3), in which case they would qualify as charitable donations. The benefits of these partnerships would be distributed widely in the form of financial savings both to receivers of donations and to those whose contributions enable tax write-offs. Additionally, this could be helpful in marketing shares, because partner organizations would want to encourage the practice of making such donations. WPPI's two projects in Wisconsin, New Richmond and River Falls, were successful in including this option.

In addition to providing economic benefits to the community, such partnerships would also have social benefits. Connections made between residents of L'Anse, local businesses, and local nonprofit organizations could go a long way in fostering community spirit.

Recommendation 7: Offer a Worker Coop Model

A worker-coop model would provide opportunities for customers to work in exchange for shares. Other projects, such as Tri-County Electric cooperative's 74 kW community solar array in Rushford, Minnesota, have found this to be a successful way to involve community members of more modest economic means and also to increase general participation through peer-to-peer

marketing. Because there would be little ongoing work associated with building and maintaining a community solar system in L'Anse, however, opportunities for labor are minimal. Community members could be employed in selling shares, or in advertising the installation in exchange for free or discounted shares. For example, one or more residents could be hired to promote the project. They would not be paid in cash, but could receive one share for every x-number of shares they subscribe in exchange for their efforts.

Recommendation 8: Offer Energy Efficiency Participation Incentives

Survey results showed that community support for solar energy was correlated with interest in energy efficiency. There are a number of ways to integrate means of increasing energy efficiency with program design.

In particular, the results show that there is high demand for particular means of increasing energy efficiency of respondent's homes. The two measures for which demand was highest were insulation for water heaters, and energy audits. Other energy efficiency incentives include LED bulbs, such as were provided to community members in attendance at the meeting on August 22nd, where focus groups were conducted. Still others could include window caulking, plastic for covering windows in the winter, and faucet aerators. They may be ways that community solar programs could be more directly integrated with energy efficiency programs, and we encourage utilities to explore those opportunities as they arise.

Recommendation 9: Offer Options for Purchasing Plans, including On-Bill Financing

We recommend that the Village offer multiple purchasing options for customers to choose from. In reviewing existing program models, we discovered that projects that offer multiple purchasing options and financing plans were more successful at selling shares than those that only had a single upfront cost. Upfront cost is the biggest barrier to participation, particularly for low-to-moderate-income residents. Therefore, designing a program that is affordable is key. Some ways that this could be achieved are reflected in the section describing potential purchasing options, below. These models show options for financing the cost of solar shares at 0% interest, including options to pay a small down payment (or no down payment) plus a monthly payment, and receive monthly returns.

It is important, when determining what financing options customers may be eligible for, that participation not be unnecessarily impeded by customers' credit scores. Customers may have relatively low credit scores for a variety of reasons, including having little official credit history. For this reason, using FICO scores to determine eligibility for financing can unnecessarily restrict participation. Other projects, such as the Solstice Initiative, have been successful in challenging the assumption that low-to-moderate income individuals present a greater risk to community solar, working to design a program that incorporates reducing potentially low credit scores from standing in the way of a potential participant's interest in community solar. This can be done by determining eligibility based on utility payment history, rather than FICO score, as it is more relevant in the case of on-bill financing and widens opportunity for participation.

While most of the options proposed below are based on 25-year plans, it is also recommended that a five-year plan is offered as an option to potential program participants. Survey findings show that residents of ages 75 and older were less supportive of community solar. One of the existing programs that we reviewed showed that addressing the issue of program length tended to be an issue in older communities. This recommendation is designed to provide an option to those who either a) feel that they are too old to see the payback from a 25-year-long program, or b) don't plan to live in L'Anse in the longer term. The latter scenario is more often the case for LMI residents.

Recommendation 10: Create a Local Participants' Board for Decision-Making

Study results suggest that maintaining trust and local involvement will be key to project success. Survey results indicate that Village of L'Anse utility customers currently have a large degree of trust in the local utility and level of trust was an important factor in predicting support for community solar. In order to maintain this trust, it will be important to create a program that meets subscribers needs and expectations, while being transparent about benefits. Results also show the importance of local control and community benefits. In order to help maintain trust and enhance local control and local benefits, we recommend creating a board, consisting of shareholders as well as representatives from the Village and WPPI Energy, that makes programmatic decisions, helps recruit participants, monitors progress, and addresses concerns as they arise. This could include specific activities in the early phases such as determining final program design elements, writing a Request for Proposals to developers, awarding a contract, fixing a timeline, and recruiting participants. Additionally, the board is likely to increase the efficacy of peer-to-peer marketing.

Cost & Purchasing Options

What people really want to know is how much the buy-in costs would be and what would be the approximate payback. Ultimately, this will depend on installation costs, tax incentives, size of system, number of shares sold, and program design. Here, we review some approximate numbers and potential design scenarios to provide a sense of what these costs could be.

Installation costs for a 100kw system are currently priced at about $1.75/W for a total cost of roughly $175,000. Assuming that the Village is able to partner with a developer who takes the 30% federal income tax credit and passes half of that credit on to shareholders in the form of reducing the installation price, we estimate the installation cost to be $148,750. We also assume the Village would receive a no-interest loan from WPPI for the cost of the system to be paid back in full within 10 years at a even, monthly rate. Payments from shareholders would be used to finance the loan. WPPI would sign a contract to purchase the energy generated, the exact rate for which they would purchase that power has yet to be determined. The research team discussed and evaluated a series of scenarios that L'Anse might adopt as possible options that potential shareholders could choose from. Of the various models the team considered, four proposed concepts were developed into working models, each of which is described below.

All four models were generated based on the ideas that shareholders need to make some profit on their investment over the course of the program length and that the Village would need to raise enough funds from the shareholders to repay their loan from WPPI on time. They also were generated based on the assumption that the program would have one or more anchor "flex" customers who would be in a position to buy roughly half of the initial shares. Flex customers would also have the opportunity to buy shares that either went un-recontracted, see Option 2, or were defaulted on. Each model is based on selling a total of 400 shares for a 100kW system, meaning each share is roughly 250 watts (or somewhat less than one full 300 watt solar panel). Based on a previous technical site evaluation, it is estimated that a 100kW system of the intended style has the potential to generate 113,850 kWh annually (Vickers 2017). The models shown here assume that WPPI Energy would purchase the generated solar energy at the average rate of $0.095/kWh over the life of the program. The team used community input via the interviews, (Appendix D), community conversation on August 22, 2017 (Appendix E) and the community survey results (Appendix C) as well as information gathered from other programs to help generate each of the suggested financial models. The survey showed (Table 3) that respondents were willing to purchase shares at a value of $350. Upon reviewing costs, we found the more realistic price per share to be $375. Still, Option 1 below closely mimics the survey scenario. The survey also found that respondents were even more interested in purchasing shares for a reasonable down payment plus small monthly installments, Options 3 and 4.

The following paragraphs outline each of the individual models, as well as how combining any of the individual models together, would work. Table 4 compares key details for each of the four models. Full model details can be found in Appendix G. In order to appeal to a variety of different household and economic conditions, we recommend that the Village offer a mix of these (or similar) options to utility customers for how they could choose to participate in a community solar program. To help decision makers determine which of these options could work well together, the team created an interactive spreadsheet that allows users to determine whether multiple models can be used in conjunction with one another and how many shares per individual model would allow for the Village to repay the loan.

The team also considered several other potential financial options, not included below. These models included options like using a lock-in-rate for shareholders, giving shareholders who signed up for the program early and prepaid for their share a discount, and various other price points and financing terms. Ultimately, the team developed the options that provided the most financial benefit to shareholders while allowing the Village to repay its loan. We were unable to develop a lock-in rate model that would provide net financial benefit to shareholders and generate adequate financing for the project; but with more work this could be an option for an additional type of model as it has been successfully implemented by other projects. The following options, detailed below, are those that the team recommends the Village of L'Anse consider or develop similar approaches to offer customers and future shareholders.

Option 1: Pay Upfront

The first option requires that the full cost per share, $375, be paid upfront. With the purchase of one share would come an estimated annual credit of $27 for a program length of 25 years. This credit would be divided into monthly payments of roughly $2.25 to the shareholder. It would take approximately 13.87 years to make back the initial cost; after which point shareholders would continue to receive the annual credits, earning surplus for roughly 11.13 additional years (through the end of the 25 year term). In total, shareholders could expect to receive a savings of roughly $300 per share over the length of the program.

Option 2: Pay Upfront- Full, Shorter and Recontract Program Options

This option also requires the full cost per share to be paid upfront; however, instead of only offering plans for the full lifetime of the solar panel system, it also allows for the initial purchase of a 5 year term. For those interested in participating for the full 25 years the model would match that of Option 1. For those unsure about whether they want to commit to the full 25 year long program, they could participate in a 5 year option. The upfront cost would be $110 with annual credits of roughly $27 in the form of $2.25 monthly payments to the shareholder. It would take approximately 4.07 years to make back the initial cost; after which point shareholders would continue to receive the annual credits through the end of the 5-year program, earning surplus for roughly 11 months. In total, shareholders could expect to receive a savings of roughly $25 per share over 5 years. After the first 5 years an option to recontract for the remaining 20 years of the program would be made available to those who initially only invested in the 5 year term. Any shareholders who choose not to recontract would then lose their shares in the program and someone else could buy them as part of the recontract model. This 20 year term (recontract) would have an estimated upfront cost of $300 with annual credits of roughly $27 in the form of $2.25 monthly payments. This means it would take approximately 11.09 years to make back the initial cost; after which point shareholders would continue to receive the annual credits, earning surplus for roughly 8.91 additional years . In total, shareholders could expect to receive a savings of roughly $240 per share over the length of the program. For those who participate in both the initial 5 year model and the 20 year recontracting model it would take approximately 15.16 years to make back the initial cost; after which point shareholders would continue to receive the annual credits, earning surplus for roughly 9.84 additional years (through the end of the 25 year term). In total, shareholders could expect to receive a savings of roughly $265 per share over the length of the program.

The shorter 5-year plan was successfully implemented in one of the programs that the team researched- a rural Northern MN community that is predominantly older residences and seasonal lake home owners. Offering a shorter program length was attractive to those customers who were nearer the end of life and had more uncertainty about whether they would still be customers at the end of the full program length.

Option 3: Minimal Down Payment plus On-Bill Financing

This option involves a down payment of $25 per share and monthly payments of about $3 for 10 years. Each shareholder would receive annual credits of an estimated value of $27 in the form of monthly payments of $2.25 for the full 25 years. It would take approximately 14.24 years to make back the cost of investing in the program; after which point shareholders would continue to receive the annual credits, earning surplus for roughly 10.76 years (through the end of the 25 year term). In total, shareholders could expect to receive a savings of roughly $290 per share over the length of the program.

Option 4: No Down Payment- Full Financing

A no-down-payment option could be offered with monthly payments of roughly $3.50 per share for 10 years. Shareholders would receive annual credits of roughly $27 in the form of monthly payments of $2.25 for 25 years. It would take approximately 15.53 years to make back the initial cost; after which point shareholders would continue to receive annual credits, earning surplus for roughly 9.47 years (through the end of the 25 year term). In total, shareholders could expect to receive a savings of roughly $255 per share over the length of the program.

Alternatively, the Village could offer a smaller number of customers, that qualify under specific income guidelines and have no history of defaulting on bill payments, financing spread over 25 years. The monthly payment would be roughly $1.50 for 25 years and shareholders would receive annual credits of roughly $27 in the form of $2.25 monthly payments. This means that shareholders would immediately see a net monthly benefit of about $0.75. In total, shareholders could expect to receive a savings of roughly $225 per share over the length of the program.

Combining Options:

While any of these options could function independently, the team recommends that L'Anse offer customers choices for how they might participate. This would mean offering a combination of these, or similar, options. The Village would choose the financial options they are most comfortable with offering and, using the previously mentioned spreadsheet provided by the team, to determine the number of shares that could be sold under each option and still allow the Village to repay its loan on schedule.

Table 6: *Financial Options to Consider*

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

Marketing Recommendations

When discussing how to market this project to potential shareholders, the team concluded that it would be optimal to use peer-to-peer marketing as much as possible. This marketing strategy encourages discussion of the project among participants, and can be spurred by such efforts as the focus groups that the team has already engaged L'Anse community members in, as well as simply by reminding people to share the benefits of their participation with others by telling them about it. A marketing plan that includes a strategy such as using yard signs to advertise the project could promote peer-to-peer marketing by letting people know who in the community is participating, and opening up the possibility for conversation among neighbors about the project.

Additional marketing strategies include:

- Hiring recruiters who could earn free shares for getting others involved
- Designing a website that provides information and encourages involvement
- Designing infographics to inform about the benefits of community solar
- Using advertising to increase the visibility of the solar array at the L'Anse Water Treatment Plant to give potential participants an idea of how a solar PV system operates in L'Anse already

Conclusions

This report summarized the results of the social and economic feasibility analysis conducted by students at Michigan Technological University (MTU), in partnership with members of UPSTART. The feasibility study addressed (a) whether or not L'Anse utility customers are likely to buy shares and (b) how best to design a program that works for L'Anse residents (including low-to-moderate income residents) and businesses. To reiterate, the Village will not move forward with the project if community members are not in favor. The program would be voluntary and would not impact rates for any customers who don't elect to participate.

Along with economic benefits, the community solar project will provide environmental and social benefits to residents. Renewable energy is a very important part of current efforts to make the transition into a more sustainable world. Building the community solar array would allow L'Anse to increase its resilience and further the forward thinking and sustainable future that many resident's hope to achieve. By having a locally-owned renewable energy system, community solar enhances residents' sense of pride in their community, provides opportunities for employment, spreads awareness of renewable energy and sustainability, and promotes values that inform environmental decision making and community ethos.

The team evaluated several existing community solar programs to determine successful components that can be replicated in the Village of L'Anse community solar design. These evaluations illustrate a recurring concern with previous community solar projects: difficulty in selling shares to finance the entire system. Instituting appropriate marketing and incentive mechanisms into the Village's community solar project may combat these issues.

The team developed four financial models as potential options to move forward with the community solar project. The proposed 100kW community solar project will cost roughly $175,000 but it is believed that the Village will be able to take advantage of some tax incentives

to bring the installation cost down to $148,750. The team recommends that the Village combine different models together using the larger model spreadsheet to determine the number of shares allotted to each individual financial option that they are most comfortable with. Ultimately, the financial models show that in the long run, shareholders and the Village could save on energy costs by moving forward with community solar.

Results from Village of L'Anse community studies (survey, interviews, and focus groups) show that the community likes the idea. The team's findings suggest yes the community should move forward with the project, but with careful attention to certain considerations. Despite understanding that the project would provide benefits for the community, a program must be designed that addresses the needs and concerns of residents who may have barriers to participation. Major considerations that surfaced include: overall trust, LMI involvement, installation, maintenance, and ownership as functions of program design. Overall, developing a program that includes low-cost financing options for LMI residents will allow the Village of L'Anse to become a unique community solar model that is forward thinking, the first of its kind, and provides benefits to all participants.

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Appendices

Appendix A: Community Solar Information Sources

The following resources are listed to provide more background information on the development and design of community solar programs, means of expanding access and improving the affordability to participants in community solar, and technological design elements that go into developing such projects as the one that is being proposed in L'Anse.

Title	Source	URL
*Breaking Ground: New models that deliver energy solutions to low income customer*s	Rocky Mountain Institute	https://d231jw5ce53gcq.cloudfront.net/wp-content/uploads/2017/04/eLabLeap_Breaking-Ground-report-2016.pdf
Community Solar Garden Subscriber Questions	Clean Energy Resource Teams	https://www.cleanenergyresourceteams.org/sites/default/files/CommunitySolarGarden_SubscriberQuestions_July2017.pdf
Community Solar Developer & Operator Questions	Clean Energy Resource Teams	https://www.cleanenergyresourceteams.org/sites/default/files/CommunitySolarGarden_CommunityTips_12-11-14_0.pdf
Guide to Community Solar: Utility, Private, and Non-Profit Project Development	U.S. Department of Energy	https://www.nrel.gov/docs/fy12osti/54570.pdf
Guidebook for Community Solar Programs in Michigan Communities	Great Lakes Renewable Energy Association	https://www.michigan.gov/documents/mdcd/Michigan_Community_Solar_Guidebook_437888_7.pdf
Low-Income Solar Policy Guide: Unlocking Participation	Low Income Solar Policy Guide	http://www.lowincomesolar.org/why-act/unlocking-participation/
Model Rules for Shared Renewable Energy Programs	Interstate Renewable Energy Council	http://www.irecusa.org/publications/model-rules-for-shared-renewable-energy-programs/
2017 Solar Market Snapshot	Smart Electric Power Alliance	https://sepapower.org/resource/2017-solar-market-snapshot/

Michigan Technological University

College of Sciences and Arts

L'Anse Community Solar Survey

The Village of L'Anse is considering a community solar program and would like your feedback on this short 10 minute survey. The Village has partnered with Michigan Technological University to gather input from residents and businesses. By completing the enclosed questionnaire you will help the Village make important decisions about solar power.

The survey includes questions about your interest in participating in a community solar program and factors that may influence your decision to participate. Participation is voluntary. You are free to stop at any time, and skip any questions you choose. Responses are confidential and do not commit you in any way.

To thank you for completing the survey, we would like to offer you a $5 *Baraga County Gift Check* which can spent at any Baraga County businesses. Simply return your completed survey to the L'Anse Village Office by mail, in-person or online. We will make the combined results from this survey available to the community through a final report and in a presentation to the community.

If you have any questions about this survey or the proposed program, call Brad Barnett at (906) 482-7205 or email barnett@mtu.edu. You can also contact the research Project Director Richelle Winkler at (906) 487-1886 or rwinkler@mtu.edu. If you have any questions regarding your rights or to register a complaint about this project, please contact the Michigan Tech Institutional Review Board at (906) 487-2902 or by email at irb@mtu.edu. This Office oversees the review of the research to protect your rights and is not a participant in this study.

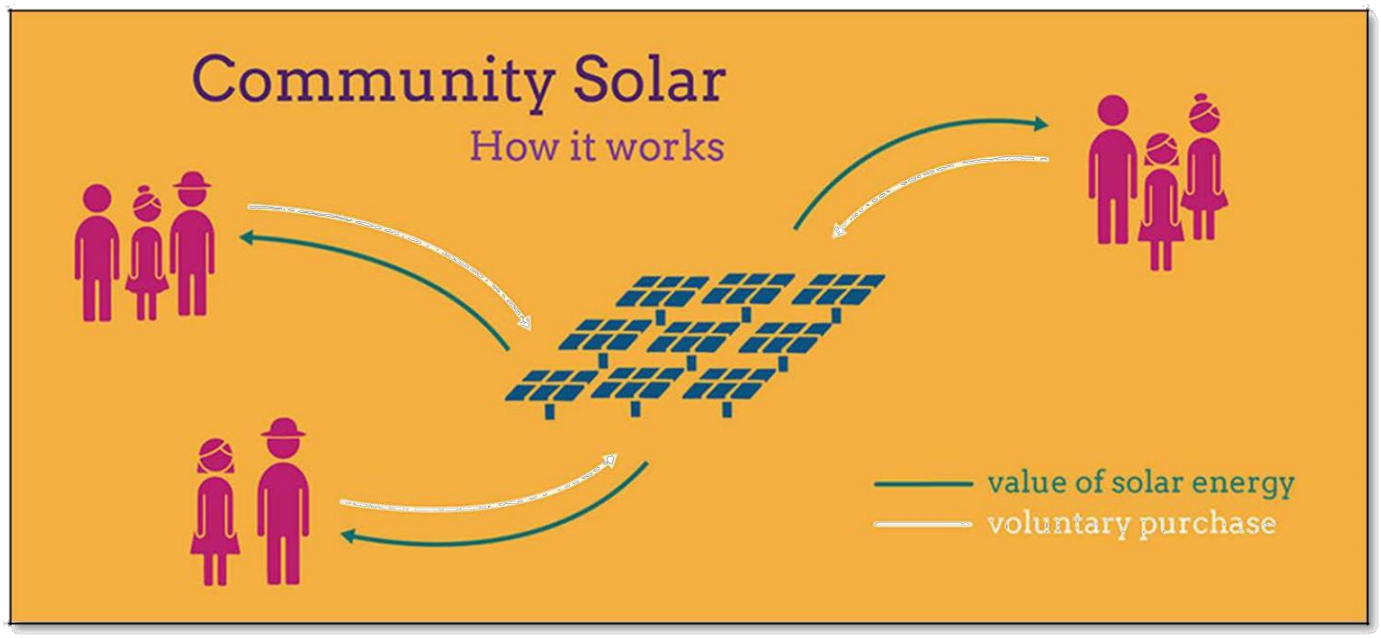
Thank you so much for your help!

Sincerely,

Richelle L Winkler

Richelle L. Winkler, PhD
Associate Professor of Sociology and Demography
Michigan Technological University

201 Walker Arts and Humanities Center | 1400 Townsend Drive, Houghton, MI 49931-1295
906-487-2156 | f. 906-487-3347 | **mtu.edu/sciences-arts**



Community Solar in L'Anse

The Village of L'Anse is considering developing a community solar program for Village electric utility residential and business customers. Community solar includes:

- A large group of solar panels built in one sunny location
- Customers can choose to buy "shares" of the panels
- Share owners earn money back on their utility bill, based on the energy generated

The L'Anse system would include about 200 panels, located in the new industrial park off Lambert Road. Customers who wish to participate would be able to pay a one-time fee for "shares" in exchange for a monthly credit to their household's monthly electric bill based on the amount of power generated. Purchased shares could be transferred or sold to other L'Anse utility customers. The program would not change electric utility rates for customers who choose not to participate.

A community solar project located near Traverse City, MI

Instructions for Completing the Survey

We ask that an adult (over the age of 18) in your household with the next upcoming birthday complete this survey. Please complete the following questions to reflect your opinions as accurately and truthfully as possible. Carefully read each question and indicate your response according to the question's instructions. Please clearly mark your response to each question. This helps ensure that we gather the best information possible.

We ask that you complete the survey by **October 7th**.

How to Return the Survey: Completed surveys can be returned by mail (or in person) with your bill payment to the Village Office using the provided envelope. It can also completed online at: **www.surveymonkey.com/r/LanseSolar**.

Thank you for your time and thoughtful responses.

Survey Questions

1. Before receiving this survey, did you already know about community solar?
   - ☐ Yes ☐ No

2. Do you know anyone (including your household) who currently owns solar panels for their home or business?
   - ☐ Yes ☐ No

3. Are you in favor of the Village developing a community solar program in L'Anse?
   - ☐ Yes ☐ No ☐ I don't know

4. How much are you willing to pay, in the form of a one-time payment, for one share that **returns $25 per year for 25 years**? Please check one answer.

$100	$150	$250	$350	I would not purchase a share
$500	$700	$1,000	Other:$_____	

Skip to #6

5. How likely would you be to purchase one or more shares **today** if the **upfront cost per share was $350 and you received a $25 return per year for 25 years?**

   Very unlikely Unlikely Unsure Likely Very likely

6. How likely would you be to purchase one or more shares **today** if the **upfront cost per share was converted into fixed monthly payment of $6 for 5 years**? You would still receive about $25 in return per year for 25 years.

   Very unlikely Unlikely Unsure Likely Very likely

7. How likely would you be to purchase one or more shares **today** if the **upfront cost was $100,** and you would receive about **$10 in return per year for 25 years**?

   Very unlikely Unlikely Unsure Likely Very likely

8. If you could purchase shares **today,** how many shares would you purchase if (please give response for each scenario):
    - You paid **$350 up front** and received an **annual return of $25 per year**:_____
    - You paid **$6 per month for 5 years** and you received an **annual return of $25 per year**:_____
    - You paid **$100 up front** and you received an **annual return of $10 per year**:_____

9. Please indicate your level of agreement to these statements.

Factor	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Purchasing shares is a good investment for my household (or business).	☐	☐	☐	☐	☐
$500 per share is too expensive.	☐	☐	☐	☐	☐
I can't afford the upfront cost of $500.	☐	☐	☐	☐	☐
An annual credit of $50 isn't enough to justify the upfront investment.	☐	☐	☐	☐	☐
It is important that my electricity comes from renewable sources.	☐	☐	☐	☐	☐
This area does not get enough sun to make this work.	☐	☐	☐	☐	☐
I don't know enough about the details to feel comfortable with this idea.	☐	☐	☐	☐	☐
A community solar program would make L'Anse a better community to live in.	☐	☐	☐	☐	☐
I don't plan to live in L'Anse long enough to make it worth the investment.	☐	☐	☐	☐	☐
A community solar program would attract more residents and businesses to L'Anse.	☐	☐	☐	☐	☐
A community solar program would increase my pride in my community.	☐	☐	☐	☐	☐
Share owners should receive public recognition on a website or community sign.	☐	☐	☐	☐	☐
I trust my Village as an electricity provider.	☐	☐	☐	☐	☐

Energy Efficiency

10. Reducing the amount of energy you use is a great way to decrease your monthly electric bill, and we're interested in creating programs to help you do that. To help us know where we should focus, please use the table below to indicate if you have taken any of the following actions in the past 5 years.

	Yes	No, but I would like to	No, and I have no interest in it	I don't know
Installed compact florescent lighting (CFL) to replace incandescent lighting				
Installed LED lighting to replace incandescent lighting				
Installed programmable thermostats				
Caulked/added weather stripping to seal windows, doors, and ducts				
Installed aerators on faucets and shower heads to reduce the use of hot water				
Added additional insulation in attic, walls, and or flooring				
Wrapped water heater with insulation (or hot-water heater blanket)				
Replace older windows with energy efficient ones				
Installed high-efficiency water heater				
Installed high-efficiency HVAC (or furnace) unit				
Obtained an "energy audit" from a trained professional to identify opportunities for energy efficiency improvements.				

About You

We need to ask you a few questions about your household. Your responses will be kept strictly confidential.

11. What is your age?

☐ 18-29 ☐ 30-44 ☐ 45-59
☐ 60-74 ☐ 75+ ☐ Prefer not to answer

12. Are you a current customer of the L'Anse Village electric utility (check all that apply)?

☐ Residential customer ☐ Business/Non-profit customer ☐ Not a customer

13. How long have you lived (or owned property/business) in L'Anse?

☐ Less than a year ☐ 1-5 years ☐ 11-15 years ☐ 16-20 years ☐ 6-10 years ☐ 21+ years

14. How many live in your household?

☐ 1 ☐ 2 ☐ 3 ☐ 4
☐ 5 ☐ 6 or more

15. Do you currently own the property referenced in the previous question? Please choose <u>one</u> answer.
    - ☐ Yes, I (or another member of my household) own this property, but I live elsewhere most of the year
    - ☐ Yes, I (or another member of my household) own this property and it is my usual residence/business
    - ☐ No, I (or another member of my household) rent this property

16. Which of the following categories represents your household's typical yearly total income? Please choose <u>one</u> answer.

☐ Less than $25,000	☐ $25,000-$49,999	☐ $50,000-$74,999
☐ $75,000-$99,999	☐ $100,000+	☐ Prefer not to answer

17. Are you:

☐ Male	☐ Female	☐ Prefer not to answer

Your Feedback

Please use this section to provide additional information about your thoughts or questions regarding a community solar program in L'Anse.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for completing the survey!

Please tear off here & provide your address if you would like your **<u>$5 Baraga County Gift Check</u>** mailed to you. This will go in a separate box at the Village office to maintain confidentiality.

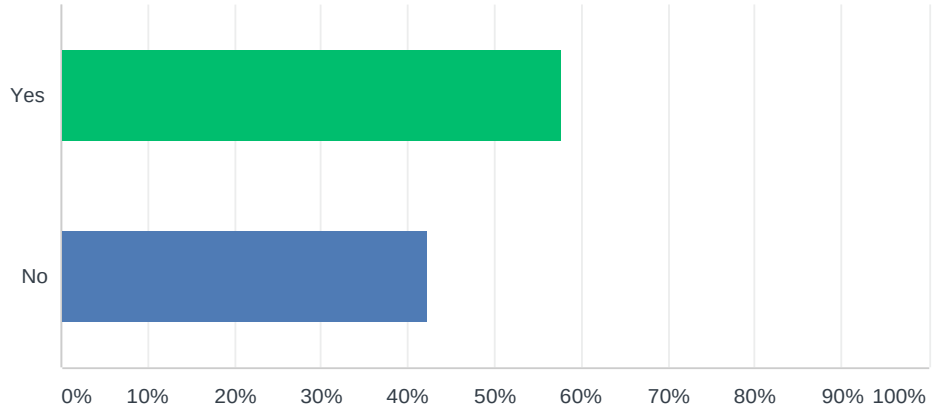
Address:_____

City, State, & Zip Code:_____

Appendix C: Full Raw Survey Results

Q1 Before receiving this survey, did you already know about community solar?

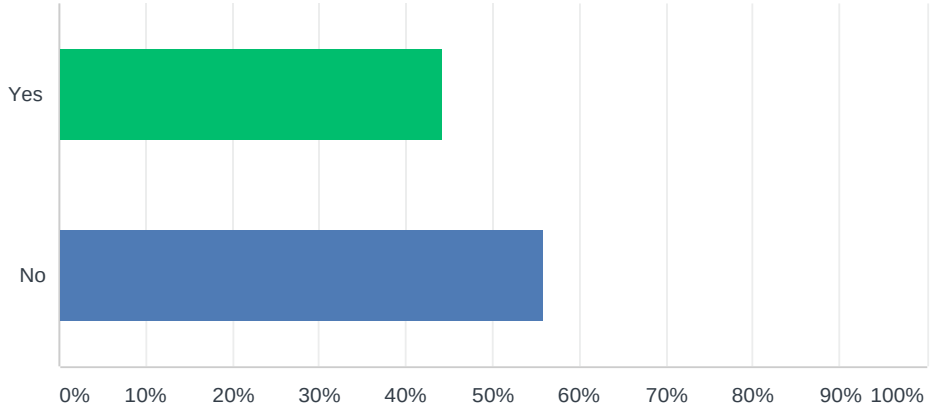
Answered: 163 Skipped: 6



ANSWER CHOICES	RESPONSES	
Yes	57.67%	94
No	42.33%	69
TOTAL		163

Q2 Do you know anyone (including your household) who currentlyowns solar panels for their home or business?

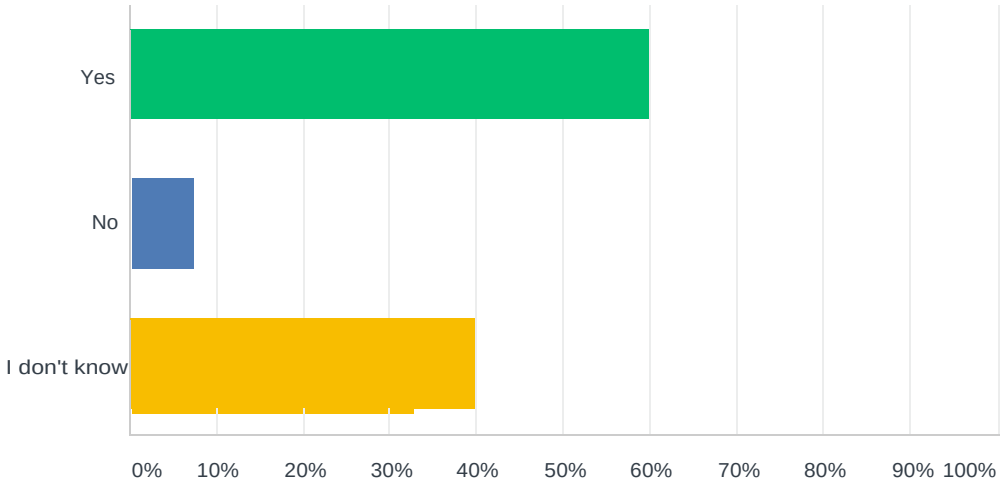
Answered: 163 Skipped: 6



ANSWER CHOICES	RESPONSES	
Yes	44.17%	72
No	55.83%	91
TOTAL		163

Q3 Are you in favor of the Village developing a community solar program in L’Anse?

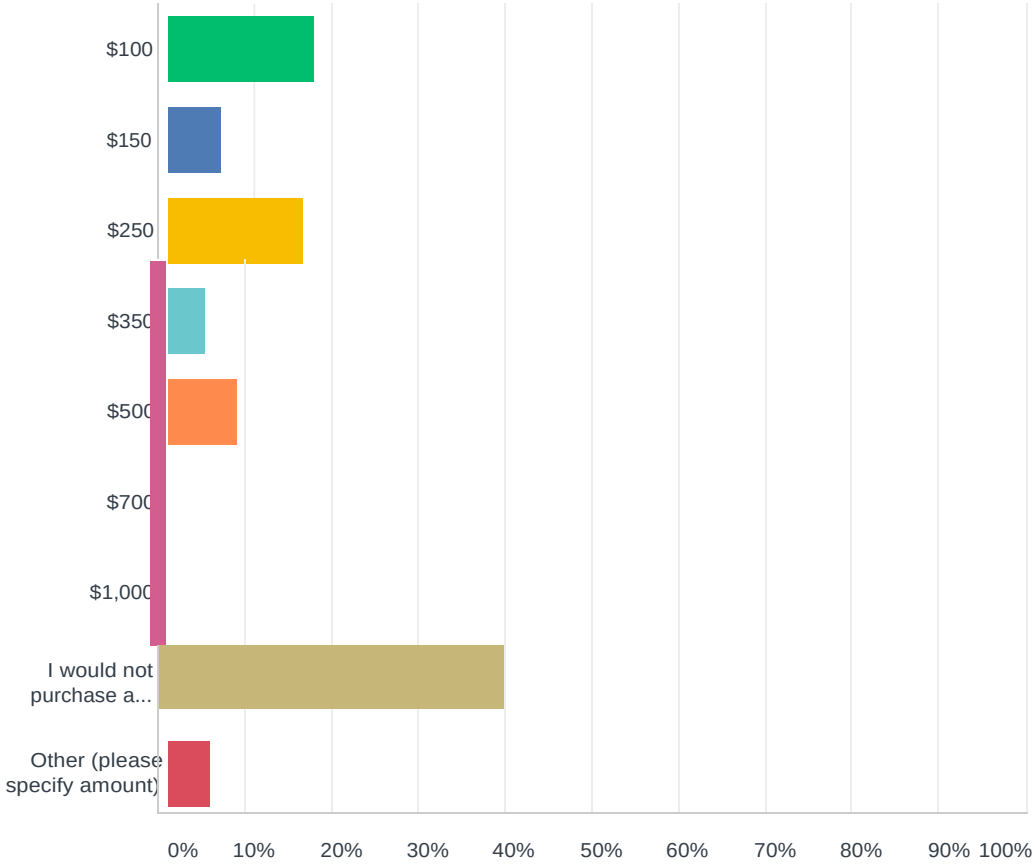
Answered: 162 Skipped: 7



ANSWER CHOICES	RESPONSES	
Yes	59.88%	97
No	7.41%	12
I don't know	32.72%	53
TOTAL		162

Q4 How much are you willing to pay, in the form of a one-time payment, for one share that returns $25 per year for 25 years? Please check one answer.

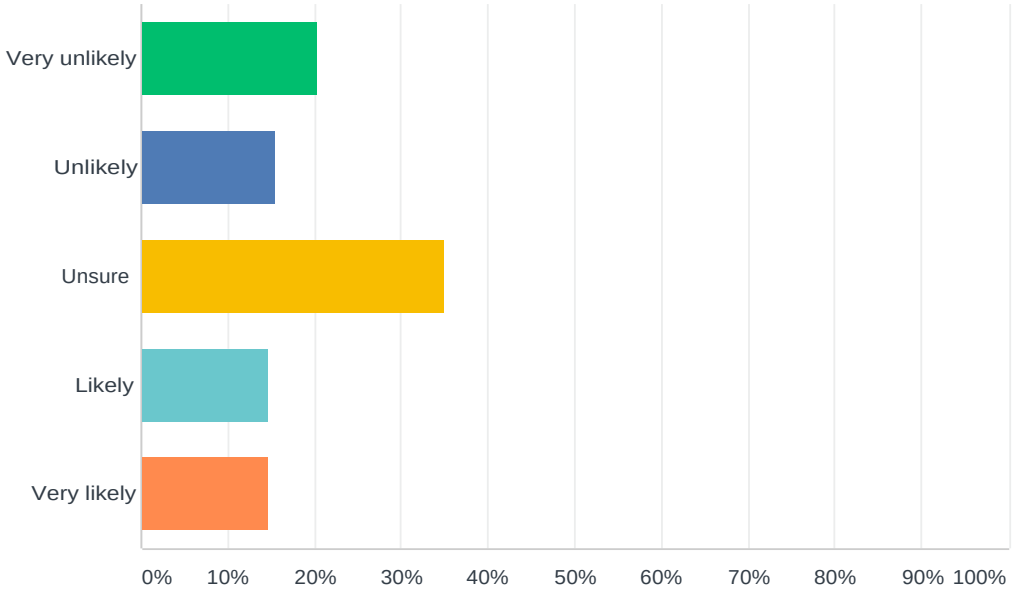
Answered: 159 Skipped: 10



ANSWER CHOICES	RESPONSES	
$100	16.98%	27
$150	6.29%	10
$250	15.72%	25
$350	4.40%	7
$500	8.18%	13
$700	1.89%	3
$1,000	1.89%	3
I would not purchase a share	39.62%	63
Other (please specify amount)	5.03%	8
TOTAL		159

Q5 How likely would you be to purchase one or more shares today if the upfront cost per share was $350 and you received a $25 return per year for 25 years?

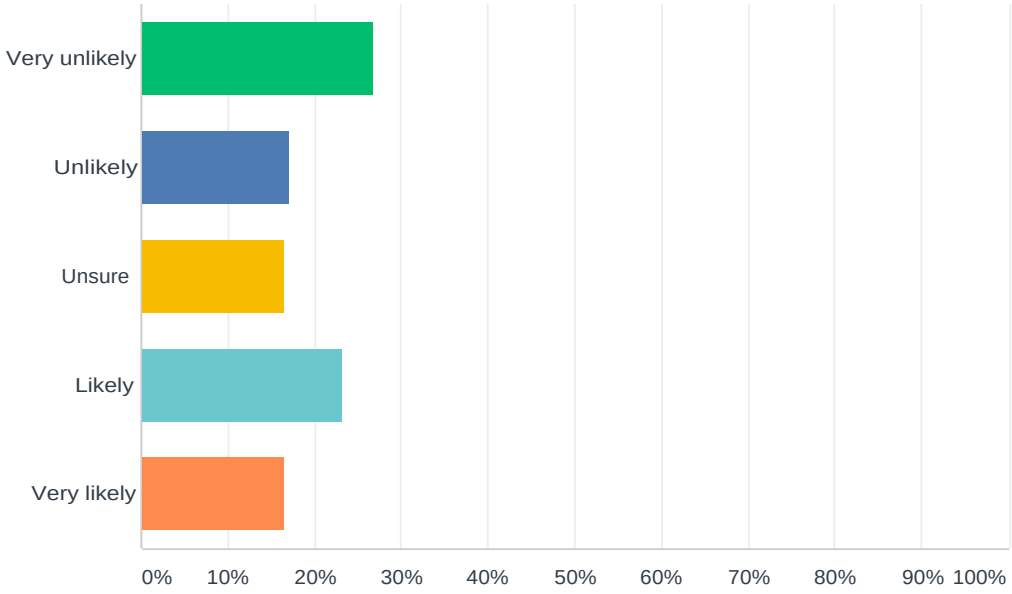
Answered: 103 Skipped: 66



ANSWER CHOICES	RESPONSES	
Very unlikely	20.39%	21
Unlikely	15.53%	16
Unsure	34.95%	36
Likely	14.56%	15
Very likely	14.56%	15
TOTAL		103

Q6 How likely would you be to purchase one or more shares today if the upfront cost per share was converted into fixed monthly payment of $6 for 5 years? You would still receive about $25 in return per year for 25 years.

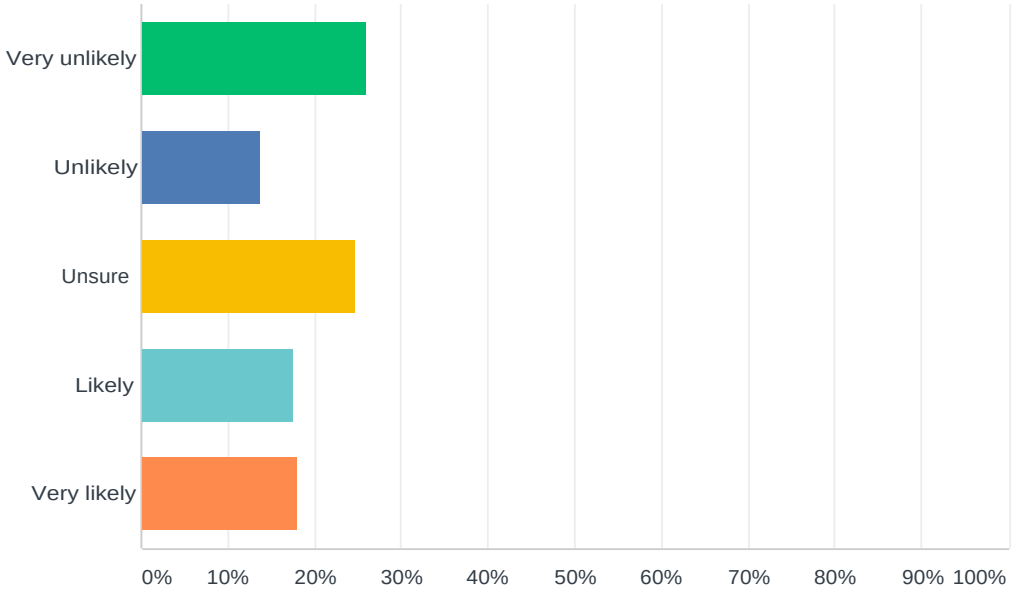
Answered: 164 Skipped: 5



ANSWER CHOICES	RESPONSES	
Very unlikely	26.83%	44
Unlikely	17.07%	28
Unsure	16.46%	27
Likely	23.17%	38
Very likely	16.46%	27
TOTAL		164

Q7 How likely would you be to purchase one or more shares today if the upfront cost was $100, and you would receive about $10 in return per year for 25 years?

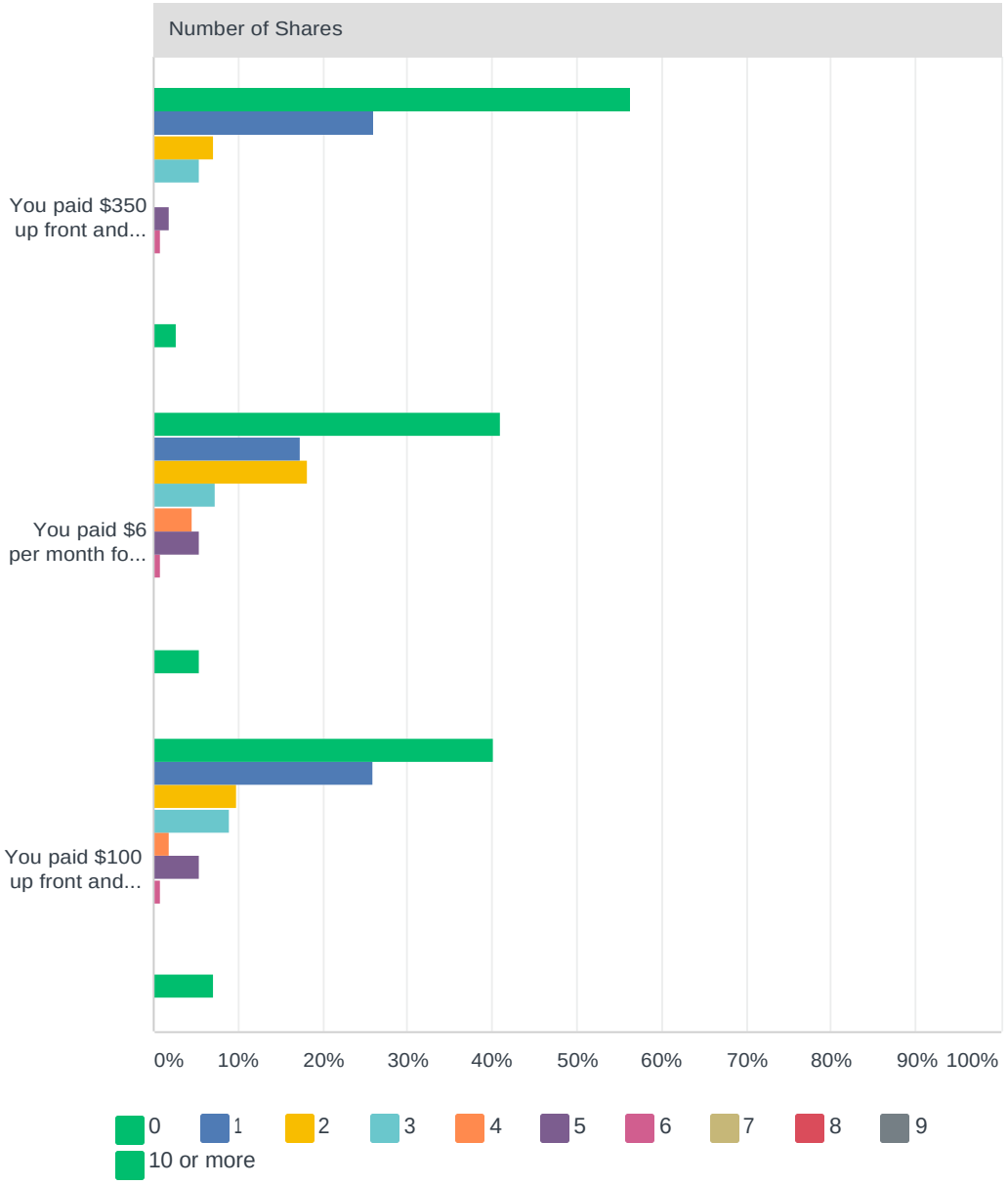
Answered: 166 Skipped: 3



ANSWER CHOICES	RESPONSES	
Very unlikely	25.90%	43
Unlikely	13.86%	23
Unsure	24.70%	41
Likely	17.47%	29
Very likely	18.07%	30
TOTAL		166

Q8 If you could purchase shares today, how many shares would you purchase if (please give response for each scenario):

Answered: 119 Skipped: 50

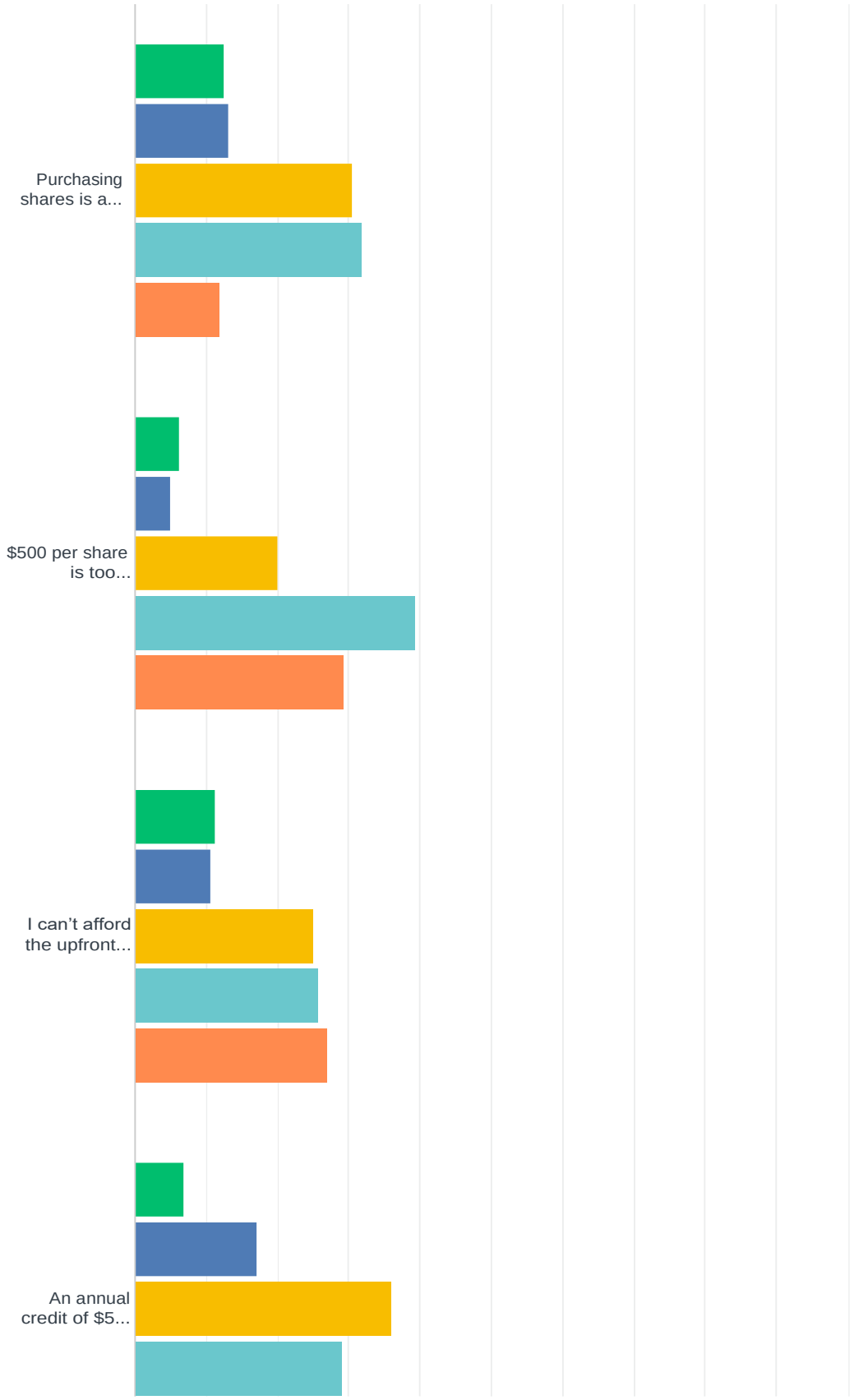


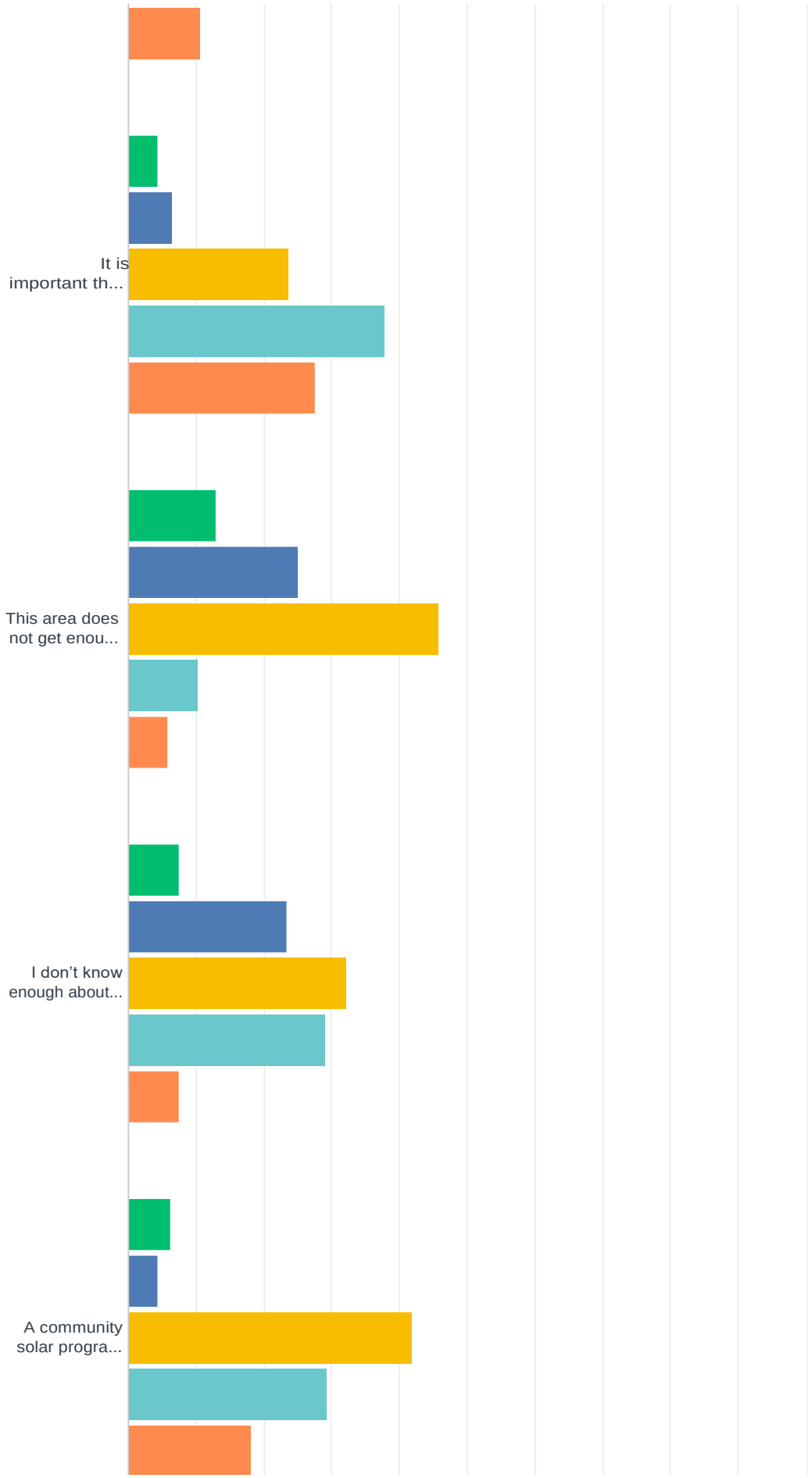
Number of Shares												
	0	1	2	3	4	5	6	7	8	9	10 OR MORE	TOTAL
You paid $350 up front and received an annual return of $25 per year:	56.25% 63	25.89% 29	7.14% 8	5.36% 6	0.00% 0	1.79% 2	0.89% 1	0.00% 0	0.00% 0	0.00% 0	2.68% 3	112

You paid $6 per month for 5 years and you received an annual return of $25 per year:	40.91% 45	17.27% 19	18.18% 20	7.27% 8	4.55% 5	5.45% 6	0.91% 1	0.00% 0	0.00% 0	0.00% 0	5.45% 6	110
You paid $100 up front and you received an annual return of $10 per year:	40.18% 45	25.89% 29	9.82% 11	8.93% 10	1.79% 2	5.36% 6	0.89% 1	0.00% 0	0.00% 0	0.00% 0	7.14% 8	112

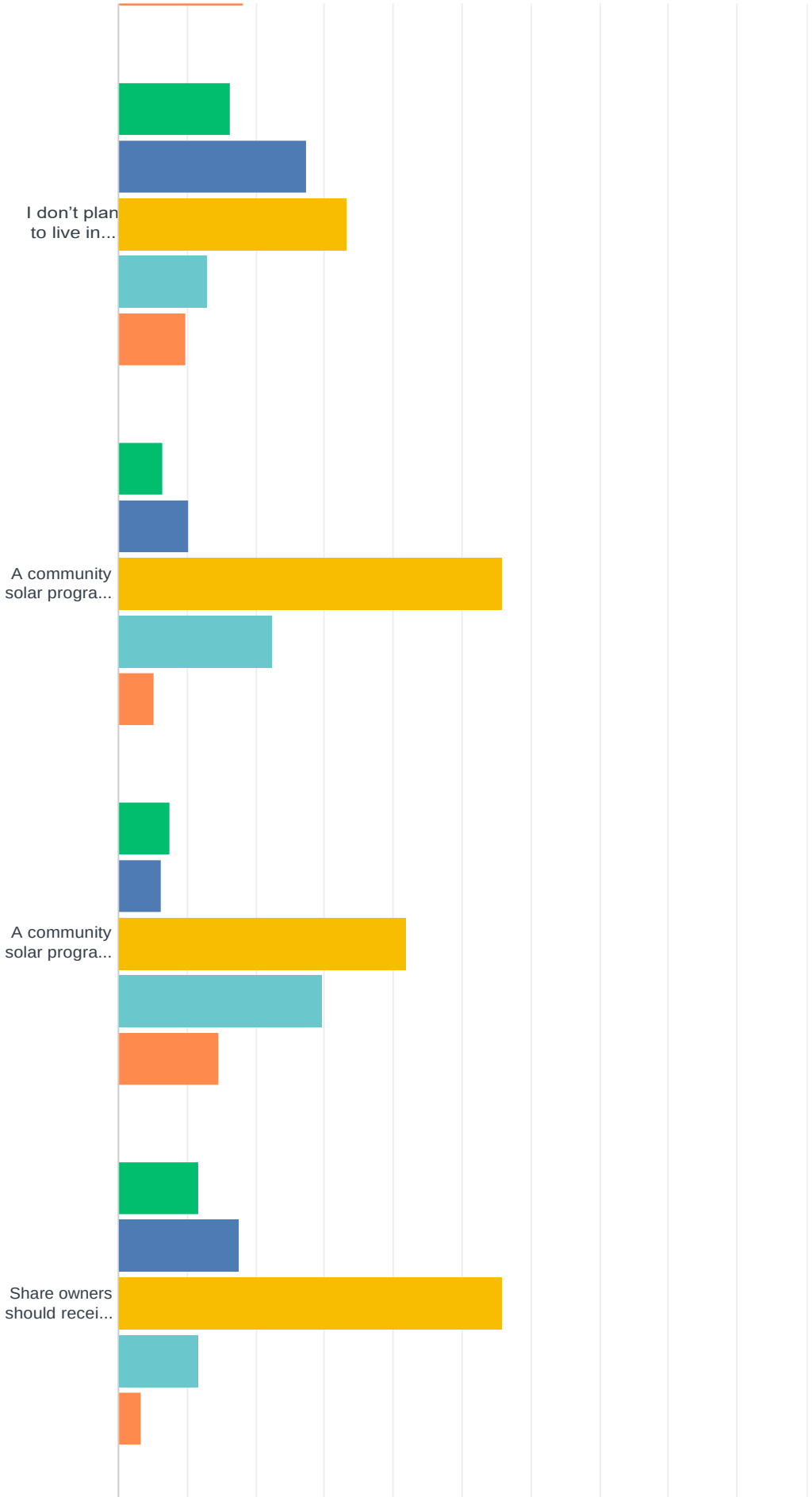
Q9 Please indicate your level of agreement to these statements.

Answered: 162 Skipped: 7

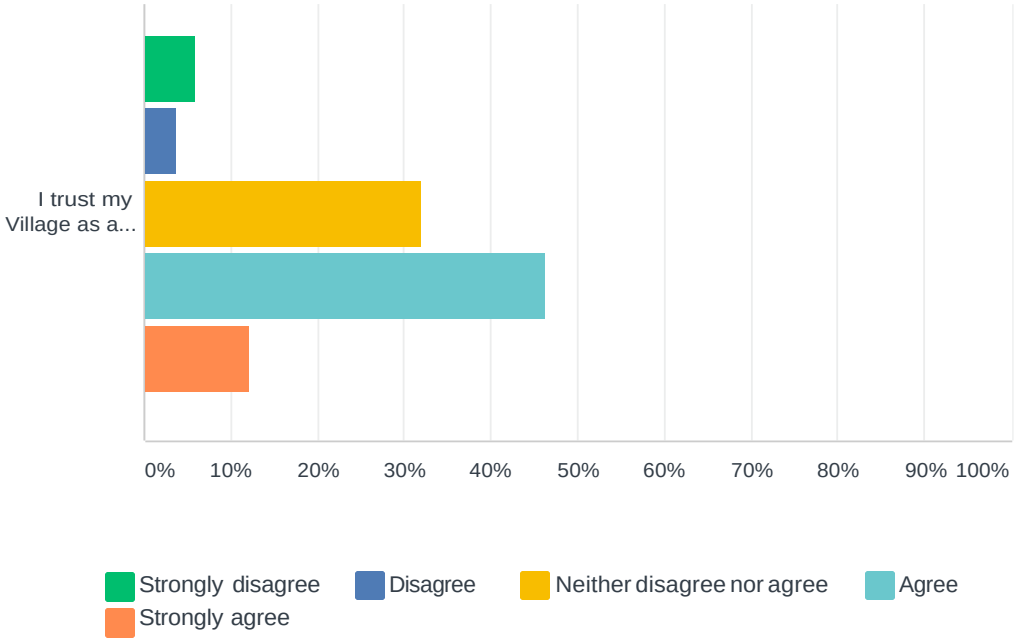



It is important th...
This area does not get enou...
I don’t know enough about...
A community solar progra...

C11


I don’t plan to live in...
A community solar progra...
A community solar progra...
Share owners should recei...

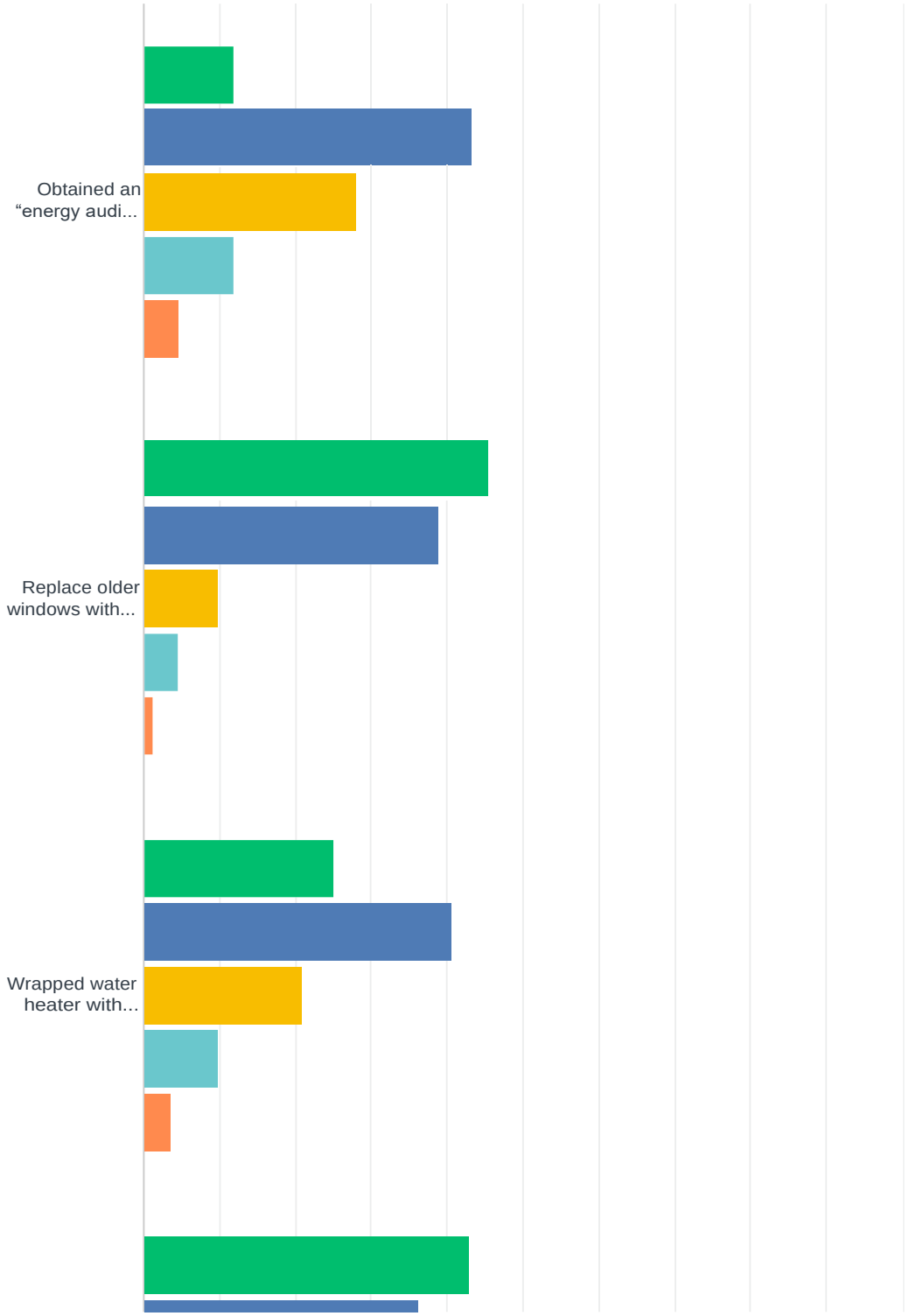
C12

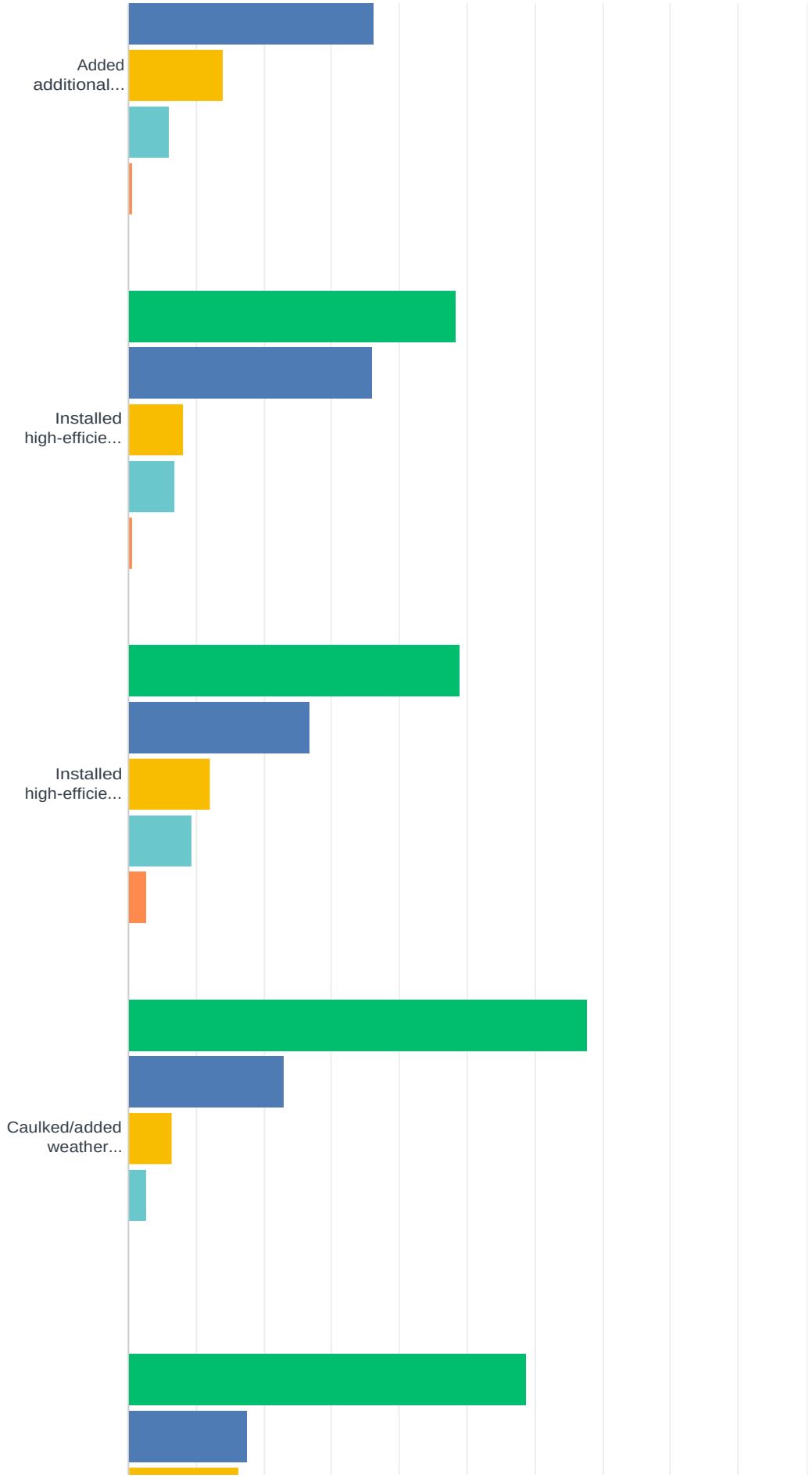


	STRONGLY DISAGREE	DISAGREE	NEITHER DISAGREE NOR AGREE	AGREE	STRONGLY AGREE	TOTAL
Purchasing shares is a good investment for my household (or business).	12.50% 20	13.13% 21	30.63% 49	31.87% 51	11.88% 19	160
$500 per share is too expensive.	6.25% 10	5.00% 8	20.00% 32	39.38% 63	29.38% 47	160
I can’t afford the upfront cost of $500.	11.32% 18	10.69% 17	25.16% 40	25.79% 41	27.04% 43	159
An annual credit of $50 isn’t enough to justify the upfront investment.	6.96% 11	17.09% 27	36.08% 57	29.11% 46	10.76% 17	158
It is important that my electricity comes from renewable sources.	4.49% 7	6.41% 10	23.72% 37	37.82% 59	27.56% 43	156
This area does not get enough sun to make this work.	12.90% 20	25.16% 39	45.81% 71	10.32% 16	5.81% 9	155
I don’t know enough about the details to feel comfortable with this idea.	7.59% 12	23.42% 37	32.28% 51	29.11% 46	7.59% 12	158
A community solar program would make L’Anse a better community to live in.	6.25% 10	4.38% 7	41.88% 67	29.38% 47	18.13% 29	160
I don’t plan to live in L’Anse long enough to make it worth the investment.	16.34% 25	27.45% 42	33.33% 51	13.07% 20	9.80% 15	153
A community solar program would attract more residents and businesses to L’Anse.	6.41% 10	10.26% 16	55.77% 87	22.44% 35	5.13% 8	156
A community solar program would increase my pride in my community.	7.59% 12	6.33% 10	41.77% 66	29.75% 47	14.56% 23	158
Share owners should receive public recognition on a website or community sign.	11.69% 18	17.53% 27	55.84% 86	11.69% 18	3.25% 5	154
I trust my Village as an electricity provider.	5.77% 9	3.85% 6	32.05% 50	46.15% 72	12.18% 19	156

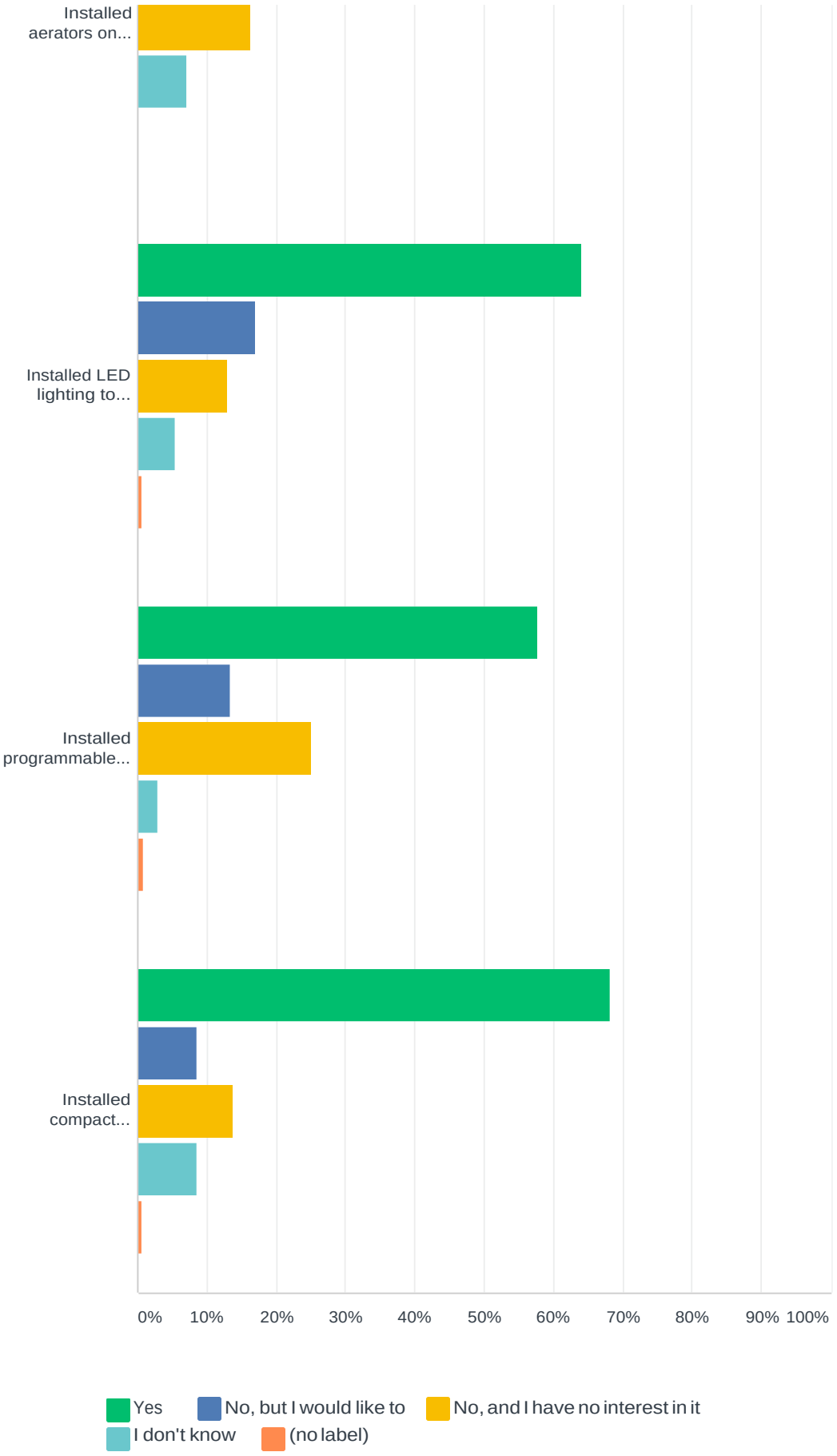
Q10 Reducing the amount of energy you use is a great way to decrease your monthly electric bill, and we're interested in creating programs to help you do that. To help us know where we should focus, please use the table below to indicate if you have taken any of the following actions in the past 5 years.

Answered: 160 Skipped: 9




Added additional...
Installed high-efficie...
Installed high-efficie...
Caulked/added weather...

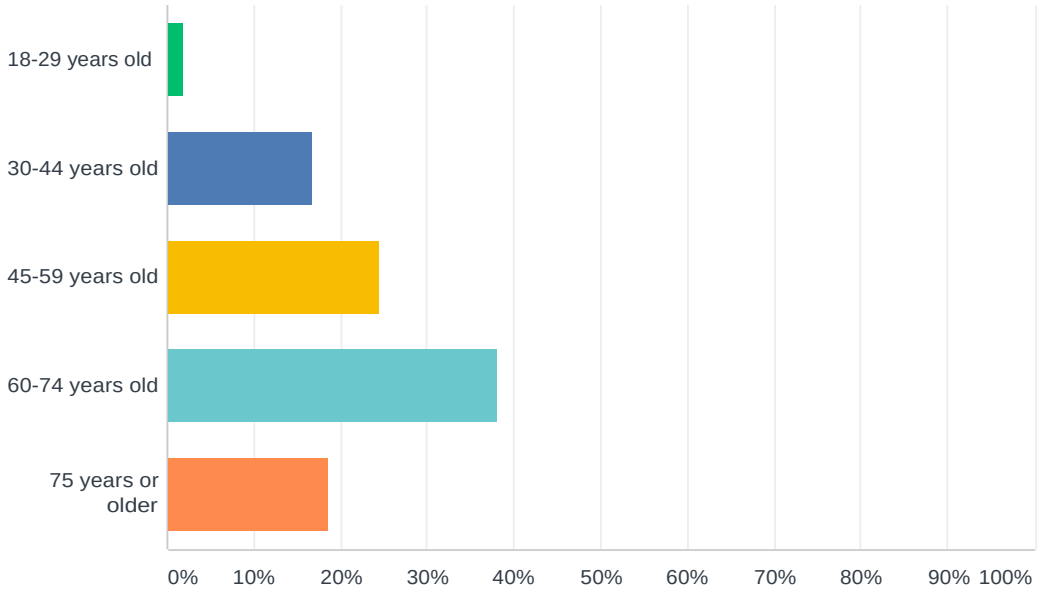
C15


Installed aerators on...
Installed LED lighting to...
Installed programmable...
Installed compact...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Yes
No, but I would like to
No, and I have no interest in it
I don't know
(no label)

	YES	NO, BUT I WOULD LIKE TO	NO, AND I HAVE NO INTEREST IN IT	I DON'T KNOW	(NO LABEL)	TOTAL
Obtained an “energy audit” from a trained professional to identify opportunities for energy efficiency improvements.	12.00% 18	43.33% 65	28.00% 42	12.00% 18	4.67% 7	150
Replace older windows with energy efficient ones	45.39% 69	38.82% 59	9.87% 15	4.61% 7	1.32% 2	152
Wrapped water heater with insulation (or hot-water heater blanket)	25.17% 36	40.56% 58	20.98% 30	9.79% 14	3.50% 5	143
Added additional insulation in attic, walls, and or flooring	42.95% 64	36.24% 54	14.09% 21	6.04% 9	0.67% 1	149
Installed high-efficiency water heater	48.30% 71	36.05% 53	8.16% 12	6.80% 10	0.68% 1	147
Installed high-efficiency HVAC (or furnace) unit	48.99% 73	26.85% 40	12.08% 18	9.40% 14	2.68% 4	149
Caulked/added weather stripping to seal windows, doors, and ducts	67.76% 103	23.03% 35	6.58% 10	2.63% 4	0.00% 0	152
Installed aerators on faucets and shower heads to reduce the use of hot water	58.82% 90	17.65% 27	16.34% 25	7.19% 11	0.00% 0	153
Installed LED lighting to replace incandescent lighting	63.95% 94	17.01% 25	12.93% 19	5.44% 8	0.68% 1	147
Installed programmable thermostats	57.78% 78	13.33% 18	25.19% 34	2.96% 4	0.74% 1	135
Installed compact florescent lighting (CFL) to replace incandescent lighting	68.21% 103	8.61% 13	13.91% 21	8.61% 13	0.66% 1	151

Q11 What is your age?

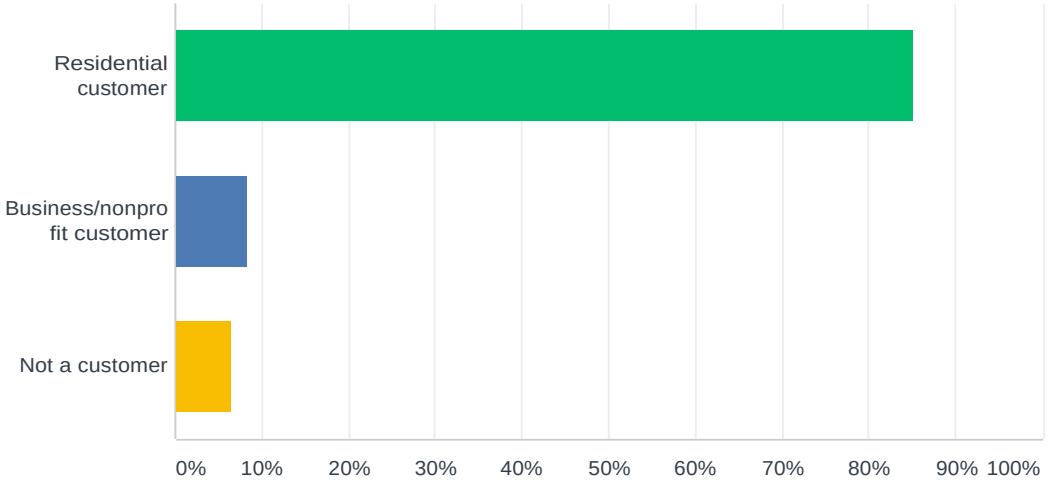
Answered: 155 Skipped: 14



ANSWER CHOICES	RESPONSES	
18-29 years old	1.94%	3
30-44 years old	16.77%	26
45-59 years old	24.52%	38
60-74 years old	38.06%	59
75 years or older	18.71%	29
TOTAL		155

Q12 Are you a current customer of the L'Anse Village electric utility (check all that apply)?

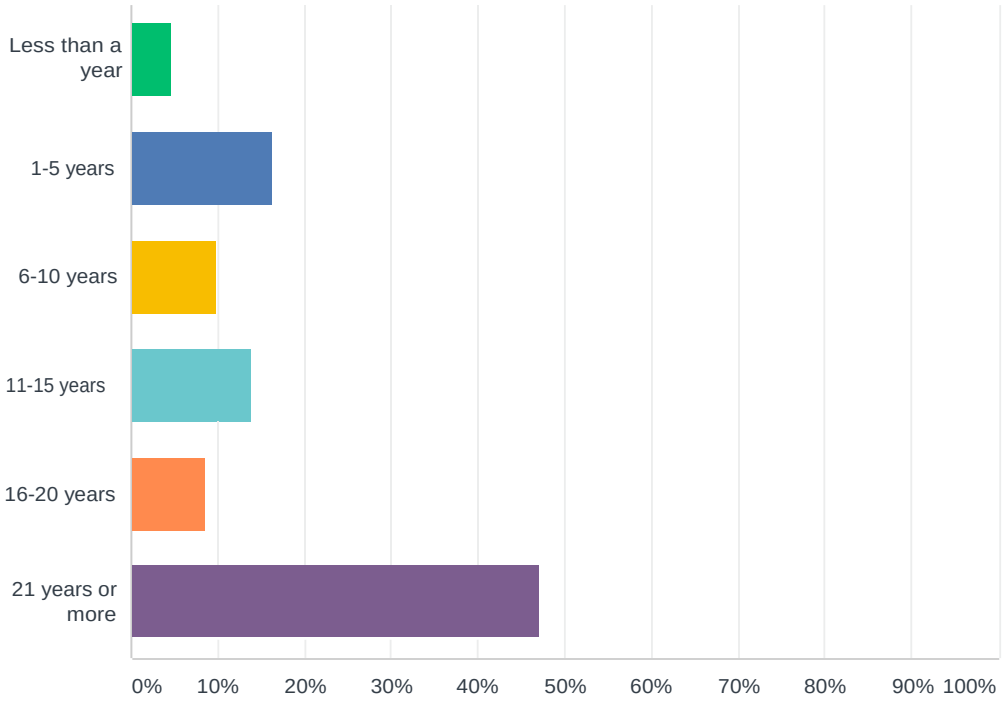
Answered: 154 Skipped: 15



ANSWER CHOICES	RESPONSES	
Residential customer	85.06%	131
Business/nonprofit customer	8.44%	13
Not a customer	6.49%	10
Total Respondents: 154		

Q13 How long have you lived (or owned property/business) in L'Anse?

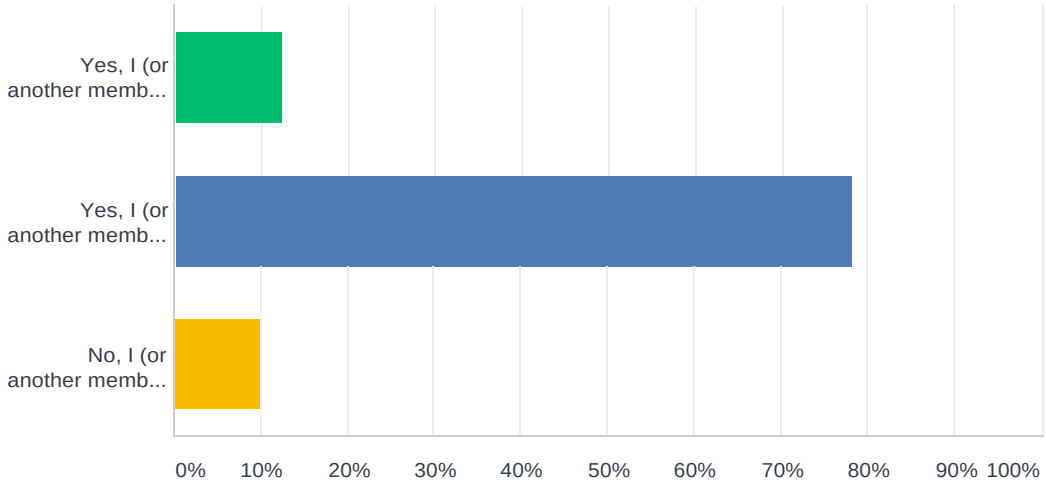
Answered: 153 Skipped: 16



ANSWER CHOICES	RESPONSES	
Less than a year	4.58%	7
1-5 years	16.34%	25
6-10 years	9.80%	15
11-15 years	13.73%	21
16-20 years	8.50%	13
21 years or more	47.06%	72
TOTAL		153

Q14 Do you currently own the property referenced in the previous question?

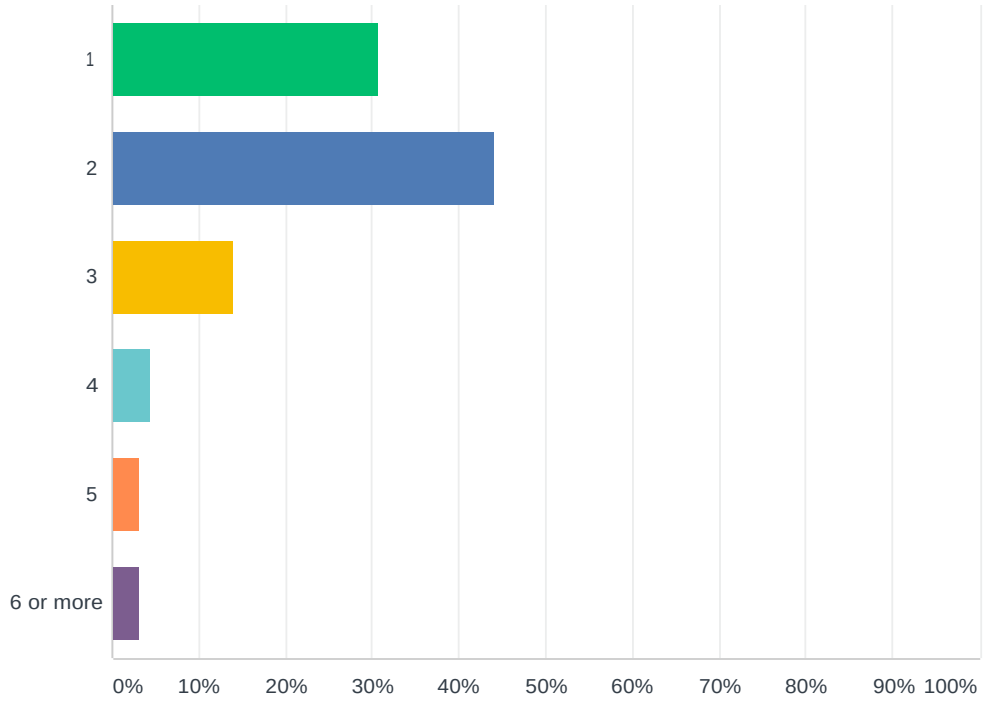
Answered: 146 Skipped: 23



ANSWER CHOICES	RESPONSES	
Yes, I (or another member of my household) own this property, but I live elsewhere most of the year	12.33%	18
Yes, I (or another member of my household) own this property and it is my usual residence/business	78.08%	114
No, I (or another member of my household) rent this property	9.59%	14
TOTAL		146

Q15 How many live in your household?

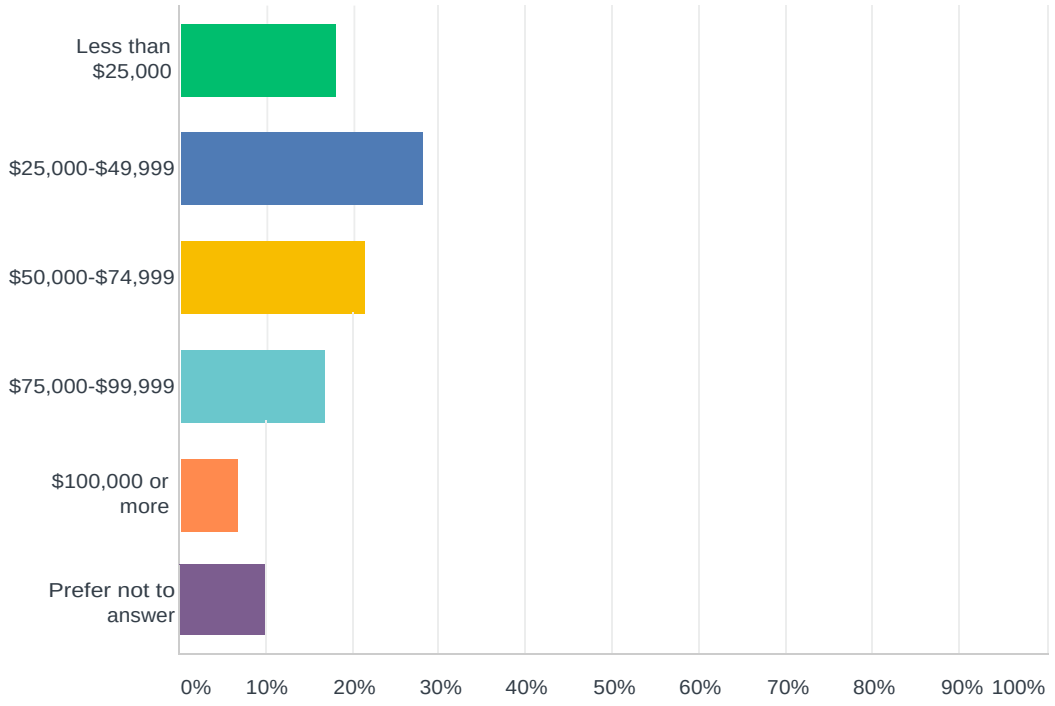
Answered: 156 Skipped: 13



ANSWER CHOICES	RESPONSES	
1	30.77%	48
2	44.23%	69
3	14.10%	22
4	4.49%	7
5	3.21%	5
6 or more	3.21%	5
TOTAL		156

Q16 Which of the following categories represents your household's typical yearly total income?

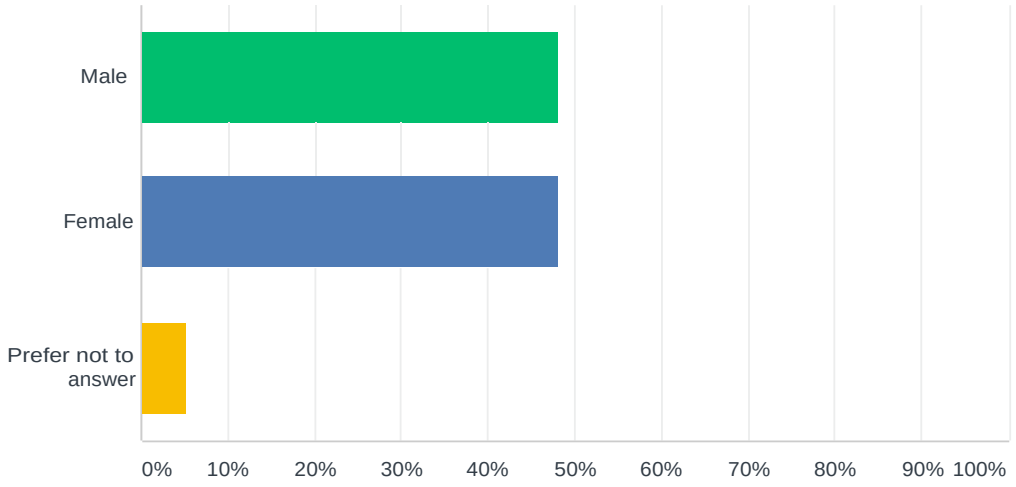
Answered: 150 Skipped: 19



ANSWER CHOICES	RESPONSES	
Less than $25,000	18.00%	27
$25,000-$49,999	28.00%	42
$50,000-$74,999	21.33%	32
$75,000-$99,999	16.67%	25
$100,000 or more	6.67%	10
Prefer not to answer	9.33%	14
TOTAL		150

Q17 Are you:

Answered: 152 Skipped: 17



ANSWER CHOICES	RESPONSES	
Male	46.71%	71
Female	48.03%	73
Prefer not to answer	5.26%	8
TOTAL		152

Appendix D: Interview Results

L'Anse Community Solar Feasibility Study
Project Report: Key Informant Interviews

Emily Prehoda, Environmental and Energy Policy PhD Program, Michigan Tech University
Richelle Winkler, Associate Professor of Sociology and Demography, Michigan Tech University

August 25, 2017

Introduction

This report summarizes the process and results of a set of key informant interviews in the L'Anse, Michigan area conducted by Emily Prehoda at Michigan Technological University in summer 2017. Emily worked as a representative of the Upper Peninsula Solar Technical Assistance and Research Team (UPSTART), which includes the Village of L'Anse, Western Upper Peninsula Planning & Development Region (WUPPDR), WPPI Energy, and Michigan Technological University. UPSTART is evaluating the social and economic feasibility of implementing a community solar project in L'Anse.

The purpose of this specific interview project was to gain insight and understanding into how L'Anse area community members feel about the possibility of beginning a community solar project in their village. The key questions we sought to answer were:

1- How do L'Anse residents and business owners feel about a community solar project in their community?
2- What problems/obstacles/hurdles might come up in if the Village pursues a community solar project in L'Anse?
3- What cultural, economic, social, or institutional factors could impact the success of a project?

Interviews were conducted as a way to get a general sense of what issues could arise. One interview with a KBIC tribal leader aimed to uncover lessons learned and insights that the tribe experienced through the process of recently installing a large tribal solar PV system. The interviews are not meant to be representative of the community's feelings. Rather, they are to provide the team with a sense of key issues that will need to be considered moving forward.

This report includes a brief summary of methods and results. It concludes with a discussion of implications of these findings for the project team's continuing work. Interview protocols are included in Appendixes.

Methods

Emily interviewed five stakeholders in the L'Anse community with varying backgrounds. Interviewees range from living and working in L'Anse from 1 year to about 77 years. The interviewees represented organizations whose role in the community was to improve the

community in some way through small business, health and social services, or general community relations. Interviews were conducted from June to August 2017. Interviews were audio recorded and lasted, on average, 30 minutes long. The audio files were then partially transcribed to highlight key themes or ideas surrounding the potential community solar program. One informant interview was conducted with a KBIC member. This interview served to provide information regarding solar PV installation process in the neighboring town. The interviewee provided direct knowledge and experience regarding the success and shortcomings of these previous solar PV projects.

Results

Most interviewees had some basic knowledge of solar power, recognizing that solar photovoltaic (PV) systems harness energy from sunlight and use it for electrical generation. Overall solar was considered a good investment for the individual homeowner, but interviewees saw lack of sunlight and heavy snow as a disadvantage to solar power in this area. Most interviewees also had a general understanding of what community solar entails. They were generally able to describe how community solar works, at a basic level.

Major themes that participants brought up are highlighted (in bold) and described in some context in the summary that follows. These themes are then discussed in the Implications section.

Concerns/Limitations

Participants' concerns about doing a community solar project in L'Anse were more about the local community's acceptance than about the viability of the system itself. Most interviewees discussed an **unwillingness to change**, and described this as the "culture of the community" or "the attitude of some residents." The community's **trust** in outsiders is low- so coming in and building something as third party, with no backing from the L'Anse community leaders would be difficult. The village is home to a large population of **low to moderate income** individuals who may be unable to afford the upfront cost for participating in a program like this. Therefore the program should be tailored in way to make it attractive for those individuals as well as others.

Overall Perceptions of the Project Idea

Overall the interviewees considered the Village of L'Anse community solar project to be a good idea for the community. Reasons for support included: increasing or **instilling pride in the community,** opportunity to bring young people back, increasing community education, and developing a more **sustainable** energy source. Challenges circled back to getting the community to (1) care about the electrical situation enough to seek out alternative options, (2) lowering the resistance to changing the current system they already have, and (3) trusting the project team. Stakeholders also felt that **cost** would be a huge determining factor in the success of this project. Particularly for low income individuals, allowing them to pay longer on the solar panel shares might make participation more attractive.

Most organizations were interested in further involvement in some fashion. Some might serve as a medium for communication facilitation, partnership, or just be interested in purchasing shares in the potential program.

Questions Participants Raised

- My question would be- the sun is only out here minimally, a lot of time it is gray. So does that matter? We don't have a lot of **sun days**, we have a lot of cloudy days so what does that do to the amount of energy that is produced? What about snow glare? Does that bounce more rays?
- At what point are you looking for this investment to come people? Right away?
- Or is this something that you're going to be building and this a project that is going to be completed?
- Is this an investment that I stand to lose something or is it a **guarantee gain**?
- Are they looking to try to lower the rates for people, they are looking to reduce what people are being charged, but also get a return on the investment?
- What's the approx up-front **cost**?
- Would a person have to buy a whole panel?
- Would there be an option to buy in at another time? **Optioning in or out** of the program might be a helpful recruiting tool
- How is it coming in a as **payback**? If people become reliant in the summer time on a certain amount coming in and it gets to be February and then all of a sudden that's not there, and there is an extra 30 and 40 dollars. Then you're going to get lashback from that.

Lessons from KBIC Projects

Leadership was seen as the most beneficial component to project success. This was something the KBIC project struggled with. Their leadership system responsibilities were spread out over several positions which took more time for completion along with overlap of duties. Another challenge with direct implementation was **local versus non-local labor**. Some tribal members who were involved were able to provide labor, but they lacked technical skills that directly translate to solar PV; therefore, outside contractors had to be included in the process, challenging the balance of labor and ultimately project completion. Ultimately the project has been a success due to **economic benefits, community empowerment, and energy independence**.

Summary & Implications

Respondents generally felt positively about the idea of L'Anse doing a community solar project. The interviews uncovered several important themes that the UPSTART team should consider in designing and marketing a potential community solar program.

L'Anse community members were generally seen to have an ingrained **culture that is resistant to change**. Respondents felt that this could reduce peoples' willingness to adopt community

solar. Inertia could be a real problem- people need to care enough to go out of their way to do something different. The team might couple selling shares with messages about why this is important to community members. The team might also attempt to connect community solar to ideas that locals are more familiar/experienced with and feel positively about, presumably reducing the "newness" of the idea.

Also, **building trust** in the community is a process that takes time. The team should collaborate with trusted organizations as much as possible. This is also related to the importance of leadership. Leaders need to be trusted. At the same time, roles need to be clearly identified and overlap limited.

Sun days. The idea that solar doesn't work well with the amount of cloudy winter days and snow that we receive in L'Anse area (western Upper Peninsula) needs to be clearly addressed. UPSTART will need to make clear that this does work here and show evidence to support that argument.

Economic concerns are huge. Residents will want specifics on the cost to buy into the program, the payback period, whether or not the investment is guaranteed (or is their potential for loss?), and to clearly understand the economic risks and benefits. **Costs** should be reduced as much as possible, especially for low-to-moderate income participants. **Financing** programs or no up-front cost could be really important for getting participation from lower income residents. Similarly, **flexibility** is valued—programs might be designed to have multiple options for how much to buy in, financing, transferring, and timing for opting in or out. The possibility for bringing **economic returns** is also important and attractive, but the upfront costs and details of the payback will be just as important.

Respondents liked the possibilities for **community empowerment**, local control, and energy independence associated with community solar. These are factors that the team could emphasize in marketing. They focused on local benefits and designing to increase the local returns as much as possible, including the possibility of hiring local labor.

A community solar program could be a sense of **community pride** for L'Anse. It could be seen as a leading UP community and a leading small community nationwide. For a town like L'Anse (that is a little beat down by recent and long-term job loss and historical population loss), this could be a really important factor. They need a victory. It may improve the popularity of this idea if the team can connect this project to local community and economic development—local jobs, local generation, $ circulated locally, local skills and education opportunities, etc.

Finally (but not least important), **sustainability** is important. Respondents liked that this is a sustainable, green energy and local energy source. This is something that at least some L'Anse community members will identify with and find important convincing reason to buy in.

Appendix I. Stakeholder interview questions

Review consent statement and ask if it is OK if you record.

Thank you for being willing to take the time to talk with me. Its really important to our project team to hear from community leaders, like yourself, early in this process of figuring out if it makes sense for L'Anse to move forward with a community solar project. We are really now just getting started analyzing the feasibility of the project, in terms of whether people in the L'Anse area would be interested. We'll be able to come back to you with a lot more specifics in another six months or so.

To start, I hope that you could tell me a little about yourself and your organization.

1- How long have you lived and/or worked in the Village of L'Anse?

2- One of the reasons that I wanted to talk with you is because we know that [FILL IN ORGANIZATION HERE] is an important organization in the L'Anse community. Can you describe your organization's role in the community?

   a. What are its key activities or major goals?

   b. What would you say is its range of influence? Or how does the organization impact people in the L'Anse area?

I'd like to shift now and talk about your thinking on solar PV systems in general and then we'll get to talking more specifically about a potential project with the Village of L'Anse.

1- Can you tell me about any knowledge you have of solar-powered electricity?

2- What do you think about solar powered electricity? What do you see as the advantages/disadvantages?

3- If you were to weigh the plusses and minuses of adopting solar powered electricity for your own organization or about encouraging other people or businesses to do so, what would be the key things that you would consider?

4- Have you ever heard about *community solar* systems?

If yes…

   a. Can you generally describe what you know? [don't worry, this isn't a test! ☺]
   b. Where have you heard about community solar?
   c. What do you think of community solar? [advantages/disadvantages]

Now, I'd like to tell you a little bit about the project that the Village of L'Anse is considering…

[explain what kind of project the Village is considering using bullets below…]

- It would be built in the new industrial park [explain location] and the power generated would feed into the grid.

- Customers (businesses and residential) who are served by Village of L'Anse utility would be eligible to purchase shares in the system. Those who purchase then earn returns on the $ made from the generation as it is sold to consumers.

- It won't cost customers who choose NOT to buy in any money. They will keep paying their usual rates. Rates for those who choose not to buy in won't increase due to installing this system.

- For those who do choose to participate, we are working on coming up with a plan that would allow to spread the cost of their shares out over up to a 10-year period and to finance it on-the-bill at 0% interest. So, the bill would have an extra fee that shows up. The amount would vary depending on how many shares purchased. Then, once the system is producing and selling into the grid, the bill would also have a positive balance (again depending on # of shares purchased) that is the return on investment as the system produces power and sells back into the grid.

- Only customers of Village of L'Anse utility could participate.

- Most likely ~ 50 kW project. This means its big, but not huge. We are doing a feasibility study now to help us size it to meet community interest. Ideally, it would be built to the size that people are interested in investing in and not much bigger.

- This is not a for sure thing to happen yet. The Village and their energy provider (WPPI Energy) are interested in making it happen. But, it will only go forward if we get positive results in this feasibility study. We are doing feasibility study for two reasons:

    - 1- to see of L'Anse utility customers are likely to buy shares. They won't do this if people don't want to participate.

    - 2- to determine how best to design a program that makes people want to participate and especially makes it possible for low-to-moderate income households to be able to participate.

5- Do you have any questions for me at this point about the project under consideration in L'Anse?

6- Now that you know a little more about how this potential project would work, do you think this could be a good thing for L'Anse? Why or why not?

7- What sort of opportunities do you think a community solar project like this could provide for community members?

8- What sort of challenges can you envision that might come up?

    a. Follow up: can you describe any pushback that could happen?

9- I know its hard to say without numbers in front of you (which I don't have yet), but generally speaking, do you think organizations and residents would be interested in buying in? Why or why not?

10- What do you think would be reasons that your organization (or others) might want to participate?

11- What do you think would be the greatest barriers to participating for your organization and/or others?

12- Can you think of any important things that would be important in terms of how this thing were set up (program design) that would make it more attractive for organizations and residents to participate?

    a. Follow Up: for instance, is it really important that it could be financed on-the-bill with long term payment? Would it be helpful to get a statement from the utility noting how much of the organization's electric demand is offset by the solar purchased (so that a business could say that XX% of their electricity is provided by solar)? Other little things that would make it more or less attractive?

13- Would your organization be interested in being further involved as we work through the program design possibilities and/or would you be interested in being contacted to consider purchasing shares once all the specifics are figured out if it looks like they are going to go forward with the project?

14- Is there anything else that you think I should know? Or do you have any questions for me?

15- We are hosting a Community Forum August 22 at the L'Anse Area school cafeteria at 6:30-8:00pm. We will provide some basic information about the project idea in a short presentation. Then, we'll spend most of the time hearing feedback in small groups. Everyone is invited. We would like to get as many people there as possible, and we would especially like to invite you and anyone else that you think might be interested. Would you be willing to help us get the word out about this meeting if we forward you some flyers and a promotional email? Are there any other channels of communication that you would suggest?

16- We will host another community meeting in early December where we share initial results of the feasibility study and ask for more feedback. We can let you know more when it gets closer.

THANK YOU so much for taking the time to talk with me and sharing your insights.

Appendix II. Tribal stakeholder interview questions

Review consent statement and ask if it is OK if you record.

1- To start, could you tell me more about your role and responsibilities with the tribe?
   a. And specifically, how have you been involved with solar PV systems?

I hope we can talk some about experiences that the tribe has had with solar PV systems, so that we might be able to learn from your experiences. Then, I have a few questions about the L'Anse community solar project idea more specifically.

2- Does the tribe have an official position on solar energy or on energy use or systems more generally?

3- Can you describe the goals behind the tribe's decision to install solar PV systems?

4- Can you tell me more about these systems (how many? Where? How big?)
   a. How successful would you say these projects have been?
   b. What do you think has worked best?
   c. What were the most challenging parts of getting the project(s) done? What problems did you come across?
   d. What have been the benefits?
   e. What would you do differently?
   f. Who did you work with to complete the solar PV systems? Would you recommend (or not) working with any of these organizations?
   g. What were the funding sources?

5- Is the tribe considering any more renewable energy projects or expanding on existing ones? Why or why not?

Now, shifting to talk about the project that the Village of L'Anse is considering…
[explain what kind of project the Village is considering using bullets below…]

- Most likely ~ 50 kW project. We are doing a feasibility study now to help us size it to meet community interest.
- It would be built in the new industrial park [explain location] and the power generated would feed into the grid.
- Customers (businesses and residential) who are served by Village of L'Anse utility would be eligible to purchase shares in the system. Those who purchase then earn returns on the $ made from the generation as it is sold to consumers.
- It won't cost customers who choose NOT to buy in any money. They will keep paying their usual rates. Rates for those who choose not to buy in won't increase due to installing this system.
- For those who do choose to participate, we are working on coming up with a plan that would allow to spread the cost of their shares out over up to a 10-year period and to finance it on-the-bill at 0% interest. So, the bill would have an extra fee that shows up. The amount would vary depending on how many shares purchased. Then, once the system is producing and selling into the grid, the bill would also have a positive balance (again depending on # of shares purchased) that is the return on investment as the system produces power and sells back into the grid.

- Only customers of Village of L'Anse utility could participate.

- This is not a for sure thing to happen yet. The Village and their energy provider (WPPI Energy) are interested in making it happen. But, it will only go forward if we get positive results in this feasibility study. We are doing feasibility study for two reasons:

    - 1- to see of L'Anse utility customers are likely to buy shares. They won't do this if people don't want to participate.

    - 2- to determine how best to design a program that makes people want to participate and especially makes it possible for low-to-moderate income households to be able to participate.

6- Not that you can speak for everyone, but do you have a sense for how tribal community members might feel about the Village of L'Anse starting a community solar project?

7- I understand that the tribe doesn't own many buildings within the Village limits and that most tribal members don't live within the Village. But, does KBOCC have some property in the Village and so might be interested in participating? Are there any other tribal properties you can think of that might want to participate, since they are L'Anse utility customers? Are there specific other people that I should talk to about these opportunities?

8- And with regards to tribal members living in L'Anse, there must be some. We were looking at the census data from 2010 and it shows that about 9% of L'Anse village residents identified themselves as having at least some American Indian ethnicity. We would like to be sure that we include these people as we think about how to design the program and to get their feedback. We would certainly like to invite them to the Community Forum we are hosting Aug 22 and to be sure we communicate with them. Can you think of any good communication stream that might help us reach this group?

9- Do you have a sense for things that might encourage or discourage tribal members who are L'Anse customers from participating in a program like this? How might we design it so that it is attractive?

10- What sort of partnership (if any) would you envision in working with UPSTART (current group of partners) to move forward with a L'Anse project? Would you like to be involved more or not? And if so, how?
    a. Following up with that, can you describe what you'd like to see from UPSTART to have a successful partnership?

11- Is there anything else that you think I should know? Or do you have any questions for me?

12- We are hosting a Community Forum August 22 at the L'Anse Area school cafeteria at 6:30-8:00pm. We will give folks some basic information about this project idea in a short presentation. Then, we'll spend most of the time hearing feedback in small groups. Everyone is invited. We would like to get as many people there as possible, and we would especially like to invite you and any other KBIC members that might be interested. Would you be willing to help us get the word out about this meeting if we forward you some flyers and a promotional email? Are there any other channels of communication that you would suggest?

13- We will host another community meeting in early December where we share initial results of the feasibility study and ask for additional feedback. We can let you know more about that when it gets

closer. We will also be compiling the results of our feasibility study into a short report and into a book chapter. These should be ready in Spring 2018. Would you like us to share those documents with you?

THANK YOU so much for taking the time to talk with me and sharing your insights.

Appendix E: Community Meeting Results (August 22, 2017)

L'Anse Community Solar Feasibility Study
Project Report: Focus Group Discussions

Emily Prehoda, Environmental and Energy Policy PhD Program, Michigan Tech University
Richelle Winkler, Associate Professor of Sociology and Demography, Michigan Tech University

September 8, 2017

Introduction

This report summarizes the process and results of a set of focus group discussions which were held at a community meeting at the L'Anse Area Schools building August 22, 2017. The meeting was hosted by the Upper Peninsula Solar Technical Assistance and Research Team (UPSTART), which includes the Village of L'Anse, Western Upper Peninsula Planning & Development Region (WUPPDR), WPPI Energy, and Michigan Technological University. UPSTART is evaluating the social and economic feasibility of implementing a community solar project in L'Anse.

The purposes of this meeting and associated focus group discussion were to share some basic information about community solar and a proposed community solar project in the Village of L'Anse with the broader community and to gain insight and understanding into how L'Anse area community members feel about the possibility of beginning a community solar project in their village and to uncover issues and considerations that could impact project adoption in L'Anse. We wanted to give community members an opportunity to learn about the project idea, to discuss it among themselves, and to share feedback about the idea with the project team.

This report includes a brief summary of methods and results. It concludes with a discussion of implications of these findings for the project team's continuing work.

The findings presented here are not based on a representative sample of L'Anse community members. It is highly likely that residents and businesses owners who are already interested in solar/community solar would be more likely to attend a meeting such as this. Also, we know that some of the participants who attended the meeting are not L'Anse utility customers (reside outside Village limits) but are people who are particularly interested in energy issues. For these reasons, the ideas presented here should be considered as important ideas and themes that will likely continue to come up, but not as representative of the general attitudes of the community as a whole.

Methods

The community meeting was held at the L'Anse Area Schools Cafetorium on Tuesday, August 22nd from 6:30 pm to 8:00 pm. Emily Prehoda and Richelle Winkler (social scientists at Michigan Technological University) facilitated the meeting. Forty-nine participants attended the event. The participants sat in small groups of 5-6 people each at round and square tables spread

around the large room. The facilitators began the meeting with a 15 minute presentation about community solar and the proposed project in L'Anse. They then answered questions raised by the community.

Focus groups discussions lasted for 60 minutes following the initial presentation. The facilitators posed the following questions to the small groups and asked them to discuss each for about 5 minutes within their table. Also seated at each table was a member of the research team whose primary purpose was to take notes on the discussion. These notes were collected by the team and form the basis of data that were later coded for key themes. After discussing all five questions, the facilitators asked participants to publicly summarize key points they had discussed and wrote these important points on flip charts at the front of the room. These key points that were recorded form a second set of data collected at the meeting for analysis.

The five questions posed to participants were:

1- What do you like about the idea of L'Anse doing a community solar project?
2- What concerns you most about this idea or makes you think it might not work?
3- Would you purchase shares? And why or why not?
4- What are some things that the team needs to consider in designing the program?
5- Do you think that L'Anse should move forward with this? Why or why not?

Prehoda read through all of the notes collected at the August 22 meeting and coded them for key themes that emerged.

Results

Overall participants were positive about the Village of L'Anse moving forward with a community solar project. Most participants were excited about the potential project and saw it as a positive development for the community, but some were also skeptical about some aspects of the idea. Participants raised several important considerations and that could impact program design and project adoption in the local community.

Major themes that participants brought up are highlighted (in bold) and described in some context in the summary that follows. These themes are then discussed in the summary section.

Question 1: What do you like about the idea of L'Anse doing a community solar project?

L'Anse community members liked that the potential community solar project could help create a more sustainable energy program. It would allow L'Anse to be on the cutting edge of decreasing their **environmental** footprint. L'Anse can pave the way to greener energy sources through this type of **forward thinking**. By owning a more sustainable electric power source, L'Anse will have **local** accountability- i.e. by having local maintenance but also by steering away from unhealthy biomass burning. Benefits will be **economic** in nature. This type of investment will potentially add value to property. The benefits will also stay local, will be more **inclusive** of low to moderate income individuals, and ultimately will allow the community to come together and increase local pride. Additionally, if this project is a success, community members would like to see this project inspire and be replicated in other small towns. Additionally, due to the nature of community solar (optional purchase of shares) community members maintain **freedom to choose**.

Question 2: What concerns you most about this idea or makes you think it might not work?

Participants raised several concerns primarily with the soft design components. They were interested in several specific aspects of how the program would be designed and carried out. These included:

- Transfer of shares- Can they be bought and sold and under what conditions? If you were moving out of Village limits, could you easily get rid of your shares and be compensated fairly? What if someone who owns shares passes away? Could they "will" the shares to descendants or non-profits?
- Dibs on Purchasing- Who is allowed to purchase shares, when, and how many can be purchased. What if a few organizations or individuals buy up all the shares before others have a chance?
- Shareholder Liability – Participants were concerned with any liability that would come with purchasing a share in the community solar program. Community members felt that if by purchasing a share they might become responsible for any negative impacts or harm caused by this project. Will the Village take on this responsibility?
- Financing- Participants expressed interest in multiple finance models. Some felt that it will be really important to offer multiple options for payment and financing, as some may want to pay up front while others will need an easy financing option. It would be nice if the financing option could help people to improve their credit (count for their credit score). Would there be some kind of a bonus or reward for those who purchase shares early?
- Payback Period- The payback period was considered long to pay off initial investment. There was also some question about the length of the term of service (20 years, 25 years, etc.)- why would the credits stop at this point?
- Overall total participation- First, community members were concerned there would not be enough overall interest in the program, making it a waste of time. Alternatively, linked to the above "dibs on purchase" concern, community members felt the program would be sold out, before allowing all community members a chance to buy into the program. Will there be a possibility for expansion to accommodate all interest?

Participants did raise some concerns about technical design components, but these were less important to the participants. They generally accepted that community solar is technically feasible in the L'Anse area. The "technical" concerns that were raised included several things that might be considered part of the soft program design as well. These include the following:

- Size of the System- The community members were concerned with how the system size would be determined. Linked to this, some felt the system might be too small, while still others felt the system would be too big. These concerns were based on the perceived interest in the program. Will the size be determined based on energy needs of the community? Estimation of participants following the feasibility study? And will the system be tailored to that interest?
- Maintenance- Who would be responsible for maintaining the system? Could local workers be used? Who would pay for maintenance?

- Vandalism- Participants noted that a similarly sized solar system in a neighboring community had experienced some vandalism. What would be done to reduce vandalism? And who would take care of it if it occurred?
- Selling the Energy- participants raised the question of whether we could guarantee that WPPI Energy would purchase the power generated, how this relates to the size of the system, and whether the Village would have control to sell the power generated to any other entity if they should so choose.

Question 3: If this happens, do you think you will buy one or more shares for your home/business? Why or why not?

The main answer was yes. Some groups felt they would buy into this program as it increases the **community empowerment and pride.** When asked why or why not, focus groups tended to provide answers with "depending on…". They steered back to concerns they had with designing the program. **Transferability** was still the overarching concern found with this question. A couple incentives were offered as possibility to program design: if program managers offered a discount to community members who purchased shares by a certain date; a hard commitment from WPPI to pay back for power generated. This program would appeal to community members, especially **low-mod income** if it were in place to help them build their credit back.

Those that answered no look at the program versus other "better" investments/returns on investment. For example, the returns with this program are not as high as investing in **energy efficiency**, such as insulation. Alternatively, some seemed to **lack trust** in the local government and local energy firms. These groups were concerned with the hidden benefits both the village and WPPI Energy would receive from this program.

Question 4: What are some things that the team really needs to consider in designing the program?

The following is a list of considerations that the UPSTART partners should include when designing a program for this community. Again the considerations were focused more on the soft design components including financing, transferability, and local/community benefits:

- Transferability- defining this clearly
- What to do if the shares sell out?
- Selling shares to non-profit entities
- Default on payback
- Defining how much a credit will be versus how much it is worth: dollar value that panels produce and then sell back to the grid
- Utilizing local workforce for maintenance
- Making it affordable for the community
- Multiple financing/payment options- depending on your economic/income status
- Trackable energy usage
- Utilizing some sort of trade system: i.e. work for shares

Additionally, there is a question of different **consumer classes**. Some groups wondered how residential and business consumers would perceive benefits differently. The team should quantify the **true value** of environmental costs and benefits.

Question 5: Do you think that L'Anse should move forward with this? Why or why not?

Ultimately "yes". People generally felt that they need more information regarding program design prior to committing to participating, but they were interested in seeing the project move forward and were glad to be involved in the discussion and opportunity. Community is more likely to be engaged if the ownership is kept **local**. This type of project helps the village look to the future energy needs and other environmental concerns. The village can help transition to other **alternative energy strategies** with this initial project.

Summary & Implications:

Respondents generally were positive about the idea of moving forward with the community solar project. They liked the idea for a combination of reasons primarily combining environmental benefits with economic returns and local empowerment. It's the wedding of these three major themes that seems most important as some participants will be more or less interested in each, but the possibility of bringing them all together seems like a real win.

The focus group discussions uncovered several important themes that the UPSTART team should consider in designing and marketing a potential community solar program.

Local Control & Community Empowerment

Community members really liked the idea of keeping the community solar ownership at a local level. This allows them to **think locally, but acting globally** to reduce their overall carbon footprint. The team should consider keeping as much of the process local as possible to keep this positive thinking surrounding the project. Local can help in multiple ways from producing the power locally, to having local accountability and a locally specific program design, to keeping the benefits local, to serving as a source of local pride and an opportunity for local education. Keeping the work local is important to the community. All of this increases community empowerment and pride in the community. The idea that L'Anse could be a leader for other communities and on the "cutting edge" is important. It could be seen as a leading UP community and a leading small community nationwide.

Another aspect of local control is having the freedom to choose whether to participate or not and to talk to local people who are designing the program. It is important for people to have this be a volunteer option that they are involved in the choosing of.

Economics and Financing

The possibility of making an economic return on investment is important. While some were concerned about the payback time, most were attracted to the idea of making money from something like this. The UPSTART team needs to consider designing different financing options that are attractive to multiple economic class residents in the Village. Offering good financing models will be critical to the projects' success.

Fairness and Inclusivity

Community members felt it was extremely important that we continue to strive to find a program that especially includes low to moderate income individuals. This is directly related to the need for financing above. The team also might think creatively about other ways to involve lower income residents, including options for increasing credit rating or work-for-shares programs.

Participants also raised fairness concerns about who gets to buy shares, how many, and when. There was concern that a few individuals or businesses might buy out all the shares before others have an opportunity. The team should consider a sales model that provides an initial opportunity to the full community before opening up to purchase larger numbers of shares.

Environmental Sustainability

Because solar PV technology produces fewer emissions, residents were excited about the prospect of producing energy from a source that is **environmentally sound.** This was even more prevalent when community members compared the potential project to the L'Anse biomass plant. Highlighting the environmental benefits of solar PV will help to make the project more attractive to residents.

By investing in a solar PV system L'Anse residents can begin to help reduce the village's environmental footprint. Many community members liked this way of **forward thinking**. By doing something like this, community members could feel good about participating in a program that works to improve future generation's environment.

Some also expressed interest in alternative options for investing in reducing footprints and alternative source of energy. For instance, **energy efficiency** is also important and both reduces environmental impact and provides faster economic returns. The team should consider combining community solar with more comprehensive strategies for reducing energy consumption and/or other alternative energy options beyond community solar.

Trust

The UPSTART team should provide transparency about benefits to residents and local government as there appeared to be a lack of **trust** regarding the motives for completing a project like this.

Guarantees

Participants want some guarantees on their return. They want details on transferability to knowing they can sell. The team should strive to make this as easy as possible and to facilitate it. They also wonder if there is a guarantee return on investment and a guarantee from WPPI to purchase the power. This is also related to responsibility. Who will take care of things like liability, maintenance, and vandalism?

The team should consider clarifying these points and communicating them in marketing language.

Appendix F: "Applicability of Federal and State Income Tax Credits in the Case of the L'Anse Community Solar Project" by Zoé Ketola & Jon Pyles

This section is intended to provide general information about government subsidies available for community solar farm development. Therefore, the material contained herein is for information purposes only and does not constitute legal or tax advice. If the parties involved decide to proceed with the project, we encourage them to seek independent legal and tax representation and council.

As of the writing of this report, several federal and state government subsidies may help offset the project costs. Federal investment tax credit is available under sections 25D of the Internal Revenue Code (IRC) (residential solar tax credit) and under section 48 of the IRC. The section 25D tax credit affords individual taxpayers a federal income tax credit equal to 30% of qualified solar electric property expenditures [1]. The credit is generally claimed by the individual who purchases a rooftop solar system for their own residence [1]. Per a private letter ruling issued by the Internal Revenue Service (IRS), section 25D was authorized for a community solar project. Although the application of the private letter ruling is limited to the taxpayer regarding which it was issued, it nonetheless provides a glimpse of the IRS' position on the issue [1].

In L'Anse's project, the, section 25D might not provide sufficient help as it is premised on the ownership of solar modules by individual taxpayers. Ownership of solar modules, even with the help of financing, may be cost-prohibitive for many of the area's residents[2].

Instead, section 48 of the IRC can be used, which allows a business, as opposed to an individual, to claim the 30% credit [1]. As long as the project is properly structured and the commercial owner qualifies for the credit, it would potentially be able to pass the savings down to subscribers of the community solar project. This option allows the eligible costs of the project to be spread more equally throughout the community. However, structuring the project to take advantage of the section 48 credit is likely to increase transactional costs and decrease the value of the credit.

A renewable energy certificate (REC) "is a market-based instrument that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation" [3]. When a renewable energy source produces a megawatt hour (MWh) of electricity, a REC is created. RECs are used to signify the use of renewable energy. They can be used by the producer, or sold to an interested party. Because of the interconnected nature of the power grid, it is impossible to tell where the energy we consume was generated. This is where RECs come in. When a business or individual owns a REC and wishes to claim that they consumed the involved renewable power, they "retire" it [4,5]. The REC is then unsellable and unclaimable by another party.

RECs sold support businesses and communities that offer renewable energy sources. While they do not have a set price, RECs are valuable commodities that can support additional expansion and keep rates low [6]. REC values are often based on a state's Renewable Portfolio Standard (RPS), which defines a state's goals for renewable energy generation [7]. In 2016, Michigan increased its RPS from 10 to 15% by 2021. In addition to this, for each MWh produced by solar in Michigan, the owner is given an additional 2 Michigan Incentive Renewable Energy

Credits (MIRECs) [8]. Any renewable source gains an additional ⅛ MIREC if produced by technologies other than wind during peak demand times [8].

In the case of L'Anse, there are two state of Michigan tax incentives that may be applicable. Renewable Energy Renaissance Zones (RERZ) are an option overseen by the Michigan Economic Development Corporation (MEDC). These renaissance zones qualify for tax abatement, and do not pay the Michigan Business Tax and/or Corporate Income Tax , state education tax, personal and real property taxes, and local income taxes where applicable [9]. The tax relief afforded to RERZ can be had for up to fifteen years, and is generally phased out over the last three years of the zone's classification in 25% increments [10]. The state of Michigan currently allows for up to fifteen RERZ, and as of 2011 there were eight qualified zones which were largely in the Lower Peninsula [10]. Should the community be interested, they could begin the process and attempt to be classified as a RERZ in order to take advantage of the tax relief.

Another option is the Nonrefundable Business Activity Tax Credit. This option allows for businesses involved in alternative energy development, research, and manufacturing to claim a nonrefundable credit from the Michigan business tax. The taxpayer and business are required to be certified by the Michigan Next Energy Authority in order to be eligible for the credit [11]. The credit is then equal to "(1) the amount by which a business's "tax liability attributable to qualified business activity" for the tax year exceeds the business's "baseline tax liability attributable to qualified business activity," or (2) 10% of the amount by which the business's "adjusted qualified business activity" performed in Michigan, outside of a "Renaissance Zone," for a tax year exceeds such activity for the 2001 tax year," whichever is of lesser value [11]. This option conflicts with the aforementioned RERZ option, as it cannot be claimed when business activity takes place inside of a RERZ. However, it is a viable option either while L'Anse is attempting to gain RERZ classification, or long term if the village is not interested in applying for RERZ classification.

In conclusion, a community solar farm in L'Anse would most likely fall under section 48, giving a developer a 30% tax credit on qualified solar electric property expenditures[1]. Utilizing section 48 would allow the cost to be overtaken by a developer, whereas section 25D would put the initial costs directly onto the community [1]. As mentioned, 25D is less applicable within L'Anse as most residents would not be able to afford the initial upfront costs [2]. Section 48 allows the developer to distribute the costs and benefits throughout the community, making the project more accessible. In addition, any RECs produced by the project could be sold to further benefit the community [4]. Moving beyond the initial federal income tax credit, within the state of Michigan there are further options to cut costs. These options include applying to be classified as a Renewable Energy Renaissance Zone, or claiming the Nonrefundable Business Activity Tax Credit[9,10,11]. Classification as a Renewable Energy Renaissance Zone would allow the community to benefit from significant tax abatement, whereas claiming the Nonrefundable Business Activity Tax Credit would allow the community to benefit from a varied amount of tax relief[9,10,11]. In conclusion, the options available may improve the accessibility of the project in a way that benefits the community as a whole.

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Appendix G: Financial Model Options Information

Option 1: Full Cost Upfront with Monthly Credits (25 years)

Table G1: *Spreadsheet Readout for Financial Option 1*

Option 1: Full cost upfront with monthly credits (25 years)		
Total System Cost ($)	175000	
Tax Credit (%)	15	-Assume Village gets 15% and Developer gets 15%
Savings from Tax Credit ($)	26250	
Estimated Installation Cost ($)	148750	
Levelized Cost ($)	0.05	
Value of Solar ($)	0.095	
Expected kWh generated for (50, 100)kW System	56925	113850
Total Number of Shares	400	
Cost per Share ($)	375.00	
Total Revenue from Shares ($)	150000	Revenue equals or exceeds cost
Program Length (years, months)	25	300
Annual Credits for Total System	10815.75	
Annual Credits per Share ($)	27.04	
Estimated Payback Period (years)	13.87	Shareholders earn money
Years Profitable for Program	11.13	
Savings per Share Over 25 Years ($)	300.98	
Village Loan Length (years, months)	10	120
Monthly Village Loan Payment ($)	1239.58	
Annual Village Loan Payment ($)	14875	

Option 2: Full Cost Upfront with Monthly Credits (25 years, 5 years and 20 years)

Table G2: *Spreadsheet Readout for Financial Option 2*

Option 2: Full cost upfront with monthly credits (25 years, 5 years and 20 years)		
Total System Cost ($)	175000	
Tax Credit (%)	15	-Assume Village gets 15% and Developer gets 15%
Savings from Tax Credit ($)	26250	
Estimated Installation Cost ($)	148750	
Levelized Cost ($)	0.05	
Value of Solar ($)	0.095	
Expected kWh generated for (50, 100)kW System	56925	113850
Total Number of Shares	400	
Percentage of Total Shares in Shorter Program (%)	7.5	
Number of Shares in Shorter Program	30	
Number of Shares in Full Program	370	
Number of Shares in Recontracted Program	30	
Cost per Share in Full Program ($)	375.00	
Cost per Share in Shorter Program ($)	110.00	
Cost per Share in Recontracted Program ($)	300.00	
Total Revenue from Full & Shorter Shares ($)	142050	
Total Revenue from Recontracted Shares ($)	9000	
Total Revenue from Total Shares ($)	151050	Revenue equals or exceeds cost
Full Program Length (years, months)	25	300
Shorter Program Length (years, months)	5	60
Recontracted Program Length (years, months)	20	240
Annual Credits for Total System	10815.75	
Annual Credits per Share ($)	27.04	
Estimated Payback Period Full Program (years)	13.87	Shareholders earn money
Years Profitable for Full Program	11.13	

Savings per Share Over Full Program ($)	300.98	
Estimated Payback Period Shorter Program (years)	4.07	Shareholders earn money
Years Profitable for Shorter Program	0.93	
Savings per Share Over Shorter Program ($)	25.20	
Estimated Payback Period Recontracted Program (years)	11.09	Shareholders earn money
Years Profitable for Recontracted Program	8.91	
Savings per Share Over Recontracted Program ($)	240.79	
Estimated Payback Period Shorter + Recontracted Programs (years)	15.16	Shareholders earn money
Years Profitable for Shorter + Recontracted Programs	9.84	
Saving per Share Over Shorter + Recontracted Programs ($)	265.98	
Are the Shorter + Recontracted Programs Cheaper than Full Program?	No	
Is the Recontracted Program Cheaper than Full Program?	No	
Village Loan Length (years, months)	10	120
Monthly Village Loan Payment ($)	1239.58	Village can afford all loan payments
Annual Village Loan Payment ($)	14875	Village can afford all loan payments

Table G3: *Spreadsheet Readout for Compounding Revenue of Financial Option 2*

	Year	Revenue at Start of Year ($)	Months Able to Pay in Year	Revenue at End of Year ($)	Village Able to Pay Loan?	
	2018	142050	114.59	127175	Yes	
	2019	127175	102.59	112300	Yes	
	2020	112300	90.59	97425	Yes	
	2021	97425	78.59	82550	Yes	
Short Program Ends -->	2022	82550	66.59	67675	Yes	<-- Short Program Ends
Recontracted Program Starts -->	2023	76675.00	61.86	61800.00	Yes	<-- Recontracted Program Starts
	2024	61800.00	49.86	46925.00	Yes	
	2025	46925.00	37.86	32050.00	Yes	
	2026	32050.00	25.86	17175.00	Yes	
Final Year of Loan -->	2027	17175.00	13.86	2300.00	Yes	<-- Final Year of Loan
	2028	2300.00	1.86	-12575.00	No	
	2029	-12575.00	-10.14	-27450.00	No	
	2030	-27450.00	-22.14	-42325.00	No	
	2031	-42325.00	-34.14	-57200.00	No	
	2032	-57200.00	-46.14	-72075.00	No	
	2033	-72075.00	-58.14	-86950.00	No	
	2034	-86950.00	-70.14	-101825.00	No	
	2035	-101825.00	-82.14	-116700.00	No	
	2036	-116700.00	-94.14	-131575.00	No	
	2037	-131575.00	-106.14	-146450.00	No	
	2038	-146450.00	-118.14	-161325.00	No	
	2039	-161325.00	-130.14	-176200.00	No	
	2040	-176200.00	-142.14	-191075.00	No	
	2041	-191075.00	-154.14	-205950.00	No	
	2042	-205950.00	-166.14	-220825.00	No	

Option 3: Down Payment Plus Monthly Payment

Table G4: *Spreadsheet Readout for Financial Option 3*

Option 3: Down payment plus monthly payment (25 years)		
Total System Cost ($)	175000	
Tax Credit (%)	15	-Assume Village gets 15% and Developer gets 15%
Savings from Tax Credit ($)	26250	
Estimated Installation Cost ($)	148750	
Levelized Cost ($)	0.05	
Value of Solar ($)	0.095	
Expected kWh generated for (50, 100)kW System	56925	113850
Total Number of Shares	400	
Program Length (years, months)	25	300
Total Cost per Share ($)	375.00	
Down payment per Share ($)	25.00	
Monthly Payment per Share ($)	3.00	
Down payment Revenue for Program ($)	10000	
Monthly Revenue from Program ($)	1200	
Number of Months Revenue Collected to Pay for One Month	1.03	
Months Revenue Generated in Year	11.62	
Annual Credits for Total System	10815.75	
Annual Credits per Share ($)	27.04	
Estimated Payback Period (years)	14.24	
Years Profitable for Program	10.76	Shareholders earn money
Savings per Share for Program ($)	290.98	
Village Loan Length (years, months)	10	120
Monthly Village Loan Payment ($)	1239.58	Village can afford all loan payments
Annual Village Loan Payment ($)	14875	Village can afford all loan payments

Table G5: *Spreadsheet Readout for Compounding Revenue for Financial Option 3*

	Year	Total Revenue at Start of Year ($)	Months Able to Pay Loan at Start of Year	Months Able to Pay in Year	Revenue at End of Year ($)	Village Able to Pay Loan	
	2018	10000.00	8.07	19.68	9220.84	Yes	
	2019	9220.84	7.44	19.06	8466.56	Yes	
	2020	8466.56	6.83	18.45	7736.37	Yes	
	2021	7736.37	6.24	17.86	7029.49	Yes	
	2022	7029.49	5.67	17.29	6345.19	Yes	
	2023	6345.19	5.12	16.74	5682.74	Yes	
	2024	5682.74	4.58	16.20	5041.44	Yes	
	2025	5041.44	4.07	15.68	4420.62	Yes	
	2026	4420.62	3.57	15.18	3819.63	Yes	
Final Year of Loan -->	2027	3819.63	3.08	14.70	3237.82	Yes	<-- Final Year of Loan
	2028	3237.82	2.61	2.61	-11265.57	No	
	2029	-11265.57	-9.09	-9.09	-25305.83	No	
	2030	-25305.83	-20.41	-20.41	-38897.74	No	
	2031	-38897.74	-31.38	-31.38	-52055.63	No	
	2032	-52055.63	-41.99	-41.99	-64793.35	No	
	2033	-64793.35	-52.27	-52.27	-77124.32	No	
	2034	-77124.32	-62.22	-62.22	-89061.52	No	
	2035	-89061.52	-71.85	-71.85	-100617.54	No	
	2036	-100617.54	-81.17	-81.17	-111804.55	No	
	2037	-111804.55	-90.20	-90.20	-122634.32	No	
	2038	-122634.32	-98.93	-98.93	-133118.26	No	
	2039	-133118.26	-107.39	-107.39	-143267.43	No	
	2040	-143267.43	-115.58	-115.58	-153092.50	No	
	2041	-153092.50	-123.50	-123.50	-162603.83	No	
	2042	-162603.83	-131.18	-131.18	-171811.44	No	

Option 4: No Upfront Cost, Pay Monthly Over 10 or 25 Years (25 years)

Table G6: *Spreadsheet Readout for Financial Option 4*

Option 4: No upfront cost, pay monthly over 10 or 25 years (25 years)		
Total System Cost ($)	175000	
Tax Credit (%)	15	-Assume Village gets 15% and Developer gets 15%
Savings from Tax Credit ($)	26250	
Estimated Installation Cost ($)	148750	
Levelized Cost ($)	0.05	
Value of Solar ($)	0.08	
Expected kWh generated for (50, 100)kW System	56925	113850
Total Number of Shares	400	
Payment Period (years, months)	10	120
Lengthened Payment Period (years, months)	25	300
Number of Shares in 10 year Program	325	
Number of Shares in 25 year Program	75	
Cost per Share per Month for 10 years ($)	3.50	
Cost per Share per Month for 25 years ($)	1.50	
Monthly Revenue for First 10 years ($)	1250.00	
Monthly Revenue for Remaining 15 years ($)	112.50	
Total Revenue from Shares ($)	170250	Revenue equals or exceeds cost
Program Length (years, months)	25	300
Annual Credits for Total System	10815.75	
Annual Credits per Share ($)	27.04	
Estimated Payback Period for 10 year Program (years)	15.53	Shareholders earn money
Years Profitable for 10 year Program	9.47	
Savings per Share Over 25 Years for 10 year Program ($)	255.98	
Estimated Payback Period for 25 year Program (years)	16.64	Shareholders earn money
Years Profitable for 25 year Program	8.36	

Savings per Share Over 25 Years for 25 year Program ($)	225.98	
Village Loan Length (years, months)	10	120
Monthly Village Loan Payment ($)	1239.58	Village can afford all loan payments
Annual Village Loan Payment ($)	14875	Village can afford all loan payments

Table G7: *Spreadsheet Readout for Compounding Revenue for Financial Option 4*

	Year	Balance at Beginning of Year ($)	Months Able to Pay Initially	Monthly Revenue	Months Able to Pay Throughout Year	Balance at End of Year ($)	Village Able to Pay Loan	
	2018	0	0	1250.00	12.10	125	Yes	
	2019	125	0.10	1250.00	12.20	250	Yes	
	2020	250	0.20	1250.00	12.30	375	Yes	
	2021	375	0.30	1250.00	12.40	500	Yes	
	2022	500	0.40	1250.00	12.50	625	Yes	
	2023	625	0.50	1250.00	12.61	750	Yes	
	2024	750	0.61	1250.00	12.71	875	Yes	
	2025	875	0.71	1250.00	12.81	1000	Yes	
	2026	1000	0.81	1250.00	12.91	1125	Yes	
Final Year of Loan -->	2027	1125	0.91	1250.00	13.01	1250	Yes	<-- Final Year of Loan
	2028	1250	1.01	112.5	2.10	-12275	No	
	2029	-12275	-9.90	112.50	-8.81	-25800	No	
	2030	-25800	-20.81	112.50	-19.72	-39325	No	
	2031	-39325	-31.72	112.50	-30.64	-52850	No	
	2032	-52850	-42.64	112.50	-41.55	-66375	No	
	2033	-66375	-53.55	112.50	-52.46	-79900	No	
	2034	-79900	-64.46	112.50	-63.37	-93425	No	
	2035	-93425	-75.37	112.50	-74.28	-106950	No	
	2036	-106950	-86.28	112.50	-85.19	-120475	No	
	2037	-120475	-97.19	112.50	-96.10	-134000	No	
	2038	-134000	-108.10	112.50	-107.01	-147525	No	
	2039	-147525	-119.01	112.50	-117.92	-161050	No	
	2040	-161050	-129.92	112.50	-128.83	-174575	No	
	2041	-174575	-140.83	112.50	-139.74	-188100	No	
	2042	-188100	-151.74	112.50	-150.66	-201625	No	