MOTUS SOLARIS
SOLAR ROADMAP

OVERCOMING BARRIERS FOR RESIDENTIAL SOLAR ENERGY INSTALLATIONS

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Each community is unique in many ways. Our study focused on the Sunshine Coast of British Columbia and highlighted the Sunshine Coast Community Solar Association's initiative of implementing residential solar energy on a large scale. This roadmap is designed to encourage residential solar installation in your community and to provide examples of how to address some of the barriers you may encounter.

Motus Solaris is Latin for 'Solar Movement'. Our hope is that this roadmap helps you start your own solar movement in your own backyard!

> "Here Comes the Sun!
>
> - The Beatles

Abstract

The idea of ‘green’ energy is not new, but for many homeowners in British Columbia (BC), installing any form of ‘green' energy in their home or business is still unattainable due to high costs and ‘red tape’. Providing a step-by-step guide to local municipalities and providing information for viable financing options will address and help to overcome these barriers. This will further enable and encourage residents and developers within a community, making ‘green’ energy finally within reach.

Although there are many forms of sustainable energy, our area of focus is aimed specifically at solar energy, to aid the efforts of the Sunshine Coast Community Solar Association (SCCSA) in Gibsons, BC. Our aim is to outline issues surrounding solar energy and how to overcome them in a simple step-by-step process. Through our research, we will show how communities around the world have successfully implemented solar energy policies and practices and how we addressed these issues on the Sunshine Coast. Key elements such as sun exposure, median incomes, and an understanding of prior environmental policies and regulations in these municipalities will be of particular interest. These best practices will be identified in areas of regional comparisons, grants and incentives, and financing options.

SOLAR ROADMAP

A focus on these key areas help to foster a community solar movement.

1. Property Viability

The first step in creating a community solar movement is to determine your community's irradiation and sun exposure. Partnering with local solar installers will help to determine your community's viability and help navigate the market.

2. Policies & Incentives

Every municipality has a unique community plan. A solar initiative may compliment your city's vision which will increase local government support.

3. Personal Financing

Forming relationships with your local credit unions and community development foundations can increase funding options. As financing is the biggest barrier for residents, this is critical to your success.

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Introduction

Throughout the world, particularly across Europe, the 'green' energy sector has grown dramatically. This is driven by limited access to 'clean' energy sources, such as hydroelectricity, and higher energy prices which has propelled research and development of all forms of renewable energy.

From purchasing equipment, to installation and permitting fees, the implementation process of 'green' energy is daunting. In BC, outdated regulations are quickly evolving to cater to new, alternative forms of energy. We can hope that in the future, new provincial and federal grants can help to further reduce costs for these systems.

In BC, access to relatively low-cost hydroelectricity, which is generally accepted as a 'clean' energy source, has hindered the drive to seek alternative forms of energy. As BC's population grows at an expected rate of 40% over the next twenty years, the demand for energy will also increase. Having alternative forms of energy reduces the need for new expensive mega dams which destroy habitats of indigenous peoples and wildlife. The need for constructing new dams could be significantly reduced through the subsidization and incentivizing of solar power, thereby saving sensitive ecosystems and farmland as well as billions of government dollars to fund these projects (Hunter, 2015; BC Hydro, 2015).

Furthering the delayed adoption of 'green' energy in BC is the misconception that solar power cannot be as efficient as it is in countries that have higher levels of sun exposure. However, the limited technology that once made this belief true is no longer the case. Looking to countries with similar or lower annual **insolation** rates, it can be seen that the implementation of solar photovoltaic (PV) systems can be financially viable.

Although there are issues affecting solar energy implementation in BC, homeowners' desire for solar energy is not one of them.

Looking to progressive countries who have provided financial support to residents in the form of solar energy subsidies and reduced permitting costs, gives the promise of a 'sunnier' Canadian future.

Insolation is the rate of delivery of direct solar radiation per unit of the Earth's surface.

We will show through best practices of similar municipalities to the Sunshine Coast of BC, that solar energy installation is pursued more readily by homeowners when the process is simplified. Policies and incentives that promote and encourage these projects ease the adoption of residential solar energy.

With the newly elected Liberal Government in Canada comes promises of specific solutions to counteract climate change through renewable energy. From a $2 billion Low Carbon Economy Trust which will fund carbon reduction projects, to shifting subsidies away from fossil fuels towards clean technology, and an additional $100 million in annual investments for clean tech development, the solar energy sector will be sure to see an increase in support (CanSIA, 2015).

Regional Comparison

Finding similar regions that have successfully implemented residential solar installations is helpful to show stakeholders who may be able to contribute in your community's solar movement.

Many cities throughout Canada and the United States have adopted policies in accordance to the guidelines from the Solar America Board for Codes and Practices. The Society Promoting Environmental Conservation (SPEC) recommends that Vancouver and BC also adopt these guidelines which will "expedite the permitting process for installations that meet specific requirements." For example, if a solar PV panel does not exceed five pounds per square foot, then a building permit or earthquake assessment (which are both currently required in Vancouver) are not necessary as the structure will not be compromised (Solar ABCS, 2015). This expedited permitting process saves valuable time and money which has shown to be a successful motivator when considering the installation of solar PV systems.

Currently, SPEC is "working with the City of Vancouver to adopt better policies for solar energy installations" and are "asking them to look at best practices in other cities and adopt permitting policies similar to the cities of Toronto, Calgary, Seattle, and San Jose for [PV] solar energy systems" (SPEC, 2015). They are further recommending that the cost of electrical permits for PV systems in the City of Vancouver should be reduced.

Regarding the higher than average permitting costs in Vancouver, it is important to note that while British Columbia abides by the British Columbia Building Codes (BCBC) guidelines, Vancouver has their own building code standards and by-laws which further restrict solar PV installations. As the Sunshine Coast and all other municipalities outside of Vancouver are required to follow the codes set in place by the BCBC, they are not hindered by some of the financial costs that residents of Vancouver are. Vancouver's permitting and fees are considerably higher due to stringent structural engineering costs and building permits, etc.

The following table shows permitting cost comparisons for solar PV installations in BC (Canada), Vancouver (Canada), Toronto (Canada), Calgary (Canada), Seattle (United States of America (US)), San Jose (US) and Germany.

Table 1: Comparison of Permitting Costs for Solar PV Systems (15 kW or less).

Fee Type	City						
	Vancouver (CAD)	BC (CAD)	Toronto (CAD)	Calgary (CAD)	Seattle (USD)	San Jose (USD)	Germany (EUR)
Electrical Permit	$824	*Varies	$282	$108 (base fee) + $9.98/$1000 of construction value	$206.50- $254	Combined permit fee (see total)	€0
Admin Fee for electrical permit	$60	$62	$60	$0	$64	$0	€0
Building Permit	$225	$0	$0	$0	$0	$0	€0
Admin Fee for building permit	$120	$0	$0	$0	$0	$0	€0
Structural Engineer	$800	$0	$0	$0	$0	$0	€0
Development Permit	$0 - $500	$0	$0	$0	$0	$0	€0
Total	**$2,029**	***$1,221 (max.)**	**$342**	****$548.25 (max.)**	**$270.50 - $318**	*****$310**	**€0**

(SPEC, n.d.), (BC Safety Authority Fee Schedule: Electrical, 2015), (City of Calgary, 2015), (City of Seattle, 2015), & (City of San Jose, 2015)

**Set by BC Safety Authority. Permit fees are based on total construction value. Solar PV panel installs valued between:*
- *$5001 - $10,000 have a permit price of $366 ($377 in 2016)*
- *$10,001 - $20,000 have a permit price of $599 ($617 in 2016)*
- *$20,001 - $35,000 have a permit price of $902 ($929 in 2016)*
- *$35,001 - $50,000 have a permit price of $1,221 ($1,258 in 2016).*

***According to the Canadian Solar Industries Association (CanSIA), in 2012 the average installed price for grid connected solar PV panel installation was $2.80/Watt. Maximum allowable for residential application is now 100kW for Net Metering in BC. Based on this, the maximum installed price for a residential application would be $42,000. For this example, the maximum permit fee would be $419.16 + $21.09 Safety Code Council Fee + the base electrical fee $108 = $548.25 (City of Calgary, 2015).*

****Average permit fee for single family residential solar system, flush mount on rooftop, not exceeding 5 pounds per square foot.*

The cities in the above table were chosen because of their similar:

- Annual Global Horizontal Irradiance (GHI/year)
- Daily Global Horizontal Irradiance (GHI/day)
- Purchasing Power Parity (PPP)

GHI is a form of measurement that is used to extrapolate the potential irradiance in a specific region. Solar irradiation is the power per unit area produced by the sun in the form of electromagnetic radiation. GHI takes into consideration "solar radiation that comes in a straight line from the direction of the sun at its current position in the sky… [and what] has been scattered by molecules and particles in the atmosphere and comes equally from all directions" (3TIER, 2015).

PPP is a way to objectively compare a country's ability to afford different goods and services which essentially means evaluating their 'Gross Domestic Product' (GDP) per capita (a nation's annual monetary value of all goods and services produced, divided by its population) and converting their currency to an international standard, making them directly comparable. Table 2 shows a comparison of purchasing power values.

	City							
	Vancouver	BC	Sunshine Coast	Toronto	Calgary	Seattle	San Jose	Germany
GHI per year	1100 - 1300	1100 - 1500	1100 - 1500	1400 - 1500	1100 - 1300	1100 - 1300	1800 - 2000	1000 - 1300
GHI per day	3.0 - 3.5	3.0 - 4.1	3.0 - 3.8	3.8 - 4.1	3.0 - 3.5	3.0 - 3.5	4.9 - 5.5	2.7 - 3.5
GDP per Capita (2011 PPP $)	$40,381	$40,382	$40,382	$40,383	$40,384	$49,382	$49,854	$40,980

Table 2: Comparison of Purchasing Power Parity values (Solargis, 2015) & (United Nations, 2013)

As shown, Germany, Seattle, and Calgary represent the closest in comparison to the Sunshine Coast region in terms of GHI and PPP. These locations could prove to have good models to emulate.

Looking to Germany as an example of solar energy production who, on average, experiences less sun annually than Canada, broke a huge milestone in solar energy production. In June 2014, Germany's "solar power production peaked at 23.1 GW, which equaled 50.6 percent of their total electricity demand" (Aziz, 2014). By comparison, BC which has similar solar insolation rates, has the potential to produce the majority of our power via solar PV systems (Solargis, 2015).

Critics argue that Germany is a wealthier country and therefore has a greater ability to subsidize green energy enabling them to reach these record breaking solar energy production levels. However, although Germany's Gross Domestic Product (GDP) per capita is 2.2 times that of Canada's, according to TheGlobalEconomy.com, analyzing a country's ability to purchase over another's by comparing their GDP per capita may be misleading. GDP "may not capture other aspects of the quality of life such as crime, education, environmental quality, etc." They suggest a country's purchasing power parity (PPP) may be more suitable in capturing their ability to subsidize green energy.

Additionally, the "Human Development Index (HDI) published by the UN is a composite measure that accounts for a broader set of development factors beyond Gross Domestic Product (GDP)" (The Global Economy, 2015). When comparing the HDI scores of Germany (9.11) to Canada (9.02), we can see that Canada and Germany are comparable when analyzing financial power (United Nations, 2013). This also enables us to look to Germany as an example of how solar energy can similarly work in Canada and BC through progressive subsidization programs.

"50.6% of Germany's energy consumption is from solar energy."

Grants and Incentives

The financial costs associated with the installation of a solar energy system is one of the biggest barriers to address. Governmental support increases the return on investment through providing funds that do not have to be repaid.

British Columbia's Solar Incentives

At this time there are no provincial grants or funds for residents of BC to install solar PV systems; however, cost savings can be realized in various ways (BC Sustainable Energy Association, 2015).

In BC, renewable energy equipment is exempt from provincial sales tax (PST) (Province of BC, 2013). There are also potential grants and opportunities that exist for start-up projects. One example of this is the *Exceptional Opportunities Fund* hosted by innovations.ca. This grant applies only to initial start-up costs regarding solar PV installations which could potentially be utilized by the Sunshine Coast Community Solar Association (SCCSA) in future programs.

BC's main energy provider, BC Hydro, has formed a Standing Offer Program (SOP) which purchases excess energy from small energy producers (1 to 15 MWh) at a varying rate (102.06 - 111.56 cents) (BC Hydro, 2016). Net metering, the most common system in place, consists of operations up to 100 kWh at a rate of 9.99cents/kWh (BC Hydro, 2014). This encompasses the vast majority of residential solar PV applications as a form of incentive, but it pales in comparison to other regions (CanSIA, 2015; BC Hydro, 2015). Another option in BC is the Micro SOP which is offered to residents producing 100 kWh to 1MW. This program is still being developed and as such, no current prices are available (BC Hydro, 2014). Rates will vary based on the size of a renewable energy production system.

Within BC, there is a Clean Energy Business Fund available to First Nations peoples. The First Nations Clean Energy Business Fund promotes Aboriginal participation in clean energy production within their territories and treaty areas. A maximum of $50,000/applicant is available to assist with feasibility studies and community energy planning (Province of BC, 2015).

Toronto's Solar Incentives

Toronto is Canada's leader for solar PV energy production which may be due to Ontario's MicroFIT program. Through this program, a feed-in-tariff (FIT) for residential systems of 10 kW or less pays solar PV energy producers a guaranteed 39.6 cents per kW for 20 years (Ontario Ministry of Energy, 2015). This is in stark contrast to the current BC rate of 9.99 cents/kWh. The benefit of a FIT system versus a net metering system is that the former pays the same price for generation as is charged for consumption, whereas a tariff pays more for the generation than for consumption.

While there are no grants or rebates for residents to invest in solar PV systems, there are incentives of up to $500,000 for community based energy projects. This money is to be used to set up arrays, grids, or to outfit public buildings with solar PV (Ontario Ministry of Energy, 2015).

Additionally, the Aboriginal Renewable Energy Fund is available to Aboriginal Community projects ranging from 10 kW to 500 kW to apply to the FIT Program and to assist with development costs for projects with a FIT contract up to $100,000 per project. "These costs include resource assessments, legal services, engineering designs and regulatory approvals" (Ontario, 2015).

Calgary's Solar Incentives

In 2008, the Micro-Generation regulation was passed allowing for Albertans to create their own energy and sell it back to the grid, similar to that of a net metering process (Alberta Utilities Commission, 2013). The categorization of a 'small' micro-generation instalment is 150kW or less, drastically reducing limitations for independent power producers (CanSIA, 2011).

Because Alberta's energy suppliers are independent systems operators (ISO), they can offer competitive rates which are determined by the production capacity of a system. Rates fluctuate hourly to match supply and demand, therefore so do the micro generation prices (Alberta Energy Providers, 2015).

Albertans have many options regarding the way that they are able to generate electricity. Low regulation requirements and permitting fees are a draw for the installation of solar PV (City of Calgary, 2015).

Seattle solar Incentives

Seattle provides attractive policies and incentives for residents to invest in solar PV systems. Incentives include a low average permitting fee (e.g. a permit for a 5 kW system costs $294) and all solar energy systems are eligible for tax credits. Federally, the "tax credit[s] [can range up to] 30 percent of the system cost (the total of installation and materials)" (Solar Energy Systems, 2015). The state also offers sales tax breaks that depend on the size and year of the installation, which range from partial to full tax exemption.

Their net metering system depends on where parts of the system have been manufactured, promoting the local solar energy industry. The different rates are:

- $0.15 /kWh for a PV system manufactured outside of Washington
- $0.18 /kWh for a PV system with an inverter manufactured in Washington
- $0.36 / kWh for a PV system with modules manufactured in Washington
- $0.54 / kWh for a PV system with an inverter and modules manufactured in Washington (Solar Energy Systems, 2015).

These prices show how greatly consumers can benefit from supporting their local solar industry.

San Jose's solar Incentives

San Jose has passed legislation that enables property owners to finance energy upgrades by attaching financing to their property tax bill through a program called Property Assessed Clean Energy Financing. This allows approved property owners to defer upfront costs while simultaneously lowering energy bills. The upgrade investment is amortizable with the property tax and the remaining debt is transferable to new owners if the property is ever sold or can be paid off at that time. This means short-term property owners can also benefit through this program (Energy and Water Efficiency Upgrade Financing).

Comparing Regions

Areas which have high solar installations rates can be used as an example for the future of BC.

Germany's strong influence to divest from nuclear energy and invest in alternative renewable resources makes it a global leader in solar energy production. Their annual sun exposure is similar to BC with only 1000 to 1300 hours of sunlight per year, making it an ideal comparative model for Vancouver and the Sunshine Coast. Germany remains a leader with no permitting fees, making a strong case for their high uptake of solar energy installations.

Toronto's MicroFIT program, incentives, and low cost energy permits, have created a high solar PV system installation rate.

Alberta's low permitting fees have encouraged a high uptake of solar PV system installations. With the available options to produce energy, compared to BC Hydro's monopoly on the BC energy sector, Albertans have a choice in who supplies their power which leads to competitive energy rates.

Seattle has similar levels of sun exposure and weather elements to the Sunshine Coast. Their low permitting fees and their tax credits make their system a prime candidate to emulate.

With low permitting fees, San Jose provides a vision of what is possible through invested legislation change of the 'green' energy movement.

Financing

The financial costs associated with the installation of a solar energy system is one of the biggest barriers to address. Finding ways to reduce these costs can be the tipping point for your community's solar movement.

Within North America there are many ways individuals and groups can gain the necessary finances to install solar systems on their homes and community buildings. The following financing options are prevalent in the US and are also utilized in Canada (Energy Informative, 2014).

Solar leasing and power purchasing agreements (PPA) are similar ways to address solar financing. They involve having one party buy, install, and maintain a solar array for another party in exchange for a monthly payment. Solar leasing is a flat predetermined rate for the solar services. In comparison, the price for a PPA is determined by how much power the system produces (Energy Informative, 2014).

Avoiding third party ownership of systems is a benefit to the profitability of, or savings you will realize from, a system. Attaining financing through home equity loans or energy efficient mortgages is a great way to take advantage of banks and credit unions who are trying to keep up with the growing need for sustainable practices within their industry. By financing solar installations through home equity loans "homeowners [can] save more in electricity bills compared to their loan payments from the start" (Energy Informative, 2014).

Some financial institutions in BC that offer "green" loans are: VanCity, ScotiaBank, and the Royal Bank of Canada (RBC). Their loans are typically associated with energy efficient upgrades or any upgrades that reduce homeowners' carbon footprint. VanCity clearly lays out their specifications. They will grant loans to people who are attempting to "reduce [their] energy demands" (VanCity, 2016). Local Credit Unions can also be a great source for low-interest loans as they are committed to the development of their community.

VanCity provides flexible loans ranging from $3,500 to $50,000 at a rate of prime+1% for up to 15 years. They also have advisors that work with you to find the best way for your household to reduce your collective energy consumption and carbon footprint (VanCity Home Energy™ Loan: Financing your smart choices., 2016).

ScotiaBank has a similar lending scheme through their Scotia EcoEnergy Financing program. This program is specifically for installing renewable energy, not energy efficient upgrades. They will finance "up to 100% of start-up costs … including equipment, installation, and grid hook-up" (Scotia EcoEnergy Financing, 2016). They have three different term options that go up to 15 years.

RBC has equal loan options for energy retrofits, upgrades, and efficiencies. They offer both floating-rate term loans, where the interest rate is based on their prime rate, and fixed-rate term loans, where interest is fixed based on a premium that is more than base rate. These loans are 10 year and 5 year terms respectively (Solar Panel Financing, 2016).

The Canada Mortgage and Housing Corporation (CMHC) offers a rebate for homebuyers that put less than 20% down on their home and need a CMHC insurance premium. When making energy efficiency upgrades on a new home one can apply to get "a 10% mortgage loan insurance premium refund" (My Mortgage, 2016). To be eligible for the refund, the house must be assessed before any renovations take place and then assessed again afterwards to ensure that the upgrades increase the home's energy rating sufficiently (My Mortgage, 2016).

After presenting these financing options to the **Sunshine Coast Credit Union** (SCCU), they were eager to create a competitive financing option for their members who are wishing to participate in the SCCSA's solar bulk buy. In the future, they are planning on offering a range of financing options to address all forms of green technology. These options may include financing for rain catchment systems, electric vehicles, building upgrades, and more.

Municipal Lending

One program that has been wildly successful across the US (such as San Jose, as previously mentioned) is the Property Assesses Clean Energy Program (PACE). It allows homeowners to loan money from their municipality and pay it back through their property taxes over a 15 to 20 year period. Unlike home equity loans, PACE doesn't reduce the equity of the property or home. This is because upon selling the property, the tax liability is passed on to the new owners.

Other Methods

Peer-to-Peer Lending

Peer-to-peer lending (P2P) is becoming increasingly popular as more online facilitation platforms emerge. This form of lending matches borrowers and lenders around the world. Because there is no form of collateral, the interest rates are higher for borrowers and the return-on-investment for lenders is lower (Energy Informative, 2014).

In the US, Solar Mosaic Inc. provides a platform for P2P investing, averaging a 4-7% return over a 20 year loan. This form of solar financing is becoming increasingly more popular as borrowers can install PV systems with no money down, instantly reducing their monthly utility bill, and lenders can invest in a sustainable future for their community (Bloomberg, 2015).

Crowdfunding

Crowdfunding or crowdsourcing is another form of P2P lending, although it can be organized as either a donation or lending platform. This form of lending could become a viable option as the sustainability trend gains momentum in mainstream society; more people want to feel good about "doing good" so they invest in good causes. For example, participants of the Great Climate Race signed up for a 10k or 2.5k run or walk that helped fundraise $20,000 for solar energy projects in BC (Great Climate Race Renewable Energy Fund, 2015).

Current barriers to this form of lending include higher minimum investment capital to be eligible, required higher net worth, increased risk of borrowers defaulting, and lack of general education on crowdfunding. Through Solar Bonds, companies such as SolarCity are now insuring loans and higher rates of return than traditional loans which should help increase this form of funding by additionally reducing risk (Ashoka, 2015).

Shared Solar

Shared solar in the form of a solar co-operative is already being planned by the SCCSA. Shared solar is normally used by individuals who are unable to install solar arrays on their property. These arrays "can be both community or third-party owned" (Energy Informative, 2014).

This model has been executed across North America. For example, Colorado Community Solar Collective provides a platform for individuals to participate in and benefit from a wide variety of solar investment opportunities. It allows its users to view live power production from individual shared solar models (Clean Energy Collective, 2015).

Another way of gaining financing for a shared solar array is through an investment co-op. An investment co-op is like a mutual fund; individuals invest capital and receive dividends based on the productivity of the investment. In the case of a solar array, the dividends would be payments equal to the energy savings realized by the houses or businesses attached to the array.

One successful investment co-op (non-solar based) in Vancouver, BC is Knives and Forks (K&F). The membership fee is $100 and individual investment shares are $2400. This provides enough capital for K&F to invest in two local food ventures per year. Loans given out to companies range from $35,000 to $50,000 and payments are made back to the co-op when the borrower becomes cash-flow positive (Lee, 2015).

Group Purchase

In the summer of 2015, EOS Eco-Energy, a not-for-profit organization from New Brunswick, successfully organized a solar PV system bulk buy that was extremely similar to the one planned by the SCCSA. They partnered with their local Credit Union to supplement any finances needed by homeowners in the region. Setting hard deadlines seemed to be a highly effective tool for getting homeowners to commit to the bulk buy (Weldon, 2015).

Another example of group purchasing integrates a bulk buy approach with solar leasing. Four large companies, 3M, Cisco, Kimberly-Clark, and the National Geographic Society, along with the World Wildlife Fund, coordinated a bulk buy of solar PV systems for employees and their family and friends in Canada and the US. Participants were not required to put any money down and instead, were able to pay a monthly fee. This fee was 35% lower than the national average for solar leasing and 50% lower than average electrical utility rates (World Wildlife Fund, 2014).

There are many levels to the solar energy industry and navigating through the purchase of a solar bulk buy can be difficult. For example, system installers typically purchase panels, inverters, and any other supplies from their supplier, who in turn receive their materials from another company. Going around the installers to attain bulk products may hinder future relationships between residents and their local electricians. This makes it hard to maintain and upgrade systems in the future, and also creates a loss for these local entrepreneurs. For bulk purchases to work smoothly, dialogue and partnerships must be established with local electricians and installers (Hutchings, personal communication, February 10, 2016).

Primary Research

It is critical to build strategic relationships with key stakeholders in your region. Understanding different perspectives will help the success of your solar movement. Additionally, the information they provide may guide you in directions that will make more efficient use of your time and energy.

Primary research was conducted utilizing two methods: an online survey and face-to-face informal interviews. Our goal was to find the barriers of residents, installers, and municipal governments pertaining to solar PV installations within the Sunshine Coast and BC.

Online Survey

Participants

43 Sunshine Coast residents ranging in age from 37 to 73 years old, voluntarily responded to on online survey, all of which were contacted through the SCCSA's email list. These respondents had previously voiced interest in solar energy and represented the population that had interest or knowledge in renewable energy and therefore are not representative of the entire population of Sunshine Coast residents. Future surveys should be sent out to a broader range of residents through avenues such as local papers and social media.

Materials

Respondents were sent an electronic link to an online survey developed on an online server, *Survey Monkey*.

Procedure

Respondents were informed that responses to our survey would be anonymous and used to aid the SCCSA's solar initiatives. They were given three weeks to respond, after which the results were collected to collate and analyze.

Interviews

Participants

Informal interviews were conducted with multiple key stakeholders regarding the SCCSA's proposed solar PV bulk buy. Interviewees were selected based on their knowledge of government policy structure, the renewable energy industry in BC, or their involvement in solar PV installations (Appendix A). Their opinions do not represent all government officials in BC, however, the information they provided was used to help shape the survey in Appendix B.

Materials

All interviews were structured informally, however, discussions were focused around specific barriers regarding the uptake of solar energy within their communities or organizations.

Procedures

All team members of Motus Solaris were present for every interview, with one team member recording notes. The interviews were allowed to flow organically to prevent limiting information the interviewee was able to provide. After each interview, the meeting notes were uploaded to a shared online folder for all team members to review. The answers were then compared and analyzed.

Outside Sources

Procedures

Online survey questions were guided by previously administered surveys such as: San Diego's Solar Survey and Census Demographics (City of San Diego, 2009) (Data Surfer, 2015) which were found online. These sources were used to compare potential barriers for community members of the Sunshine Coast regarding solar PV installations.

Results

To further understand the common barriers of your community, it is important to collect data to support or refute claims made by individuals. This will help focus attention to areas of actual barriers, helping to ignite your community solar movement.

After completing our analysis, we found that the data collected from the survey supports our initial assumptions. These results will be highlighted in this section along with other demographic and solar electric interest/literacy aspects.

General Results

There were 43 completed responses to the survey sent out to Sunshine Coast residents. These respondents' ages ranged from 37 to 73 with an average age of 60. Most are married or common law and/or retired, with the majority living in Sechelt and Robert's Creek. The following graph illustrates the length of homeownership within the sample group:

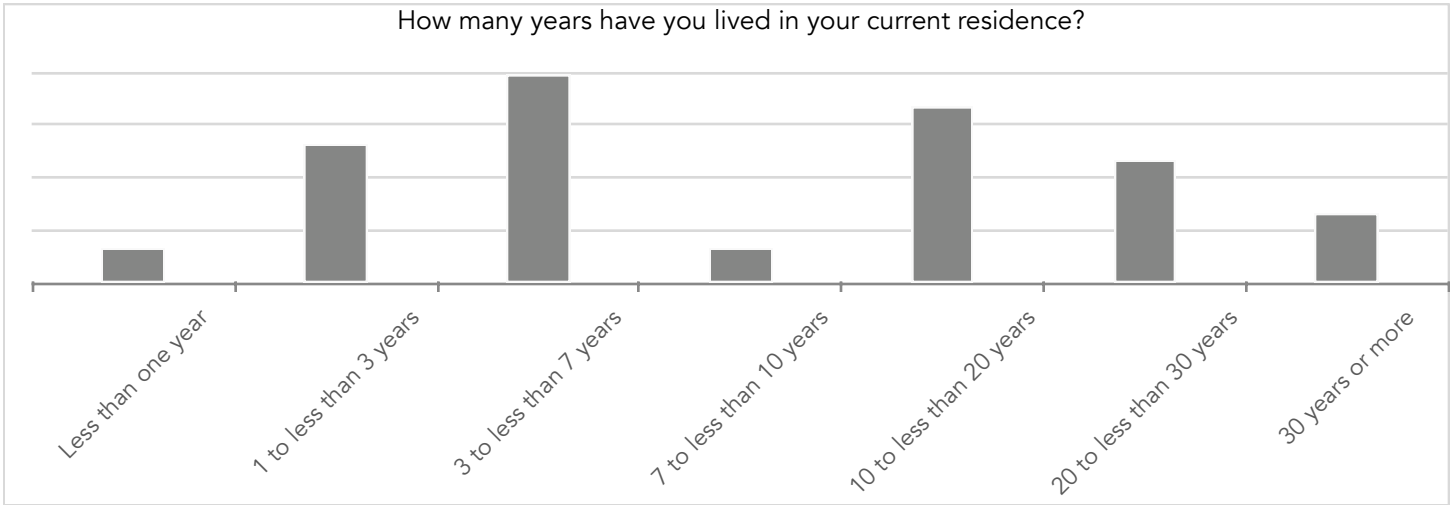


Figure 1: Question 2 - How long have you lived in your current residence?

Figure 2 shows the length of time that the participants are planning on living in their current home.

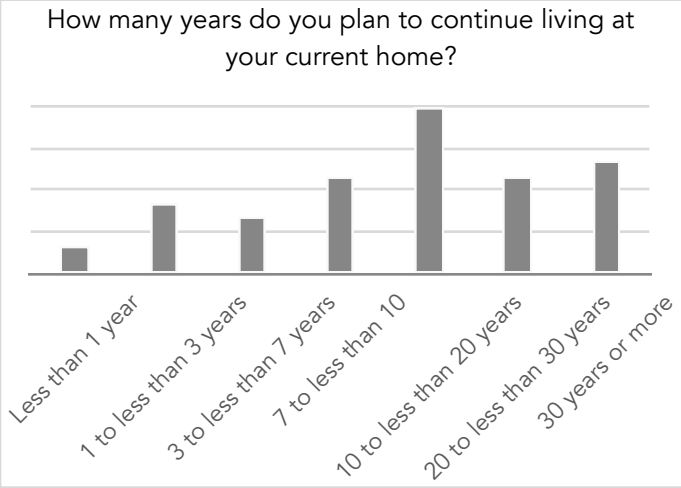


Figure 2: Question 5 – How many years do you plan to continue living at your current home?

Encouraging residents on the Sunshine Coast to commit to investing in solar should not be difficult because the majority are planning to stay in the same home for 7 to 20 years and beyond.

Average Household Income and Barriers

Costs and roof orientation are the main barriers for most participants. Overall, 51% of participants say solar systems are too costly and 56% are waiting for prices to come down. These numbers have an immaterial change between different income brackets (Appendices E & F).

Average Household Income and The Bulk Buy

The majority of residents have an annual income of $0 to $74,999 per year.

Just under half of the residents that fall in this category said that they needed a home assessment done before they would commit to the bulk buy. The remainder of the residents responded with scattered results, the most prominent being "I want to learn more about the SCCSA and their bulk buy" or that they still need a home assessment done. This confirms our assumption that participants are interested in a bulk buy but also want to be informed before they purchase and install a system. There are no other clear trends that came from the differences in income.

Location of Residence and Barriers

Property location and amount of sunlight that reached each rooftop seemed to not have any impact on perceived barriers. The respondents said they were waiting for prices to come down before purchasing their PV system. They also stated that financial aid would influence whether they would participate in a bulk buy. The data associated with this analysis can be found in Appendices G and H.

Location of Residence and the Bulk Buy

The location of residents' homes didn't seem to affect their interest in a bulk buy. There were two responses that were prevalent regardless of location; most people are either considering participating in a bulk buy or waiting to have a home assessment.

The graph below shows the overall considerations about a solar PV bulk buy.

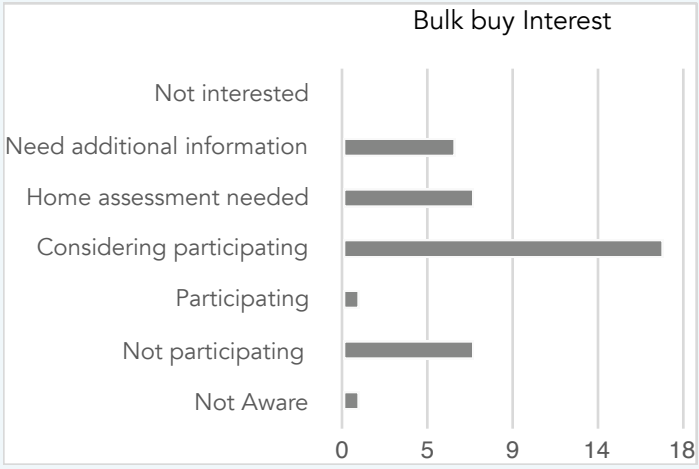


Figure 3: Question 23 - Interest in the Bulk Buy

Experienced Barriers and Perceived Barriers

A comparison of the two main barriers experienced by Respondent G, who has a solar PV system against the barriers perceived by the other respondents was conducted. The data tables associated with these questions can be found in Appendix D.

The two top reasons for non-interest in a bulk buy are, "It's too costly" and "I'm waiting for prices to come down further". These are in line with the barriers encountered by Respondent G, which were identified as system costs and permitting fees, along with voicing concerns about future shade from neighbouring trees.

These aspects affect not only their barriers of installing solar in general, but also their interest in a bulk buy. The main reason people have not committed to a bulk buy is that they are yet to determine their home's capacity for energy production through a home assessment.

Realized Barriers

Of all the respondents, only one respondent (Respondent G) had already installed a solar PV system on their property. It should be noted that their responses may not be indicative of what everyone will experience when purchasing and installing solar panels. They do, however, indicate what many people in the same situation on the coast may go through in their solar journey.

Respondent G has lived in their home for 20 to 30 years and are planning on staying at the same residence for another 20 to 30 years. This long term commitment may have been a driving force behind being one of the first people on the Sunshine Coast to install solar panels on their home.

They installed their solar PV system 1 to 3 years ago and their system provides the home with 6kWh of converted energy. The main barriers they faced when purchasing and installing their system were permitting and associated costs. They stated that they would encourage their friends and family to install a solar PV system, even though they had doubts before installing their own. They were not only fearful of neighbouring trees growing too tall and shading their panels, but that the pay-back period would also prove to be too long.

Going "Off-Grid"

Being an independent electrical energy producer may be a long term goal for some participants as 15% want to go "off-grid". However, most respondents realize that, due to current technological barriers, their system should be grid-tied. This allows the system to use the electrical grid like a battery; in essence, storing their self-generated power for later use.

Advancements in technology are happening quickly. While Solar PV systems are capable of producing enough electricity to sustain an average home, the capacity of batteries currently on the market is not sufficient to store power for lengthy periods of time.

Discussion

Though community solar movements differ, there are common barriers to consider. These should be openly shared through various avenues to ease other communities' efforts in their own solar journey.

Residential Solar

Throughout our research, financing was the overarching barrier for residents when considering installing solar PV systems. This, and other aspects of navigating residential solar energy production, will be the basis of our recommendations to other organizations or municipalities when implementing solar in their communities. We have segmented different activities to ease the process. These steps should be done sequentially, but the activities within each step can be done in any order.

Step 1: Property Viability

The first step when considering solar energy in your area is to look into your local irradiation. Considering the amount of sun your area receives and the current technology's efficiency will tell you if solar energy will provide a large enough return on investment. When looking into local irradiation, one must also look at their roof orientation, which direction the sloped sides are facing, and how much shade their property receives.

Irradiation, exposure, and roof orientation will influence the effectiveness of a potential system. A great way for residents to gain this information is to make connections with local solar PV installers. On the Sunshine Coast, the SCCSA worked closely with a highly experienced and knowledgeable local electrical company. This company, Clear Energy Solutions, provided free home assessments and do-it-yourself workshops for residents who were considering participating in a solar bulk buy.

Step 2: Policies and Incentives

Perceived barriers to solar PV installation were initially focused on policies and permitting fees. However, as our research progressed, we found that these fees were minimal and only a small fraction of the total system cost. Also, as BC has limited incentives (only two for Aboriginal Peoples and their communities) this was not a main focal point of our study.

In other regions, incentives and programs have seemed to increase the uptake of solar PV systems. Having a full understanding of your region's permitting costs, policies and incentives will help to determine where your area of focus should be placed.

Step 3: Personal Finances

As financing was the highest barrier residents faced, we researched financing options available through local banks and credit unions. No existing financing programs for BC residents seemed to provide enough incentive to install PV systems. Once research pertaining to existing loans and mortgages was done, a relationship was developed with the Sunshine Coast Credit Union (SCCU). The credit union was incredibly supportive of the SCCSA's bulk buy project and now provides affordable financing options to participating residents.

In a statement from the credit union, they state that they are "pleased to provide a special loan offer for the purchase of solar panels sourced through the Sunshine Coast Community Solar Association's Bulk Buy initiative." This special offer includes both secured and unsecured loans that are lower than other banks and credit unions in the area.

If residents incorporate these financing options into their consideration of solar PV systems, they may be more likely to participate in the bulk buy as reduced costs make systems financially viable.

"We are pleased to provide a special loan offer for the purchase of solar panels sourced through the Sunshine Coast Community Solar Association's Bulk Buy initiative."

- SCCU

Shared Solar

The possibility of a community array was widely discussed by the SCCSA as well as other stakeholders from local government and the SCCU. With a larger, shared array, there are additional barriers compared to residential solar installations.

These barriers include but are not limited to, finding adequate land for the array, finding additional financing, and defining the type of payback scheme that will be put in place. For example some investment options include: an investment array where contributors receive dividends as they sell off energy, or the energy flowing directly to the contributing residents' homes.

In overcoming these barriers, those involved would be advised to form an association or organization, such as a cooperative, to receive government grants and subsidies. This would also allow a solar initiative to have legal backing, reducing individual liability.

Local, provincial, and federal government may be able to offer incentives in the form of capital, ongoing finances, or land use.

As local governments usually have restricted budgets, organizations may find it hard to attain financial support from their municipalities. Local governments will be more receptive to initiatives that do not require financial capital but could be supported by mechanisms such as use of public land for arrays.

After speaking with local government on the Sunshine Coast, there was a general consensus that the municipalities would do everything they could to aid the process of implementing solar energy systems in their community.

Forming partnerships with local electricians and other solar providers could also prove to be useful in the sustainability of these initiatives, as well as the local economy. These installers could prove to be receptive to providing the organizations and residents with workshops on installation, maintenance, and other solar needs. Workshops provided by Clear Energy Solutions increased interest, not only in the SCCSA's initial bulk buy, as well as solar energy in general, fulfilling a need for renewable energy education on the Sunshine Coast. Partnerships like these can decrease the cost of installation and maintenance of a community array and therefore increase profit margins for the participants.

These partnerships could aid renewable energy educational programs that are in the beginning stages of development. This incorporates a younger generation into a community's solar movement and could provide a platform for student scholarships within the renewable energy sector.

Conclusion

It is our hope that by using this roadmap, it will spark your solar journey. The main take away from our experience is that forming relationships with local government, local funding agencies, and key stakeholders will not only ease the transition to renewable, solar energy, but will create a sense of pride within your community.

Works Cited

3TIER. (2015). What is Global Horizontal Irradiance. Retrieved from 3TIER: http://www.3tier.com/en/support/solar-prospecting-tools/what-global-horizontal-irradiance-solar-prospecting/

Alberta Energy Providers. (n.d.). Retrieved November 7, 2015, from http://www.albertaenergyproviders.com

Alberta Utilities Commission. (2013, July 5). Micro-Generation Application Guide . Retrieved from Alberta Utilities Commission: http://www.auc.ab.ca/involving-albertans/micro-generation/Documents/MicroGeneratorApplication_Version1-3_20130705%20.pdf

Ashoka. "Solar Crowdfunding: In Need Of A Kickstart." Forbes. Forbes Magazine, 20 Apr. 2015. Web. 23 Feb. 2016. <http://www.forbes.com/sites/ashoka/2015/04/20/solar-crowdfunding-in-need-of-a-kickstart/3/#46221ddf1ba0>.

Aziz, J. (2014, June 20). Germany gets 50 percent of its electricity from solar for the first time. Retrieved November 6, 2015, from http://theweek.com/speedreads/451299/germany-gets-50-percent-electricity-from-solar-first-time

Bank of Canada (2010) Year Average of Exchange Rates, Ottawa: Financial Markets Department. Retrieved from http://www.bankofcanada.ca/rates/exchange/annual-average-exchange-rates/

Barber, T. (2011, June 4). The Innovation Funnel: Bringing Ideas To Life. Retrieved November 6, 2015, from http://www.greenbookblog.org/2011/06/04/the-innovation-funnel-bringing-ideas-to-life/

BC Hydro (June 1, 2014) Micro standing offer program. Retrieved December 12, 2015, from https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/independent-power-producers-calls-for-power/initiatives-in-development/micro-SOP-presentation-final.pdf

BC Hydro (2014, July 1). Schedule 1289 net metering service. Retrieved December 12, 2015, from https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/schedule-1289-net-metering-service.pdf

BC Hydro. (2015). Net Metering Program. Retrieved from BC Hydro: https://www.bchydro.com/energy-in-bc/acquiring_power/current_offerings/net_metering.html?WT.mc_id=rd_netmetering

BC Hydro. (2015, October). *Standing Offer Program*. Retrieved from BC Hydro : https://www.bchydro.com/energy-in-bc/acquiring_power/current_offerings/standing_offer_program.html

BC Hydro (2016, March). *Standing Offer Program: Program Rules*. Retrieved March 25, 2016, from https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/independent-power-producers-calls-for-power/standing-offer/standing-offer-program-rules.pdf

BC Sustainable Energy Association. (2015). Solar PV. Retrieved from BCSEA.org: http://www.bcsea.org/solar-pv

BC Safety Authority (2015, July 20). Fee Schedule: Electrical. Retrieved November 7, 2015, from http://www.safetyauthority.ca/sites/default/files/electrical_fee_schedule_2015-2017_fsel-910-02_2015-07-20.pdf

Breen, S. (2008). RENEWABLE ENERGY Exploring Options for Farmers, Rural Landowners, and Rural Communities. Retrieved November 6, 2015, from http://www.cip-icu.ca/Files/Resources/PC4801_10

Bristlow, D. (n.d.). The Business Case for Alternative Energy Technologies in Ontario. Toronto: University of Toronto. Retrieved from http://www.trca.on.ca/dotAsset/51366.pdf

Bloomberg. (June 23, 2015). How to Cut Your Electric Bill By Going Solar. Retrieved from http://www.bloomberg.com/news/videos/b/61af58dc-5441-4c6d-83f2-7bacacf762a7

CanSIA (October 20, 2015). Canadian Council on Renewable Electricity Congratulates New Liberal Government. Retrieved November 6, 2015, from http://www.cansia.ca/news-media-archive/canadian-council-renewable-electricity-congratulates-new-liberal-government

CanSIA. (n.d.). Provincial Consumer Incentives. Retrieved November 6, 2015, from http://www.cansia.ca/government-regulatory-issues/consumer-incentives/provincial

CanSIA. (2011). Provincial Consumer Incentives. Retrieved from CanSIA: http://cansia.ca/government-regulatory-issues/consumer-incentives/provincial

CanSIA. (n.d.). Provincial Consumer Incentives. Retrieved November 3, 2015, from http://www.cansia.ca/government-regulatory-issues/consumer-incentives/provincial#bcrenevera

CanSIA. (n.d.). Provincial Consumer Incentives. Retrieved November 6, 2015, from http://www.cansia.ca/government-regulatory-issues/consumer-incentives/provincial#bc

City of Calgary. (2015). 2015 Building & Trade Permit Fee Schedule. Retrieved from City of Calgary: Planning, Development & Assessment: http://www.calgary.ca/_layouts/cocis/DirectDownload.aspx?target=http%3a%2f%2fwww.calgary.ca%2fPDA%2fpd%2fDocuments%2ffees%2fbuilding-and-trade-permit-fee-schedule.pdf&noredirect=1

City of Calgary. (2015). Solar Energy. Retrieved from City of Calgary: http://www.calgary.ca/CS/IIS/Pages/Solar-Energy-Projects.aspx

City of Calgary. (2015). Trade Permit Fee Estimator. Retrieved from Planning & Development: https://dbaservices.calgary.ca/feeestimator/

City of San Diego. (March 2009). Solar Survey. Retrieved from http://www.sandiego.gov/environmental-services/pdf/sustainable/090925SOLARCITYSURVEYREPORT.pdf

City of San Jose. (2015). Solar Permits & Fees. Retrieved from sanjoseca.gov: https://www.sanjoseca.gov/index.aspx?NID=1505

City of Seattle. (2015). Install Solar. Retrieved from Seattle/gov: http://www.seattle.gov/light/solarenergy/installsolar.asp

City of Seatte (2015, May 20). Solar Energy Systems. Retrieved November 6, 2015, from http://www.seattle.gov/DPD/publications/CAM/cam420.pdf

Clean Energy Collective. (2015). Xcel Energy Community Solar: Community-Owned Solar, Solar Farms, Solar Gardens, Community-based Renewable Energy. Retrieved from http://www.coloradocommunitysolar.com

Dillemuth, A., White, D., & Ross, B. (2012). Integrating Solar Energy into Local Development Regulations. Retrieved November 6, 2015, from https://www.planning.org/research/solar/briefingpapers/localdevelopmentregulations.htm

EcoReport (2015, July 01). BC's Solar Capacity Is Doubling. Retrieved January 15, 2016, from http://theecoreport.com/bcs-solar-capacity-is-doubling/

Energy and Water Efficiency Upgrade Financing. (n.d.). Retrieved November 6, 2015, from https://www.sanjoseca.gov/index.aspx?NID=4383

Energy in B.C. (n.d.). Retrieved November 6, 2015, from http://www.bchydro.com/energy-in-bc.html

Energy Informative (2014, September 12). Best Way to Finance Solar Panels. Retrieved January 15, 2016, from http://energyinformative.org/best-way-to-finance-solar-panels/

Energy in B.C. (n.d.). Retrieved November 6, 2015, from http://www.bchydro.com/energy-in-bc.html

EOS Eco-Energy. (2015). EOS Eco-Energy's Bulk Solar Panel and Installation Program. Retrieved January 15, 2016, from http://eosecoenergy.com/en/wp-content/uploads/2015/07/EOS-Solar-Bulk-Fact-Sheet-.pdf

EOS Eco-Energy (n.d) Solar Bulk Purchase and Installation 2015. Retrieved January 15, 2016, from http://eosecoenergy.com/en/solar/bulk/

The Global Economy (2015). Comparator. Retrieved November 6, 2015, from http://www.theglobaleconomy.com/compare-countries/

Government of British Columbia (2015). Climate Action Legislation.Retrieved November 6, 2015, from http://www2.gov.bc.ca/gov/content/environment/climate-change/policy-legislation-programs/legislation-regulations

Government of British Columbia (June 1, 2008). Frequently Asked Questions Local Government (Green Communities) Statutes Amendment Act, (Bill 27) 2008. Retrieved November 6, 2015, from http://www.cscd.gov.bc.ca/LGD/intergov_relations/library/Bill27_Green_Communities_FAQs.pdf

Government of British Columbia (n.d.) LGD: Local Government (Green Communities) Statues Amendment Act, (Bill 27) 2008. Retrieved November 6, 2015, from http://www.cscd.gov.bc.ca/LGD/intergov_relations/green_communities_legislation.htm

Government of Canada (2015). Incentives Programs for Communities.Retrieved November 7, 2015, from http://www.energy.gov.on.ca/en/incentives-programs-for-communities/

The Great Climate Race. (2015). Retrieved January 15, 2016, from http://www.greatclimaterace.org/

Hamilton, T. (2009, March 23). Solar-power feed tariffs windfall for homeowners | Toronto Star. Retrieved November 6, 2015, from http://www.thestar.com/business/tech_news/2009/03/23/solarpower_feed_tariffs_windfall_for_homeowners.html

Hunter, J. (2015, May 26). Power from Site C dam 'dramatically' more costly than thought: Expert. Retrieved November 6, 2015, from http://www.theglobeandmail.com/news/british-columbia/power-from-site-c-dam-dramatically-more-costly-than-thought-expert/article24608803/

Innovation.ca. (2015). Exceptional Opportunities Fund. Retrieved from Innovation.ca: http://www.innovation.ca/en/OurFunds/CFIFunds/ExceptionalOpportunitiesFund

Lee, J. (2015, November 16). Knives and Forks set to feed local food economy. Retrieved January 15, 2016, from http://www.vancouversun.com/life/knives forks feed local food economy/11499863/story.html?__lsa=93e1-c188

My Mortgage (n.d.) Green Home Mortgage Options in Canada. Retrieved January 15, 2016, from http://www.mymortgage.ca/loan-programs/ecoaction-homes.html

National Renewable Energy Lab. (1999). The Borrowers Guide to Financing Solar Energy Systems: A Federal Overview. Retrieved January 15, 2016, from http://www.nrel.gov/docs/fy99osti/26242.pdf

Neslen, A. (2015, October 20). Europe's greenhouse gas emissions fall to record low. Retrieved November 6, 2015, from http://www.theguardian.com/environment/2015/oct/20/europes-greenhouse-gas-emissions-fall-to-record-low

News Wire (April 22, 2010) TD Canada Trust Green Mortgages now feature rebates for solar panels. Retrieved January 15, 2016, from http://www.newswire.ca/news-releases/td-canada-trust-green-mortgages-now-feature-rebates-for-solar-panels-539738091.html

Ontario Ministry of Energy. (2015). FIT and microFIT Programs. Retrieved from Ontario Ministry of Energy: http://www.energy.gov.on.ca/en/fit-and-microfit-program/

Ontario Ministry of Energy. (2015). Incentive Programs. Retrieved from Ontario Ministry of Energy: http://www.energy.gov.on.ca/en/incentives-programs-for-communities/

Province of British Columbia, (October 1, 2015). First Nations Clean Energy Business Fund. Web. 23 Feb. 2016. <http://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with-first-nations/first-nations-clean-energy-business-fund>.

Province of British Columbia. (2013, March). Energy, Energy Conservation and the ICE Fund Tax. Retrieved from Provincial Sales Tax (PST) Bulletin: http://www.sbr.gov.bc.ca/documents_library/bulletins/pst_203.pdf

RBC Royal Bank (n.d.) Solar Panel Financing.Retrieved January 15, 2016, from http://www.rbcroyalbank.com/business/financing/solar-panel-financing.html

SimplyMap (2015). Sunshine Coast Census Data. Retrieved from http://simplymap.com.ezw.lib.bcit.ca:2048/index.html

Scotia EcoEnergy Financing. (n.d.). Retrieved January 15, 2016, from http://www.scotiabank.com/ca/en/0,,4653,00.html

Solar ABCS (2015) Expedited Permit Process Report - Revision 2. Retrieved November 6, 2015, from http://solarabcs.org/about/publications/reports/expedited-permit/index.html

SPEC (n.d.) Solar Energy Best Practices for BC Communities. Retrieved November 6, 2015, from http://www.spec.bc.ca/SolarBP

Solargis. (2015). Solar Radiation Maps. Retrieved November 6, 2015, from http://solargis.info/doc/free-solar-radiation-maps-GHI

Solargis. (2015). World Map of Global Horizontal Irradiation. Retrieved from solargis.info: http://solargis.info/doc/_pics/freemaps/1000px/ghi/SolarGIS-Solar-map-World-map-en.png

SPEC. (n.d.). Solar Energy Best Practices for BC Communities. Retrieved from The Society Promoting Environmental Conservation: http://www.spec.bc.ca/SolarBP

Sun Metrix. (2015, March 27). Solar Tax Credits, Incentives and Solar Rebates: Ontario (ON). Retrieved November 7, 2015, from http://sunmetrix.com/solar-tax-credits-incentives-and-solar-rebates-ontario-on/

Sunshine Coast Community Foundation. (n.d.). Retrieved January 15, 2016, from http://sccfoundation.com/

Vancity (n.d) Vancity Home Energy™ Loan: Financing your smart choices. Retrieved January 15, 2016, from https://www.vancity.com/Loans/TypesOfLoans/HomeEnergyLoan/

Weldon, T. (2015, July 20). Sackville group pushes bulk purchase of solar panels - New Brunswick - CBC News. Retrieved January 15, 2016, from http://www.cbc.ca/news/canada/new-brunswick/sackville-group-pushes-bulk-purchase-of-solar-panels-1.3159908

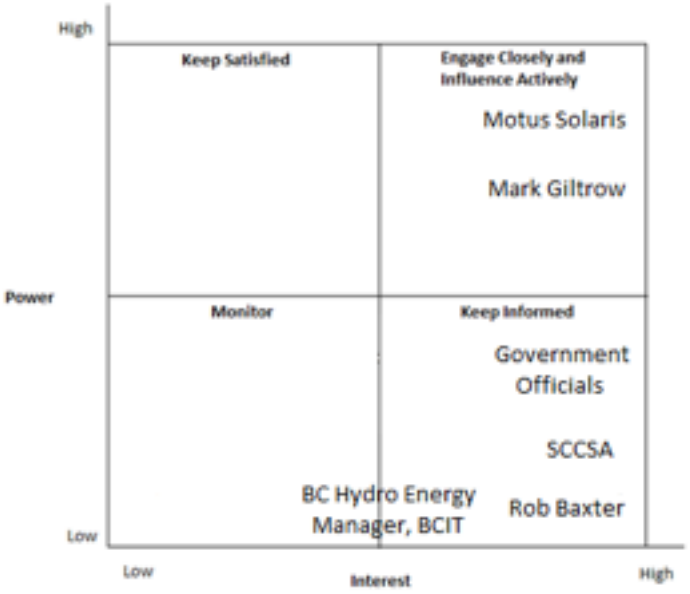
World Wildlife Foundation (October 22, 2014). First Nationwide Bulk Purchase Program Will Expand Access to Clean Solar Energy. Retrieved January 15, 2016, from http://www.worldwildlife.org/press-releases/first-nationwide-bulk-purchase-program-will-expand-access-to-clean-solar-energy

United Nations. (2013). GDP per capita (2011 PPP $). Retrieved from United Nations Development Programme: Human Development Reports: http://hdr.undp.org/en/content/gdp-per-capita-2011-ppp

United Nations (2013). Human Development Reports. Retrieved November 6, 2015, from http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components

Appendices

Appendix A – Stakeholder Map



Appendix B – Survey Questions

Participants were guided through the survey questions via Survey Monkey's platform. Each question was quantified and calculated into the final analysis. During the survey, questions were guided based on the participants' responses i.e. A 'Yes' response skipped to the next applicable question. Such responses directed a different series of questions which allowed the participant to go further into detail based on their opinion, situation and/or experience.

Survey

1. Do you own or rent the home you live in?

a. Yes

b. No

If Yes, continue. If No, disqualified.

2. How many years have you lived in your current residence? Check one that applies:

a. Less than one year

b. 1-3 years

c. 3-6 years

d. 7-10 years

e. 10-20 years

f. 20-30 years

g. 30+ years

3. Is your home:

a. detached,

b. semi-detached

c. multi-unit residences

4. Do you belong to a strata?

a. No

b. Yes. Please state which one.

5. How many more years do plan plan on living at your current home?

a. Less than one year

b. 1-3 years

c. 3-6 years

d. 7-10 years

e. 10-20 years

f. 20-30 years

g. 30+ years

6. Total combined annual household income

a. $0-$24,999

b. $25,000 - $49,999

c. $50,000 - $74,999

d. $75,000 - $99,999

e. $100,000 - $124,999

f. $125,000 - $149,000

g. $150,000 - $174,99

h. $175,000-$199,999

i. $200,000 and up

j. Other (Please explain) _____

7. Life Stage. Please check all that apply.

a. Single

b. Married

c. Retired

d. One child in your care

e. Two children in your care

f. Three or more children in your care

g. Please enter your age _____

8. Location of primary residence:

a. Gibsons

b. Roberts Creek

c. Elphinstone

d. Sechelt

e. West Howe Sound District of Sechelt

f. Sechelt Indian Government District

g. Halfmoon Bay

h. Pender Harbour

i. Egmont

j. Gambier Island

k. Keats Island

9. What type of traditional energy sources, if any, does your current residence rely on? Check all that apply:

a. Hydro electricity

b. Natural gas

c. LP Gas Generator

d. Wood Burning

e. Other:_____

10. Is any energy for your home currently subsidized with a renewable energy source?

a. No

b. Yes. (Please specify. Eg. Solar PV, Solar Hot Water, Geothermal, etc.)

11. If Yes, who initiated the installation of the system(s)?

a. Myself

b. Previous Owners

c. Builder

d. Don't know

e. Other: Please Describe

12. If no, have you ever considered installing renewable energy for your home?

a. Yes

b. No

13. Have you implemented any energy efficiencies in your home? (Select your latest upgrade)

a. LED or compact fluorescent light bulbs

b. Double or triple paned windows

c. Higher 'R' value insulation in walls or in your attic

d. Hot water on demand system

e. Energy efficient appliances (fridge, washer/dryer etc)

f. Other: (please specify)

14. Do you have solar PV panels installed on your home to provide some or all of your electrical energy needs?

a. Yes (Survey continues on question 15)

b. No (Survey continues on question 20)

15. When did you install the panels?

a. Less than one year ago

b. 1 to less than 3 years ago

c. 3 to less than 7 years ago

d. 7 to less than 10 years ago

e. 10+ years ago

16. What is the approximate size of your system (in kWh).

17. Challenges regarding purchasing and installation of your solar PV system. Please rate the following challenges based on how much of a hindrance they were to you. (Grid, Extreme Hindrance – Hindrance – Neutral, 5 point scale)

a. Permitting

b. Hard to find information regarding panel purchasing, installation, and permitting

c. Timely installation process

d. Roof orientation or shading

e. Arranging inspections

f. Associated costs

g. Lack of available financing

i. Other: Please describe

18. From the question, please explain the cases of "Hindrance" to "Extreme Hindrance"

19. Based on your experience, would you consider encouraging your friends and family to install a solar PV system for their home?

a. No

b. Yes

20. Have you ever considered installing solar PV panels on your home?

a. Yes

b. No

21. What is the reason(s) you haven't installed solar PV on your home?

a. It's too costly (including inspections, permitting, and panel cost)

b. I'm waiting for prices to come down further

c. I can't get approved for home improvement financing

d. It's time intensive

e. I'm not familiar with any Solar PV Contractor (installer)

f. My homeowner's association or strata won't permit solar installations

g. My roof orientation and/or shading greatly reduces sun exposure

h. I'm not interested

i. I'm waiting until my roof needs to be replaced

j. Other (please specify)

22. Please check all statements that you AGREE with:

a. Solar panels do not provide a good return on investment

b. We do not get enough sun in Canada to make solar PV panels worth the investment

c. I'm waiting until pricing comes down so I can afford solar panels

d. If I was able to finance solar panel installation through a low interest loan, I would seriously consider installing a system in the near future

e. Renewable energy should be subsidized by the government

f. It is imperative that Canada divests from fossil fuels

g. I, or someone in my home, works in the traditional energy sector (Hydro, Natural Gas)

h. I, or someone in my home, is employed in the renewable energy sector (please specify e.g.. solar, wind, geothermal, etc.)

23. The Sunshine Coast Community Solar Association (SCCSA) is arranging a Solar PV Bulk Buy shipment. In regard to this bulk buy, please check any statements you agree with:

a. I was not aware of the SCCSA and their Solar PV Bulk buy.

b. I was aware of the SCCSA but will not be participating in the bulk buy.

c. I will be purchasing Solar PV panels in the bulk buy.

d. I am considering purchasing Solar PV panels in the bulk buy

e. I need to have a home assessment done first before I will commit to the bulk buy (link to Matt)

f. I would like to learn more about the SCCSA and their bulk buy (Link to Solar association)

g. I am not interested in the SCCSA and/or their Solar PV panel bulk buy

24. If purchasing Solar PV panels in the bulk buy how do you intend to use your solar energy? (please check all that apply)

a. Supplement electrical power

b. Go 'Off-grid'

c. Charge electric car

d. Other_____

25. I am AWARE that I will not be able to produce all my electrical energy needs year round with solar energy alone if my house is not 'grid-tied'.

a. True

b. False

Appendix C - Question 2

How many years have you lived in your current residence?		
Less than one year	2	4%
1 to less than 3 years	8	18%
3 to less than 7 years	12	27%
7 to less than 10 years	2	4%
10 to less than 20 years	10	22%
20 to less than 30 years	7	16%
30 years or more	4	9%
n=45	45	100%

Appendix D - Question 5

How many years do you plan to continue living at your current home?		
Less than 1 year	2	4%
1 to less than 3 years	5	11%
3 to less than 7 years	4	9%
7 to less than 10	7	16%
10 to less than 20 years	12	27%
20 to less than 30 years	7	16%
30 years or more	8	18%
n=45	45	100%

Appendix E - Question 6 Compared to Question 21

$0-$24999		
Too Costly	3	60%
Waiting for Prices to come down	2	40%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	2	40%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=5		

$25000-$49999		
Too Costly	4	31%
Waiting for Prices to come down	8	62%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	1	8%
Roof orientation hinders induction capacity	2	15%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=13		

$50000-$74999		
Too Costly	6	60%
Waiting for Prices to come down	4	40%
Can't get approved for financing	1	10%
Too time intensive	0	0%
Not familiar with any contractors	1	10%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	1	10%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=10		

$75000-99999		
Too Costly	1	20%
Waiting for Prices to come down	1	20%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	1	20%
n=5		

$100000-$124999		
Too Costly	1	33%
Waiting for Prices to come down	1	33%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=3		

$200000 and up		
Too Costly	1	33%
Waiting for Prices to come down	2	67%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=3		

$125000-$149999		
Too Costly	1	50%
Waiting for Prices to come down	1	50%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=2		

$175000-$199999		
Too Costly	2	100%
Waiting for Prices to come down	2	100%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	1	50%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	1	50%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=2		

$150000-$174999		
Too Costly	1	100%
Waiting for Prices to come down	0	0%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=1		

Appendix F - Question 6 Compared to Question 22

$0-$24999		
Solar panels don't provide a good ROI	1	25%
We don't get enough sunlight on the coast	1	25%
Waiting for prices to come down	4	100%
Financial aid would make me seriously consider installing solar panels	1	25%
Renewable energy should be subsidised by the government	4	100%
It is imperative that Canada divest from fossil fuels	4	100%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=4		

$25000-$49999		
Solar panels don't provide a good ROI	2	15%
We don't get enough sunlight on the coast	1	8%
Waiting for prices to come down	7	54%
Financial aid would make me seriously consider installing solar panels	8	62%
Renewable energy should be subsidised by the government	10	77%
It is imperative that Canada divest from fossil fuels	10	77%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=13		

$50000-$74999		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	1	10%
Waiting for prices to come down	7	70%
Financial aid would make me seriously consider installing solar panels	5	50%
Renewable energy should be subsidised by the government	7	70%
It is imperative that Canada divest from fossil fuels	7	70%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=10		

$75000-99999		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	3	60%
Financial aid would make me seriously consider installing solar panels	4	80%
Renewable energy should be subsidised by the government	3	60%
It is imperative that Canada divest from fossil fuels	4	80%
I, or someone I know, Works in the traditional energy sector	1	20%
I, or someone I know, works in the renewable energy sector	0	0%
n=5		

$100000-$124999		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	0	0%
Financial aid would make me seriously consider installing solar panels	1	33%
Renewable energy should be subsidised by the government	1	33%
It is imperative that Canada divest from fossil fuels	1	33%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=3		

$125000-$149999		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	1	50%
Financial aid would make me seriously consider installing solar panels	0	0%
Renewable energy should be subsidised by the government	2	100%
It is imperative that Canada divest from fossil fuels	0	0%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=2		

$150000-$174999		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	0	0%
Financial aid would make me seriously consider installing solar panels	0	0%
Renewable energy should be subsidised by the government	0	0%
It is imperative that Canada divest from fossil fuels	1	100%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=1		

$175000-$199999		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	0	0%
Financial aid would make me seriously consider installing solar panels	0	0%
Renewable energy should be subsidised by the government	2	100%
It is imperative that Canada divest from fossil fuels	2	100%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	1	50%
n=2		

$200000 and up		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	3	100%
Financial aid would make me seriously consider installing solar panels	1	33%
Renewable energy should be subsidised by the government	2	67%
It is imperative that Canada divest from fossil fuels	3	100%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	1	33%
n=3		

Appendix G - Question 8 Compared to Question 21

Gibsons		
Too Costly	3	43%
Waiting for Prices to come down	6	86%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	1	14%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=7		

Robert's Creek		
Too Costly	4	44%
Waiting for Prices to come down	3	33%
Can't get approved for financing	1	11%
Too time intensive	0	0%
Not familiar with any contractors	1	11%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	3	33%
Not interested	0	0%
Waiting for my roof to be replaced	1	11%
n=9		

Elphinstone		
Too Costly	2	50%
Waiting for Prices to come down	1	25%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=4		

Sechelt		
Too Costly	5	42%
Waiting for Prices to come down	7	58%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	1	8%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	2	17%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=12		

West Howe Sound District of Sechelt		
Too Costly	1	100%
Waiting for Prices to come down	0	0%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=1		

Halfmoon Bay		
Too Costly	0	0%
Waiting for Prices to come down	1	33%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=3		

Pender Harbour		
Too Costly	2	67%
Waiting for Prices to come down	2	67%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=3		

Egmont		
Too Costly	2	67%
Waiting for Prices to come down	1	33%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	1	33%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=3		

Keats Island		
Too Costly	1	100%
Waiting for Prices to come down	0	0%
Can't get approved for financing	0	0%
Too time intensive	0	0%
Not familiar with any contractors	0	0%
Strata won't allow it	0	0%
Roof orientation hinders induction capacity	0	0%
Not interested	0	0%
Waiting for my roof to be replaced	0	0%
n=1		

Appendix H - Question 8 Compared to Question 22

Gibsons		
Solar panels don't provide a good ROI	2	29%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	6	86%
Financial aid would make me seriously consider installing solar panels	3	43%
Renewable energy should be subsidised by the government	7	100%
It is imperative that Canada divest from fossil fuels	6	86%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	1	14%
n=7		

Robert's Creek		
Solar panels don't provide a good ROI	2	22%
We don't get enough sunlight on the coast	1	11%
Waiting for prices to come down	5	56%
Financial aid would make me seriously consider installing solar panels	3	33%
Renewable energy should be subsidised by the government	6	67%
It is imperative that Canada divest from fossil fuels	8	89%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=9		

Elphinstone		
Solar panels don't provide a good ROI	1	25%
We don't get enough sunlight on the coast	1	25%
Waiting for prices to come down	1	25%
Financial aid would make me seriously consider installing solar panels	2	50%
Renewable energy should be subsidised by the government	2	50%
It is imperative that Canada divest from fossil fuels	3	75%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=4		

Sechelt		
Solar panels don't provide a good ROI	1	8%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	7	58%
Financial aid would make me seriously consider installing solar panels	7	58%
Renewable energy should be subsidised by the government	8	67%
It is imperative that Canada divest from fossil fuels	10	83%
I, or someone I know, Works in the traditional energy sector	1	8%
I, or someone I know, works in the renewable energy sector	0	0%
n=12		

West Howe Sound District of Sechelt		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	1	100%
Financial aid would make me seriously consider installing solar panels	0	0%
Renewable energy should be subsidised by the government	1	100%
It is imperative that Canada divest from fossil fuels	1	100%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=1		

Halfmoon Bay		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	1	33%
Financial aid would make me seriously consider installing solar panels	1	33%
Renewable energy should be subsidised by the government	2	67%
It is imperative that Canada divest from fossil fuels	2	67%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=3		

Pender Harbour		
Solar panels don't provide a good ROI	1	33%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	2	67%
Financial aid would make me seriously consider installing solar panels	0	0%
Renewable energy should be subsidised by the government	2	67%
It is imperative that Canada divest from fossil fuels	1	33%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	1	33%
n=3		

Egmont		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	1	33%
Waiting for prices to come down	1	33%
Financial aid would make me seriously consider installing solar panels	1	33%
Renewable energy should be subsidised by the government	2	67%
It is imperative that Canada divest from fossil fuels	1	33%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=3		

Keats Island		
Solar panels don't provide a good ROI	0	0%
We don't get enough sunlight on the coast	0	0%
Waiting for prices to come down	1	100%
Financial aid would make me seriously consider installing solar panels	1	100%
Renewable energy should be subsidised by the government	1	100%
It is imperative that Canada divest from fossil fuels	1	100%
I, or someone I know, Works in the traditional energy sector	0	0%
I, or someone I know, works in the renewable energy sector	0	0%
n=1		

Appendix I - Question 23

The Sunshine Coast Community Solar Association (SCCSA) is arranging a Solar PV bulk buy shipment. In regards to this bulk buy, please check the statements you AGREE with the most.		
I was not aware of the SCCSA and their Solar PV bulk buy	1	3%
I was aware of the SCCSA but will not be participating in the bulk buy	7	18%
I will be purchasing Solar PV panels in the bulk buy	1	3%
I am considering purchasing Solar PV panels in the bulk buy	17	44%
I need to have a home assessment done first before I will commit to the bulk buy	7	18%
I would like to learn more about the SCCSA and their bulk buy	6	15%
I am not interested in the SCCSA and/or their Solar PV bulk buy	0	0%
n=39	39	100%