



DEVELOPING A COMMUNITY SOLAR GARDEN

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Introduction

The purpose of this report is to provide a high-level introduction to community solar gardens, a concept that has proven effective in increasing the accessibility of solar energy in the United States. Best practices and policies from Canada and the US will be explored, including community engagement strategies, project plan, technology evaluation, design and development, and financing options available. This report will also provide an update on the status of the Urban Solar Garden project in New Westminster, British Columbia.

This report is structured as follows:

- Overview of Community Solar Gardens, including enabling policies and incentives, and community solar garden models;
- Community Solar Gardens in the United States and Canada;
- Key considerations for designing community solar garden programs and project management recommendations;
- An overview and progress report on the New Westminster Urban Solar Garden;
- Additional community solar garden resources.

Community Solar Gardens

A community solar garden is a centrally-located and centrally operated solar PV system where community members, including residents, businesses, and not-for-profit organizations, can subscribe to a portion of the electricity generated. The electricity generated from the installation is credited back to the subscriber's electricity bill in proportion to their share of the community solar garden.

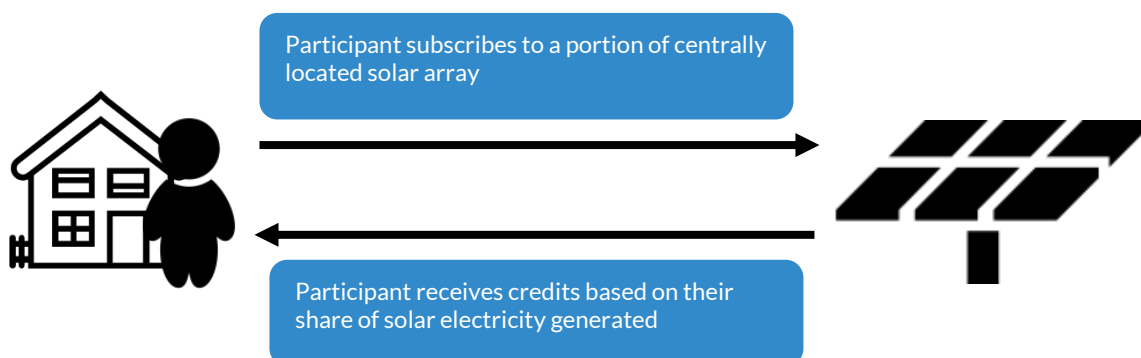


Figure 1: A simple overview of community solar garden model

There are a variety of benefits that the community solar model can present to participants:

- **Accessibility** – because the solar array is centrally owned and operated, participants do not need to install panels on their own roofs to receive the benefits of solar energy. Some customers may be interested in solar energy, but due to factors such as shading, age of the home, or sub-optimal home location may be unable to install solar panels on their roofs. Additionally, community solar gardens allow customers who do not have access to their rooftops, such as those in apartments or condos, to participate.
- **Affordability** - Depending on available incentives, community solar gardens may be a more affordable energy alternative for some customers.
- **Flexibility** – Participants can choose their level of subscription based on their energy needs and budgets. Additionally, participants can still receive the solar credit if they move, so long as they move within their utility or community solar garden service area.
- **Participation in a local, renewable energy project** – Some customers want to help drive renewable energy development in their community. Community solar gardens can help facilitate a reduction in a customer’s personal greenhouse gas emissions, especially in areas where electricity generates large amounts of carbon dioxide emissions.

Applicable Policies and Incentives

Net Metering: This policy allows customers that generate their own electricity to sell excess energy back to the grid. The utility will then credit the customer based on the amount of electricity sold, based on current electricity rates (Coughlin, et al., 2010).

Virtual Net Metering: An extension of net metering that allows that enables an entity to share the electricity output from a distributed renewable energy source to multiple customers, in proportion to their share in the energy source. This can also be referred to as shared renewables, or community net metering (Farrell, Virtual Net Metering, 2016).

Renewable Portfolio Standard (RPS): Policies that mandate a jurisdiction to have a certain percentage of electricity generated from renewable sources.

Renewable Energy Credits (RECs): These are certificates that represent greenhouse gas (GHG) reductions and other environmental benefits as a result of generating energy from low carbon or renewable sources. RECs generated can be sold separately from the energy produced to organizations looking to reduce their overall GHG footprint. Because they are not limited by geographical boundaries, RECs are often used to help provinces meet their renewable portfolio standards (Coughlin, et al., 2010).

Power Purchase Agreements (PPA): An agreement between a utility and a third-party energy generator which details when, how, and what price the utility will purchase power (Coughlin, et al., 2010).

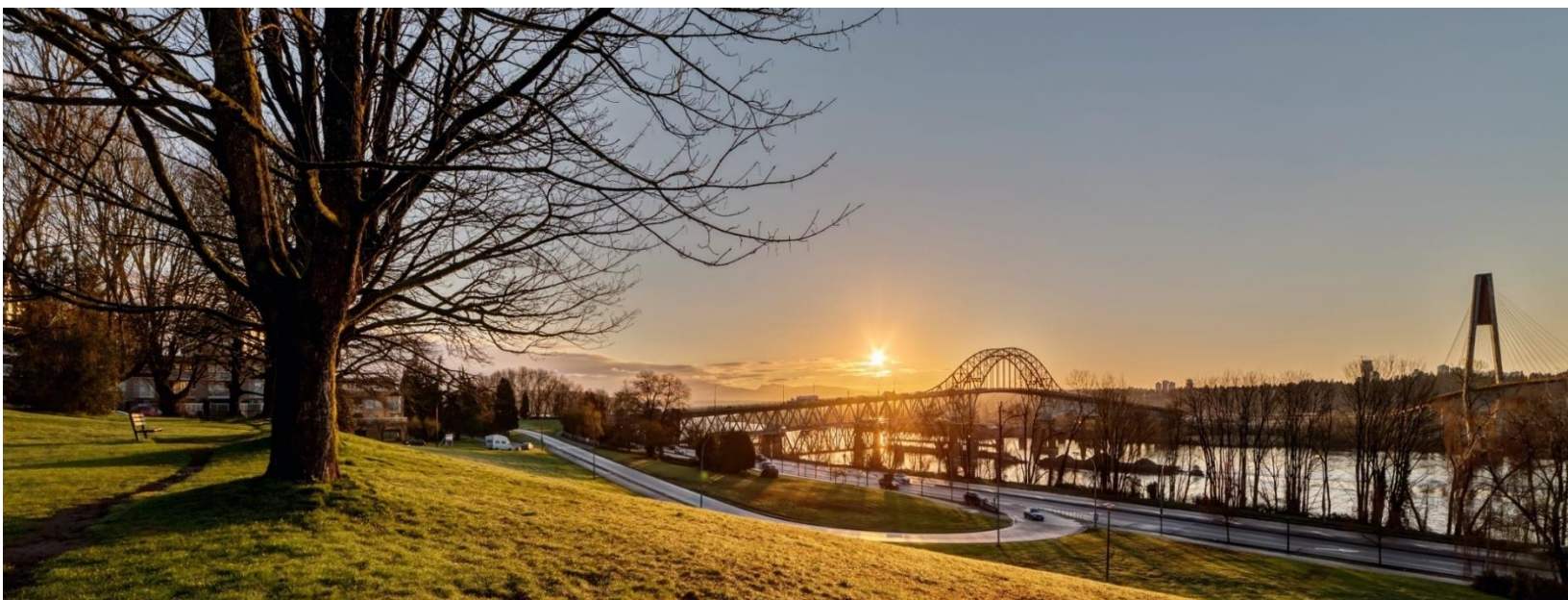
Community Solar Garden Models

The United States Department of Energy classifies community solar garden models into three general types (Coughlin, et al., 2010):

Utility Sponsored Model: Utility owns and operates the community solar garden, and customers within its service area can voluntarily participate. Subscribers do not own the physical solar array, rather they own the electricity generation rights from the array based on their level of participation. Applicable to municipalities that own and operate their own utilities, such as the City of Nelson or the City of New Westminster.

Special Purpose Entity (SPE) Model: A third-party owns and operates the community solar garden. The utility buys the electricity generated from the community solar garden, and provides additional payments or incentives, depending on the state or province. This model is applicable for businesses, cooperatives, or municipalities in states/provinces with REC's, virtual net metering, and/or other renewable energy policies and incentives.

Non-Profit Model: Participants donate to a non-profit owned community solar installation and receive tax deductions. The utility pays the non-profit for the electricity generated from the solar array. This model can help offset the electricity costs for the non-profit.



Colorado

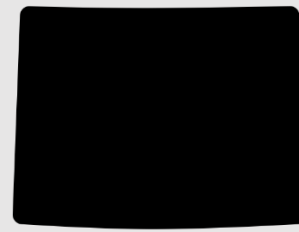
78% of Colorado's regulated electricity market comes from non-renewable sources (Colorado Energy Office, 2016). The state's Renewable Portfolio Standard requires all Investor Owned Utility's (IOU) generate 30% of electricity from renewable sources, 3% of which being generated by distributed energy sources by 2020 (Colorado Energy Office, 2004). Additionally, it requires all cooperative owned utilities to have 20% of their electricity generated by renewables by 2020.

Colorado has seen the deployment of community solar garden projects as a way of achieving their Renewable Portfolio Standard. The Community Solar Gardens Act authorizes the creation of community solar gardens as a way of encouraging further solar energy investment in the state (House Bill 10-1342, 2010). Highlights of the Act include the following:

- Solar Gardens must be less than 2 MW installed capacity.
- Subscribers are credited at the retail electricity rate plus renewable energy credits, less transfer fees.
- Renewable Energy Credits from installed community solar gardens count towards an IOU Renewable Portfolio Standard.
- There must be at least 10 subscribers per garden, and each subscription must be at least 1 kW.
- Community Solar Gardens can be owned either by utility or a contracted third-party operator, allowing for diverse market participation.
- 5% of each community solar garden's generating capacity must be for low-income customers.

To help reduce energy burden of low-income customers, Colorado awarded a \$1.2 million from to GRID Alternatives in 2015 to create a pilot community solar project, which will add 20MW of electricity specifically for low-income households.

Colorado is host to Utility-owned, Special Purpose Entity, and Non-Profit community solar gardens.



Colorado

53

Community Solar Projects

30 MW

Installed Capacity

2 29 22

Investor
Owned
Utilities

Municipal
Utilities

Rural Electric
Cooperatives

Policies and Incentives:

Community Solar Gardens Act

Renewable Portfolio Standard

Net Metering

Renewable Energy Credits

Source: <https://www.colorado.gov/pacific/energyoffice/community-solar>

Minnesota

Minnesota leads the United States in total installed capacity of community solar gardens. The rate of project development in the state is unprecedented; the state is expected to add another 400 MW worth of community solar over the next two years (Farrell, Minnesota has the best community solar program - here's why, 2017).

Energy and Policy Context

62% of Minnesota's regulated electricity market comes from non-renewable resources (EIA, 2017). The state has a Renewable Portfolio Standard, which requires each electric utility to generate 25% of their electricity from renewable resources by 2025. In addition, 1.5% of a utility's total electricity must be generated by solar energy by 2020. To support the Renewable Portfolio Standard, the state has program for trading Renewable Energy Credits (216B.1691, 2017).

Minnesota's Community Solar Garden program, developed in partnership between the state's largest IOU, Xcel Energy, and the Public Utility Commission (PUC), outlines the requirements of community solar projects in the state. Highlights include:

- There must be at least 5 subscribers per garden, and each subscription must be at least 200W.
- No single subscriber can own more than 40% of a single solar garden.
- Community Solar Gardens can be owned either by utility or a contracted third-party operator, allowing for diverse market participation.
- Subscribers are credited at the retail rate of electricity, plus renewable energy credits. Minnesota has created a Value of Solar Tariff (VOST) as an alternative to net metering, which takes into account the value of solar energy as well as its environmental value (216B.164, 2013). So far, no utility has adopted VOST to replace net metering (DSIRE, 2015).

Minnesota has community solar gardens hosted by utilities (Xcel Energy) and cooperatives.



Minnesota

64

Community Solar Projects

120 MW

Installed Capacity

4 125 45

Investor
Owned
Utilities

Municipal
Utilities

Rural Electric
Cooperatives

Policies and Incentives:

Solar Energy Jobs Act
Net Metering
Renewable Energy Standard (with
Solar Energy Standard)
Community Solar Garden Act
Renewable Energy Credits

<https://www.cleanenergyprojectbuilder.org/solar-gardenshttp://www.sharedrenewables.org/community-energy-projects/>
<http://news.energysage.com/comparing-top-community-solar-states-minnesota-california-massachusetts-colorado/>

Community Solar Garden Policies in Canada

While community solar gardens have had rapid adoption in the United States, they have only recently started development in Canada. As stated previously, Virtual Net Metering is a key policy that enable a single solar installation to benefit multiple participants.

While many provinces or utilities in Canada have net metering policies, there are no provincial policies for virtual net metering. In general, current net metering policies:

- Are limited to a single customer (BC Hydro, 2015) (Ontario Energy Board Act, 2017).
- Require the customer to own and consume the electricity generated from the distributed generating source, and cannot be owned by the third party (BC Hydro, 2015) (Ontario Energy Board Act, 2017).
- Require that the distributed generating source is located on the same site as the point of consumption (BC Hydro, 2015) (Ontario Energy Board Act, 2017).

Ontario is currently considering amendments to its net metering program which would allow virtual net metering and ownership of solar gardens by third parties off site of the participant's property. A decision regarding these proposed amendments is expected in 2018 (Ontario Ministry of Energy, 2017).

In British Columbia, some utilities are piloting virtual metering policies. FortisBC, a privately-owned utility regulated by the British Columbia Utilities Commission (BCUC) is awaiting the approval of a community solar garden in Kelowna.

Some municipalities may own and operate their own electrical distribution utility, and therefore have more flexibility in terms of program creation. Organizations or municipalities that do not own their own utilities may still create a community solar garden through a Power Purchase Agreement with their utility; however, this is dependent on the PPA regulations of the utility in question, and it is recommended that organizations research and understand their local PPA requirements prior to pursuing a community solar project.

Based on policies from the US, virtual net metering/community solar policies can help enable the development of community solar gardens, and should define:

- the minimum and/or maximum installed capacity of a single solar garden installation;
- the service area and distribution requirements for the solar garden installation;
- the requirements of utility and/or third-party community solar garden ownership;
- the minimum and/or maximum number of participants for a single solar garden installation;
- the minimum and/or maximum shares (in watts or watt-hours) a participant can purchase;
- the participant's eligibility and their ownership rights;
- the mechanism(s) for crediting participants based on their share of the solar garden, based on applicable policies;

Project Showcase: City of Nelson Community Solar Garden



Owner: Nelson Hydro

Location: Bonington Generating Station, Nelson BC

Capital Cost: \$224,689

Operating Cost: \$2000 / year

Project Lifetime: 25 years

Funding sources: Nelson Hydro Participants, Bullfrog Power

60 kW

Installed Capacity

\$923.45

Per panel subscription
(upfront payment)

3.5%

On-bill financing

25 years

Contract Length

Figure 3 Nelson Community Solar Garden. Photo credit: Luke Mori

The City of Nelson's Community Solar Garden is the first municipally owned community solar garden in Canada. It is a 60 KW solar array owned and operated by Nelson Hydro, located at the Bonington Generating Station. Subscriptions to the garden are sold on a per-panel basis, and are available exclusively to Nelson Hydro customers. Subscriptions are transferable in the case where the participant moves, so long as they move with the Nelson Hydro service area.

Based on surveys conducted by the City of Nelson, an overwhelming majority of survey participants believed that developing local renewable energy was important, with a majority of respondents still interested in participating in the program even if the cost of solar was higher than hydro power rates. To confirm interest in the project, the City had a 30-day presale period in which interested Nelson Hydro customers paid deposits to secure their subscription. The solar garden was oversubscribed, and Nelson Hydro increased the capacity of the array from 50kW to 60kW.

Maintenance and repairs on the array will be conducted by Nelson Hydro, at no additional costs to subscribers (City of Nelson, 2017).

Project Showcase: Ellison Community Solar Pilot Project



Owner: FortisBC

Location: Ellison Substation,
near Kelowna International
Airport, BC

Capital Cost: \$960,744

Operating Cost: \$9000 / year

Project Lifetime: 40 years

Funding sources: FortisBC
Participants

240 kW

Installed Capacity

\$81 / year

Per panel subscription
(Virtual Solar Panel Option)

\$0.231

Per kWh
(Solar Offset Option)

Figure 4 Location of proposed Ellison Community Solar Project. Photo credit: Google Maps

FortisBC's Ellison Community Solar Pilot Project is proposed 240 kW solar PV array, to be built on the utility's existing Ellison substation, near the Kelowna International Airport. Owned and operated by the utility, the installation is expected to produce 290,000 kWh of electricity in its first year, and all FortisBC customers are eligible to participate. The project is being reviewed by the British Columbia Utilities Commission (BCUC), and a decision is expected by December 2017.

Two pricing mechanisms have been proposed, subject to approval by BCUC. Proposed rates for both pricing options may decrease due to potential competition from other renewable energy options in British Columbia (FortisBC, 2017).

Virtual Solar Panel

Subscriptions will be sold on a per panel basis, and will receive a credit in proportion to their investment. Participants will be charged annually until participants leave the program.

Solar Offset

Subscribers can have a percentage of their electricity consumption offset by the garden, from 10% to 100%, with an Offset rate of \$0.231/kWh.

Considerations for Community Solar Garden Program Design

The following is a list of considerations when developing a community solar garden project. The list below is not exhaustive, and it is recommended that businesses, municipalities, and non-profits adapt their established business development and community engagement processes.



IDENTIFY

Understand key value drivers and key objectives for the program (GHG offset, renewable energy deployment solar energy access and affordability, etc.).

Research applicable policies, incentives, and financing, as well as any limitations on generation capacity, eligibility, etc.

Conduct market research and choose most applicable model.

Identify target participant(s) and all possible stakeholders.

Create business case for program.



DESIGN

Simplify program subscription process and agreement details.

Ensure program is economically competitive to other programs or utility rates.

Create policies, incentives, or program mechanisms that enable program deployment and facilitate participation (where applicable).

Consider financing or funding mechanisms that enable wider participation.



ENGAGE

Listen to needs, wants, and/or concerns of stakeholders.

Gather stakeholder input and synthesize feedback.

Incorporate stakeholder feedback (where relevant and possible).

Encourage buy-in and shared ownership of project.

Maintain communication with stakeholders throughout project development.

The next section, Project Development Phases, provides a high-level overview of key project considerations and suggested project workflow, which are based on established project management processes. Again, it is recommended that organizations adapt established any existing project management processes, as applicable.

Project Development Phases

PROGRAM FEASIBILITY

Identify value drivers and objectives
 Site and Resource Evaluation
 Community Engagement Plan
 Risk and Opportunity Assessment

Economic and Technical Feasibility Study
 Preliminary Program and Ownership Structure
 Program Administration Requirements
 Bylaw Amendments and Council Approval

PROJECT DEVELOPMENT

Site Selection
 Participant Agreements
 Permitting
 Quality Assurance Plan

Design and Engineering
 Risk and Opportunity Assessment
 Contracting and Procurement
 Financing, Sponsorships, and Grants

CONSTRUCTION

Site preparation
 Mounting and array support installation
 Solar array installation
 Installation Inspections

Risk Management, Quality Assurance and Control
 Commissioning
 Project Acceptance and Energization

CLOSEOUT AND HANDOVER

Receive payment from participants
 Receive as-built drawings from contractors
 Community construction completion event

Archive project documentation
 Train electricians, operators, and maintenance staff

OPERATIONS, MAINTENANCE, AND PROGRAM EVALUATION

Monitor solar array electricity production
 Routine inspections
 Preventative maintenance and part replacement

Credit participants
 Administration (adding participants, etc.)
 Program Evaluation

New Westminster Urban Solar Garden – Preliminary Project Details



Figure 5 Photo Credit: City of New Westminster

The City of New Westminster is currently developing a pilot community solar garden– named the Urban Solar Garden. New Westminster is one of the few remaining municipalities in British Columbia to own and operate its own distribution Utility, which puts the city in a position to explore local energy initiatives such as a community solar garden. This section will provide a brief overview on the current status of the project.

Key Drivers

The New Westminster Electric Utility wants to diversify its portfolio beyond traditional electricity distribution.

Success of this project would showcase the City's leadership in local renewable energy generation, and reinforce the City's image of being a progressive and innovative municipality

This project will help advance policies related to solar PV installations, community energy initiatives, or other building scale alternative energy solutions in New Westminster.

Existing Policies and Initiatives

NET METERING: New Westminster has a net metering policy which allows for the interconnection of distributed generation of up to 50 kW.

UTILITY COMMISSION STRATEGIC PLAN: The plan supports local energy generation and diversification of the City's Electrical Utility, which has an objective to embrace clean energy and the green economy, in part through distributed renewable energy generation.

COMMUNITY ENERGY AND EMISSIONS PLAN: The plan identifies actions and strategies to improve energy efficiency and reduce greenhouse gas emissions from new and existing buildings. The Plan also encourages the use of renewable, responsible and local sources of energy in buildings.

ENVISION 2032: The City's sustainability framework includes aspirational descriptions of success that encourage the construction of low-energy buildings and the introduction of renewable energy into these buildings where feasible.

ENERGY SAVE NEW WEST: this program was launched to engage local homebuilders, developers, architects, and residents on energy efficiency in residential buildings. The Urban Solar Garden presents an opportunity to help builders and residents achieve net zero energy targets by combining energy efficiency initiatives with the use of solar PV.

Preliminary Solar Array Design and Location



Owner: New Westminster Electric Utility

Location: Rooftop of civic owned building(s) (TBD)

Capital Cost: TBD

Operating Cost: TBD

Project Lifetime: 25 years

Funding sources: New Westminster participants, others TBD

50 kW

Installed Capacity
(Target)

\$820-\$940

Per panel subscription
(Projected; TBD)

25 years

Contract Length

Figure 6 Queensborough Community Centre, potential location for the Urban Solar Garden. Photo credit: Google Maps

The Urban Solar Garden grid tied solar PV array is planned to be 50 kW, owned and operated by the New Westminster Electric Utility. The array will be installed on the rooftops of feasible buildings owned by the city. The city's Net Metering Program limits installations to 50 kW, so multiple locations and arrays will be considered if there is community interest that exceeds this. Based on preliminary assessment, a 50kW array is expected to generate 54,000 kWh of electricity annually. Subscriptions are available exclusively to those with an Electric Utility account.

Subscriptions into the Urban Solar Garden will be on a per-panel basis, with an initial upfront cost. Payments from participants will fund the capital costs of the project, and will not affect electricity rates for residents not subscribed to the program. Given initial cost estimates, the price of electricity in BC (\$0.10/kWh) and assuming an average annual utility escalation rate of 3.5% (based on historic escalation rates), the expected simple payback for a participant can be between 15-20 years.

Operations and maintenance will be the responsibility of the Electric Utility, and the cost will not be incurred on the participant. Participants can move locations and still receive solar credit from the program, so long as they remain with the Electric Utility service area.

Marketing, Communications, and Community Engagement

Community interest and participation is key to the overall success of this project. As such, City staff have engaged in a variety of marketing and communications initiatives to spread awareness of the project and explain the concept. This included print ads, billboards, social media campaigns, and a one-minute explainer video.

To gauge community commitment, a 30-day pre-sale of panel subscriptions was conducted in November, where deposits were required to participate in the Urban Solar Garden. Prior to this, two public information sessions were organized alongside the aforementioned marketing initiatives. An online survey was developed for those who could not attend the events in person, and the results can be seen in Appendix A.

96% of total subscriptions were pre-sold during the 30-day period. Subject to council approval, the project will continue to Project Development and Construction phases, with target completion being in 2018.

Figure 7 Clockwise from left: Public Information Session; Solar Garden Concept Video (credit: Ballistic Arts); Billboard Advertisement (credit: Heather Dougall)

2

150

172

96%

Public Information Sessions

Total in-person attendance

Survey Respondents

Subscriptions pre-sold by Nov 24



 URBAN SOLAR GARDEN

Help us shape New West's clean energy future.

 NEW WESTMINSTER

PUBLIC INFORMATION SESSION
THURSDAY, JULY 20TH - ANVIL CENTRE

[LEARN MORE](#)

EnergySaveNewWest.ca/usg

Resources and Further Reading

This report provides a high-level overview about community solar gardens and the status of the Urban Solar Garden Project in New Westminster. Community solar gardens are promising programs that can enable accessible and affordable solar energy for residents or businesses, and can help achieve personal, provincial, or national energy targets.

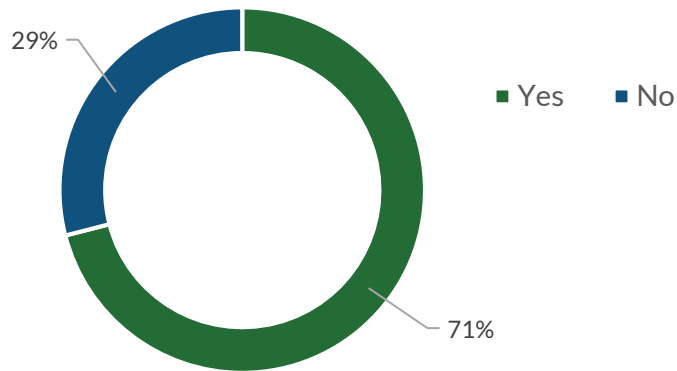
Solar garden models are varied from program to program, depending on policies and regulations in each individual jurisdiction. As such, there are multiple ways and forms a community solar garden can develop. While this report focuses on municipal and utility owned models of community solar gardens, privately owned and non-profit models exist as well.

The following is a list of resources for further reading that may assist municipalities, businesses, or non-profit organizations that wish to explore the concept of community solar gardens in more detail.

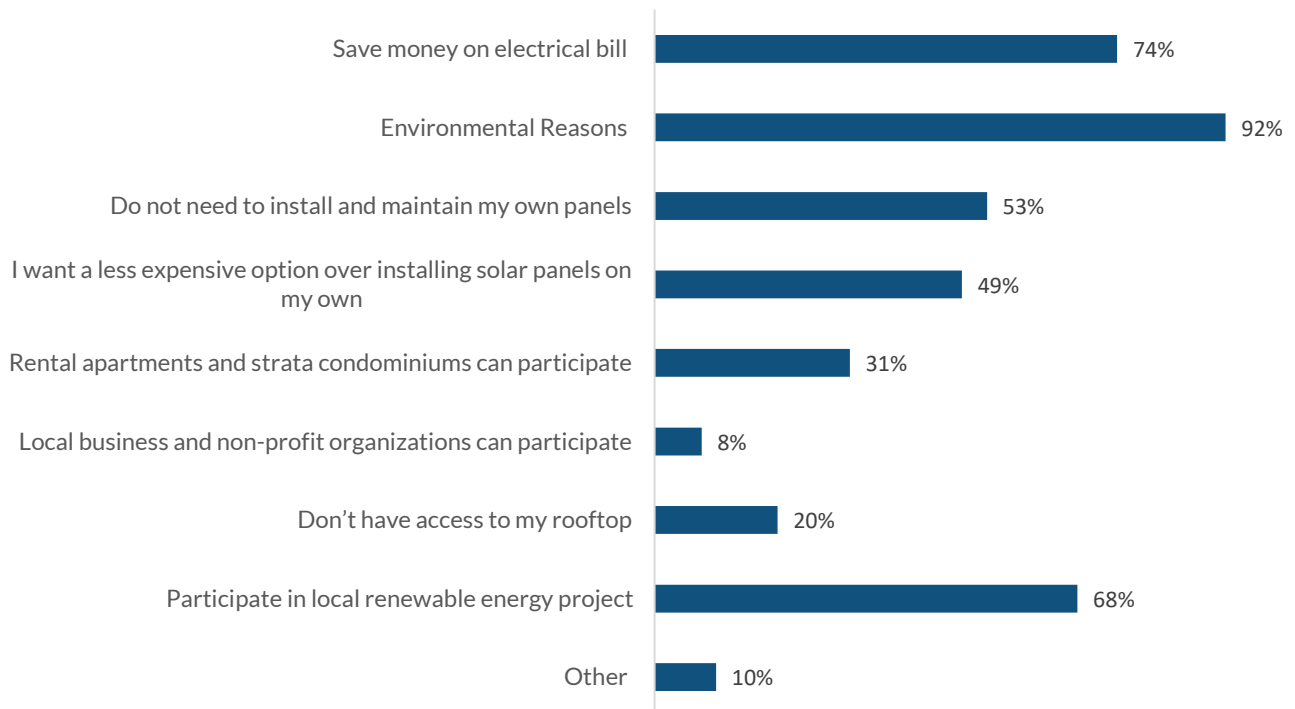
- **A Guide to Community Solar: Utility, Private, and Non-profit Project Development, by the US Department of Energy:** This guide is designed to provide a high-level overview of designing and executing community solar projects. While focused on the United States, the guide does provide further insights into the three solar garden models described above, their benefits, and limitations.
- **Alberta Community Solar Guide: Organizing and owning solar PV projects, by the Pembina Institute:** This guide provides key insights for developing community solar gardens in Alberta. The report also provides an overview into the economics of community solar, guidance on project management and key actors in Alberta's electricity system.
- **Project Management Book of Knowledge, by the Project Management Institute:** The PMBOK provides best practices for project management and these best practices can be applied to the deployment of community solar projects. This guide is recommended reading for any project management or project coordinator.

Appendix A: New Westminster Public Information Survey Results

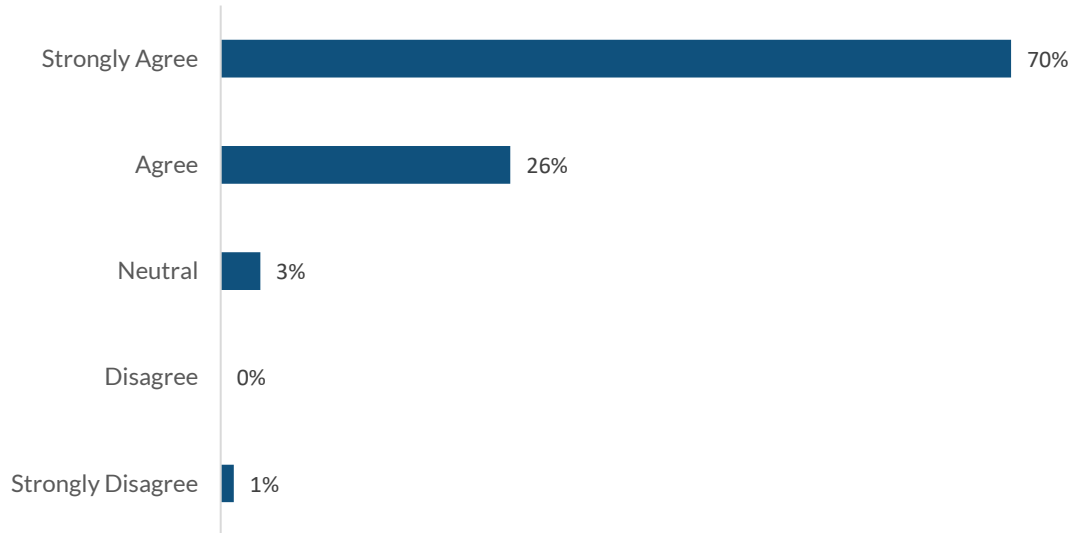
Have you previously considered installing solar panels on your home or business?



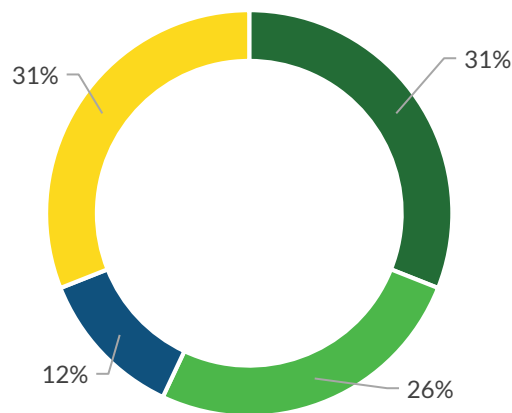
What are your reasons for participating in the Solar Garden?



Developing local renewable energy is important to me

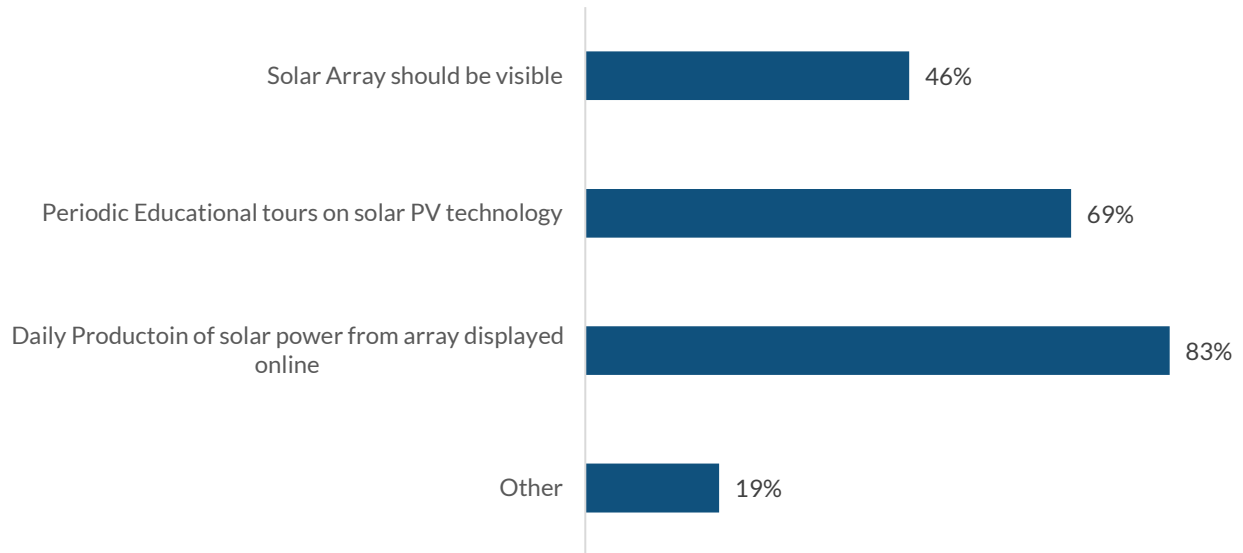


Preliminary indications are that the subscription cost per panel will be a single, upfront payment of around \$1000. Would you be interested in a monthly payment plan as an alternative?



- Yes, if I invested in one panel (\$1000)
- Yes, if I invested in more than one panel (more than \$1000)
- No
- Need more Information

The City is interested in maximizing the community benefits of this pilot project and would like to hear your ideas. We've offered a few below but would welcome your input. Please select the ideas that appeal to you



Selected Comments from New Westminster Residents

"I think it's a great idea, happy that New West is a part of it"

"Affordable solar options for residents of NW is a great idea"

"I support this initiative and think that the city's efforts to move towards renewable power are commendable and should be supported"

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- *person by Dmitry Baranovskiy*
- *Community by Dmitry Baranovskiy*
- *Colorado by Maria Darron*
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