Report

Date	October 22, 2024	File:
Subject	Opportunities for solar power in North Cowichan	

PURPOSE

To report to the Environmental Advisory Committee on installation and education opportunities for solar power in North Cowichan.

BACKGROUND

The 2022 Climate Action and Energy Plan (CAEP) outlines actions to promote solar photovoltaic (PV) systems under Goals 9 and 10: "Build local capacity to install solar PV systems, coordinate renewable energy incentive programs, and provide renewable energy education" and "Starting in 2030 at the latest, install net metered solar PV systems on all new buildings, supplying at least 10% of their electric load". While the CAEP notes that BC's low-carbon grid limits the emissions reduction potential of solar, these systems can help offset building electricity demand and contribute to achieving net zero energy and emissions performance.

Staff previously presented a report to Council discussing the potential of solar energy on December 7, 2021 recommending that the market be monitored for financial and technological improvement. In response, a public delegation (Peter Nix and Tom Mommsen) presented feedback on this report to the Environmental Advisory Committee (EAC) on April 26, 2022. Peter Nix returned to Council on April 19, 2023, to present the benefits of solar energy in achieving carbon reduction goals in North Cowichan using personal experience from their solar farm near Maple Bay. Council subsequently passed a motion directing the EAC "…to have them take another look at the Municipality's approach to solar power in the Climate Action and Energy Plan".

Following the presentation by Peter Nix, Don Skerik and Tom Mommsen at the August 22, 2023 EAC meeting, Council directed staff to:

(1) investigate the environmental, social, and economic impacts of installations on civic buildings and typical single-family buildings, mindful of the recommendations brought forward at the August 22, 2023, Environmental Advisory Committee meeting about solar power,
(2) look for opportunities to educate and demonstrate to residents how to advance solar power,
(3) investigate municipal tools and incentives available to advance solar projects in North Cowichan; and
(4) bring back a report to the EAC for review.

DISCUSSION

Solar PV systems convert sunlight into direct current (DC) electricity, which is then converted to alternating current (AC) for use in buildings. There are two main types of systems: off-grid systems,

which are typically used in remote areas with energy storage, and grid-tied systems, which connect to BC Hydro's grid. Most properties in North Cowichan use grid-tied systems.

BC Hydro's self-generation program supports residential and commercial systems under 100 kW, allowing users to consume on-site electricity and send excess back to the grid for bill credits. Through BC Hydro's rate design process with the BC Utilities Commission, a new rate for self and community generation will be submitted by December 2024. BC Hydro aims to generate 1,000 GWh/yr from self-generation by 2040, equivalent to powering 100,000 homes. Larger systems (over 100 kW) are handled through the Distribution Generator Interconnections process, primarily for independent power producers, focusing on utility-scale wind and solar projects due to cost efficiency. BC Hydro issues formal Calls for Power to enable independent power producers to generate electricity for the grid. The recent power call was the first issued in 15 years and BC Hydro received 21 proposals with the potential of powering 800,000 homes[1].

BC Hydro's electricity is 98% renewable[2], with plans to reach 100% under the CleanBC Roadmap to 2030. Solar and hydroelectricity have similar low lifecycle greenhouse gas emissions[3]. Community-based solar projects foster energy independence and collaboration. Solar panels are designed to de-energize in power failures to protect powerline technicians from working on live circuits, but systems can be installed with battery storage and backup to provide emergency power during power outages, offering greater local resiliency and independence.

Urban Systems' technical report explored potential financial scenarios for installations in civic and single-family buildings (Attachment 1).

Civic buildings:

In 2023, North Cowichan purchased 10.86 GWh of electricity from BC Hydro for $791,025, resulting in 122 tonnes of CO2e emissions. This electricity powered civic buildings, utility infrastructure and lighting. North Cowichan's solar photovoltaic initiatives include:

- Solar-powered crosswalk lights.
- A 257-panel solar array at the new RCMP building, estimated to generate 124,021 kwh annually. The system was optimized for BC Hydro's Self-Generation program, though the roof could host a larger system.
- The Crofton Firehall expansion project is solar-ready.

Urban Systems reviewed solar energy potential for several municipal buildings (Attachment 1). Smaller buildings, like the Crofton Firehall, showed greater potential due to their roof-to-floor area ratio and consumption levels lower than BC Hydro's 100 KW net metering cap. A solar installation at the Crofton Firehall is estimated to cost $45,500 ($27,300 with rebates) and would save $2,722 annually, reducing energy costs by 48% and a simple payback of 16.7 years (10 years with rebates). The other assessed buildings were the Municipal Hall, Aquatic Centre and Fuller Lake arena, which were deemed not

[1] https://news.gov.bc.ca/releases/2024EMLI0068-001550
[2] https://www.bchydro.com/toolbar/about/sustainability/our-clean-system.html
[3] https://www.nrel.gov/analysis/life-cycle-assessment.html

financially viable without grant funding (simple payback exceeds a typical 25-year warranty period for a solar panel).

Several municipalities have advanced solar projects to offset the purchased cost of electricity (such as the District of Hudson's Hope and the Comox Valley Regional District). There are also five governments operating community solar as they operate an electric utility which includes the generation and transmission infrastructure within their communities[4]. As North Cowichan is not a utility, North Cowichan is unable to resell solar energy to other entities. It is recommended that staff monitor emerging solar energy rates from BC Hydro's rate design process for future conditions that might enable community solar.

Summary of Recommendations for Civic Buildings:

1. Authorize up to $50K from the CAEP Reserve to install solar panels on the Crofton Firehall, which will serve as a demonstration site for solar energy.
2. Monitor the performance of the RCMP building's solar installation as a solar demonstration site.
3. Monitor BC Hydro's emerging rate structure to reassess viability, with potential changes including virtual net metering, larger capacity installations, and pricing structures.

Single-family buildings

The CAEP modelling shows that 4% (13,345 tonnes CO2e) of North Cowichan's 2016 community emissions come from electricity use: 1,895 tonnes CO2e from residential, 3,065 tonnes CO2e from commercial and 8,334 tonnes CO2e from industrial activity. Because of expected increases in BC Hydro's clean energy supply, the emissions associated with electricity use will continue to decrease. Solar energy will have minimal impact on the community's GHG emissions and ability to meet the targets in the CAEP.

Urban Systems evaluated four residential solar installation scenarios (Attachment 1). These scenarios considered netting out BC Hydro Tier 2 charges in all-electric and non-electrically heated homes and accommodating all electricity use in both types of homes. The energy savings are based on current electrical pricing, and rate changes could improve the business case. Attachment 1 provides preliminary suggestions on how an optional time-of-use day rate structure could impact the financial analysis.

- An all-electric home consuming 15,000 kwh/yr could cost $26,500-$37,100 ($21,500-$28,125 with BC Hydro incentives), offer annual savings of $2,000, and simple payback between 13-18 years (10.5-15.5 years with incentives).
- A non-electric heating home consuming 8,700 kwh/yr could cost $16,000-$22,400 ($11,000-$17,400 with BC Hydro incentives), offer annual savings of $1,000, and simple payback between 15.6-21.8 (10.7-17 years with incentives).

[4] There are five municipal utility providers that are located in BC Hydro (New Westminster) or FortisBC (Grand Forks, Summerland, Penticton, and Nelson) service territories and sell electricity directly to their customers. These municipalities have their own 'net-metering' program and specific details vary. Energy utilities require resources to own, operate, maintain the billing, distribution, and regulatory obligations, and can be costly to run without economies of scale.

Municipal tools and incentives

Three areas often present barriers to increased solar energy installations: permitting requirements, up-front capital, and lack of awareness of solar potential. Residents who live in rental or strata environments face an additional barrier.

The Provincial Building Act states that only the Province of BC can establish technical building requirements, primarily through the BC Building Code, with limited exceptions where local governments can impose additional regulations. Local governments can only add requirements through the BC Energy and Zero Carbon Step Codes or if classified as an "unrestricted matter" under the Act. As the Building Code does not mandate solar power, North Cowichan's authority to require installation is limited. At the community level, some buildings are more suitable for solar than others, such as south-facing homes with strong solar exposure. North Cowichan's Development Permit Area guidelines encourage the use of renewable energy technology where appropriate. The Kingsview housing project is an example of a place where new homes must be "solar ready," as negotiated in its Phased Development Agreement.

Solar installations require a North Cowichan building permit and an electrical permit from Technical Safety BC. The BC Building Code 2024 introduces new requirements, such as snow load considerations for roofs with solar panels. BC Hydro is working on a best practice guide for municipal solar permitting, and some municipalities, like Richmond, have streamlined this process[5]Additional dialogue with the building design, construction, and solar-installer communities can explore opportunities to streamline permits and improve awareness.

Incentive programs are typically offered as a 'rebate' program, requiring the up-front capital to be in place and repayment of the incentive at project completion. Incentives would not remove the barrier for installation unless the homeowner is able to afford the up-front investment. Awareness of financial mechanisms such as loan structured programs would remove this barrier, as other levels of government provide loans and incentives, and private lenders and solar companies offer homeowners the ability to finance solar projects. Available financial incentives include a federal $40,000 no-interest Canada Greener Homes Loan, a BC Hydro rebate of $2,500 (with an additional $2,500 for battery storage), and a provincial PST exemption for solar panels. Given the high cost-to-emission reduction ratio, it is not recommended that North Cowichan provide additional incentives at this time. Instead, North Cowichan's efforts should be directed to increase awareness of these mechanisms.

The CAEP introduces the use of property tax mechanisms that can encourage energy retrofits, which could also consider solar energy. However, it is important to note that implementing such mechanisms would most likely be very administratively intense, requiring significant staff resources, time and up-front financial resources. Additional staff assessment is required for property-assessed clean energy programs to understand the administration and taxation implications. Furthermore, the CAEP needs to generate more revenue to support this incentive effectively. Currently, the District of Saanich has introduced this type of program, and the Province of BC has contemplated similar program development within the CleanBC Roadmap to 2030.

[5] https://www.richmond.ca/__shared/assets/permits5848248.pdf

North Cowichan's website does not have materials that provide awareness on solar energy. A page can be created to highlight funding opportunities, technical information, and highlights from civic installations. An additional web module that can be considered is the City of Victoria's Solar Rooftop Calculator[6], a GIS-based tool that provides a screening assessment of solar potential of properties using LiDAR data. Victoria's website provides information that estimates how much solar energy a building can generate, estimated cost savings, and potential system sizes. It also offers guidance on financing options and available grants, making it easier for homeowners to make informed decisions about installing solar panels. A module such as this can be explored using North Cowichan's data.

Residents who live in rental or strata environments have limited solar energy opportunities in the current BC regulatory system. Owners of these properties are eligible for the above mentioned programs, and BC Hydro has rebates that are applicable to multi-family buildings and social housing providers. Future emerging BC Hydro rate structures may also allow for virtual net metering, which could open opportunities where barriers still exist. Virtual net metering allows credits to be provided for a share of solar energy outside of one's own meter (e.g. community solar).

Summary of recommendations:

1. Explore opportunities to increase awareness of requirements and streamline the permit process with the building design, construction, and solar-installer community.
2. Assess property-assessed clean energy programs to understand potential, administration and taxation implications.
3. Improve North Cowichan website content to increase awareness of solar projects and financial mechanisms.
4. Explore introducing a GIS layer that provides information on the solar potential of North Cowichan properties.

OPTIONS

1. **(Recommended Option)** That the Environmental Advisory Committee recommends Council:
   (1) Authorize up to $50K from the Climate Action and Energy Plan Reserve in the 2025 budget to install solar panels on the Crofton Firehall to provide a demonstration site for solar.
   (2) Monitor the performance of the RCMP building's solar installation as a solar demonstration site.
   (3) Monitor BC Hydro's emerging rate structure to reassess viability, with potential changes including virtual net metering, larger capacity installations, and pricing structures.
   (4) Explore opportunities to increase awareness of requirements and streamline the permit process with the building design, construction, and solar-installer community.
   (5) Assess property-assessed clean energy programs to understand potential, administration and taxation implications.
   (6) Improve North Cowichan website content to increase awareness of solar projects and available incentives.
   (7) Explore Introducing a GIS layer that provides information on solar potential.

[6] https://solarrooftop.victoria.ca/prod/public/

- This option is consistent with developing specific strategies and actions to advance the goals in the CAEP while also considering broader sustainability objectives and the governance structures the municipality operates within.

2. That the EAC recommends the following for Council's consideration:

   a. [list items here]

- Additional options may require additional resources or investigation.

IMPLICATIONS

Implications	Concerns or Impacts to North Cowichan
Social	• Solar fosters energy independence and improved understanding of energy systems • Because of the up-front capital requirements, additional incentives would need to address the capital barrier to encourage solar installations beyond those with the financial means.
Environmental	• Solar energy offers similar GHG benefit to BC Hydro electricity and increases local energy generation to supplement BC supply needs.
Financial	• Staff recommendation considers solar systems that offer financial viability, with recommendation to monitor and learn for future installations. • Solar investments yield positive economic outcomes for local solar installers.
Policy/Legislation	• The recommended option is in line with the BC Building Code's requirements for what municipalities can enforce regarding energy efficiency and does not make North Cowichan an electrical utility. New net-metering rate design in late 2024 may create greater opportunities.
Strategic Priority	• Aligns with Council's Strategy Plan direction to implement the Climate Action and Energy Plan.
Communication	• Resources required for website content development.
Staffing Implications	• No significant impacts or concerns. Staffing hours are necessary to oversee implementation of recommended actions, but efforts are not expected to be substantial.

RECOMMENDATION

That the EAC recommends Council:

(1) Authorize up to $50K from the CAEP Reserve in the 2025 budget to install solar panels on the Crofton Firehall to provide a demonstration site for solar.
(2) Monitor the performance of the RCMP building's solar installation as a demonstration site for solar.
(3) Monitor BC Hydro's emerging rate structure to reassess viability, with potential changes including virtual net metering, larger capacity installations, and pricing structures.
(4) Explore opportunities to increase awareness of requirements and streamline the permit process with the building design, construction, and solar-installer community.
(5) Assess property-assessed clean energy programs to understand potential, administration and taxation implications.

(6) Improve North Cowichan website content to increase awareness of solar projects and available incentives.
(7) Explore Introducing a GIS layer that provides information on solar potential.

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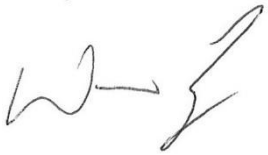
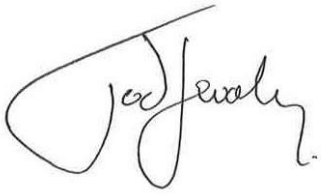


David Conway
Director, Subdivision and Environmental Services

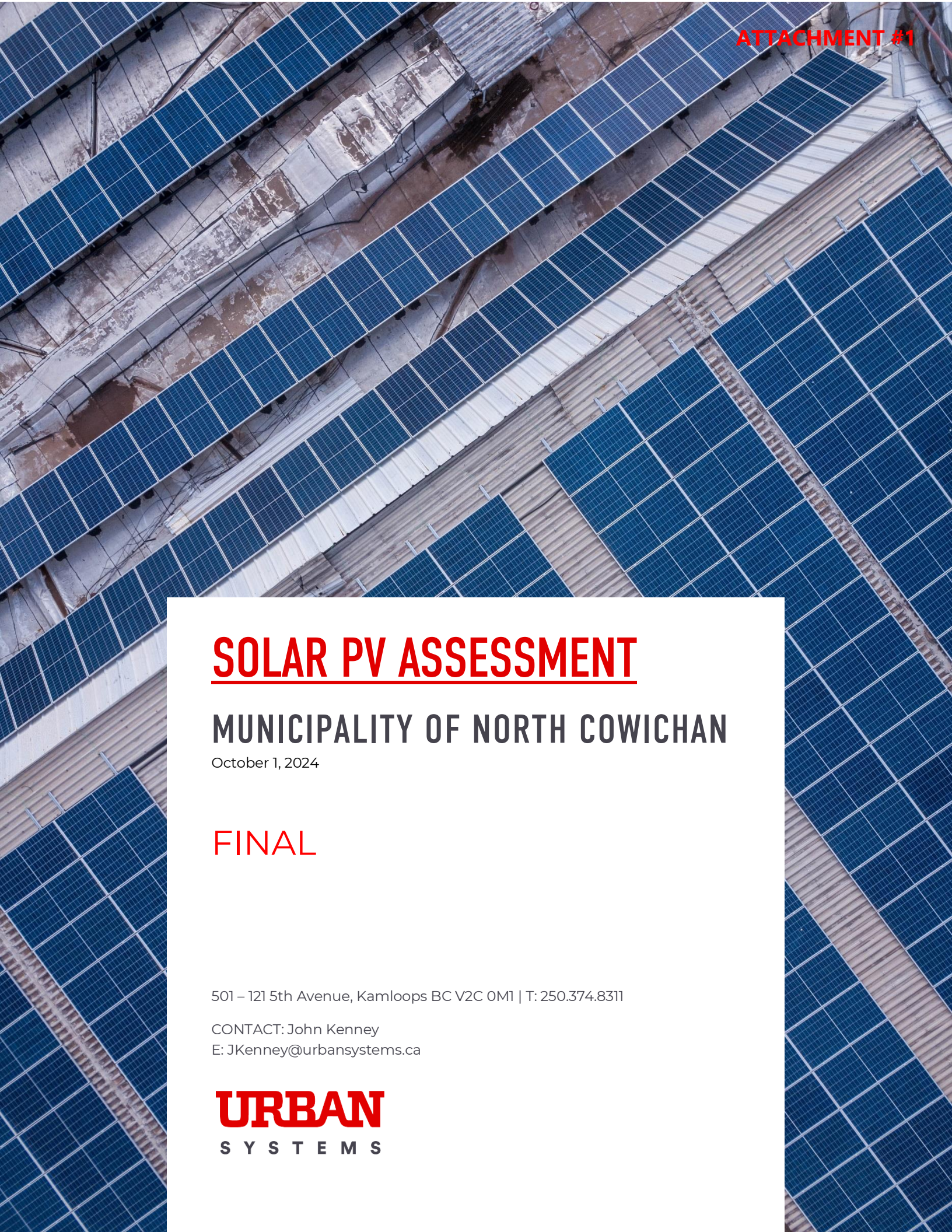
Approved to be forwarded to the Environmental Advisory Committee:



Ted Swabey
Chief Administrative Officer

Attachment:
(1) 2024 Solar Report

ATTACHMENT #1



SOLAR PV ASSESSMENT

MUNICIPALITY OF NORTH COWICHAN

October 1, 2024

FINAL

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CONTENTS

TABLES

FIGURES

EXECUTIVE SUMMARY

Energy sustainability is one of the foundations of a community's well-being. Ensuring a community has access to a stable, reliable and affordable energy supply is critical to supporting economic and social vibrancy.

This has been recognized by the Municipality of North Cowichan (North Cowichan), who has already installed solar photovoltaic (PV) on the new RCMP building, will construct the firehall expansion to be solar ready, and has expressed an interest in determining the business case of installing solar PV systems on additional civic community buildings. In addition, North Cowichan is looking to understand the business case of various residential solar PV installation scenarios.

As outlined in the Climate Action and Energy Plan, North Cowichan has two goals directly supporting solar PV projects, which include:

1. Build local capacity to install solar photovoltaic systems, coordinate renewable energy incentive programs, and provide renewable energy education; and
2. Starting in 2030 at the latest, install net metered solar photovoltaic systems on all new buildings, supplying at least 10% of their electric load.

As such, Council directed staff to investigate the impacts of installations on civic buildings and typical single-family buildings. In response, this report provides a business case assessment of various solar PV project configurations in North Cowichan. To complete the business case assessment, desktop-based solar PV modelling was completed for the following community buildings:

- Municipal Hall and Public Works
- Cowichan Aquatic Centre
- Fuller Lake Arena
- Community Firehall

For each site of interest, a project configuration was developed to inform desktop energy modelling to estimate its potential annual electricity generation and prepare an order of magnitude project cost estimate and likely business case. Where possible, the analysis considered the rooftop azimuth (orientation), site shading restrictions, the available area for solar panels, and the overall power consumption of the building.

Additionally, a desktop-based assessment was conducted to evaluate the likely business case of four residential installation scenarios. Specifically, this assessment considered:

- An all-electric home, with the PV system sized to eliminate (or "net out") BC Hydro Tier 2 charges;
- An all-electric home, with the PV system sized to accommodate (or "net out") all electricity use;
- A non-electrically heated home, with the PV system sized to eliminate (or "net out") BC Hydro Tier 2 charges;
- A non-electrically heated home, with the PV system sized to accommodate (or "net out") all electricity use.

The estimated annual solar energy production results and key business case metrics for the community buildings and residential scenarios are provided in **Table ES-0.1** and **Table ES-0.2** below.

Table ES-0.1: Summary of Solar PV Analysis Completed for Civic Buildings

Building Name	Annual Energy Usage (kWh)	Annual Usage Charges	Proposed Solar Capacity (kW)	Estimated Annual Generation (kWh)	Approximate System Cost	Approximate System Cost with BC Hydro Rebate	Estimated Annual Savings	Estimated % Reduction in Total Energy Costs	Financially Viable without Grant Funding?
Municipal Hall and Public Works	444,800	27,152	66	75,900	$165,000	$140,000	$4,956	11%	No
Cowichan Aquatic Centre	2,166,720	132,307	31	36,000	$77,500	$52,500	$2,351	1%	No
Fuller Lake Arena	692,400	42,216	100	107,244	$250,000	$225,000	$7,003	11%	No
Firehall	45,002	5,677	18	20,133	$45,500	$27,300	$2,722	48%	Yes

Table ES-0.2: Summary of Solar PV Analysis Completed for Residential Homes ($2.8/W)

Single Family Detached Home - Electric Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	7,248	15,348
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	6.25	13.25
Estimated System Cost	$19,600	$17,500	$37,100
Estimated System Cost (with BC Hydro Rebate)	$14,600	$-	$32,100
Estimated Annual Savings ($, Tier 1 and Tier 2 Rates)	$933	$1,072	$2,005
Estimated Annual Savings ($, Time of Day Rates)	$1,710		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	18.5		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	18.8		
Single Family Detached Home - Gas Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	636	8,736
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	1	8
Estimated Cost	$19,600	$2,800	$22,400
Estimated Cost (with BC Hydro Rebate)	$14,600	$-	$17,400
Estimated Annual Saving ($, Tier 1 and Tier 2 Rates)	$933	$94	$1,027
Estimated Annual Savings ($, Time of Day Rates)	$1,041		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	21.8		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	16.7		

1.0 INTRODUCTION

The concept of energy sustainability plays a pivotal role in shaping a community's prosperity, representing a key determinant of its economic and social vitality.

Recognizing the significance of a steady, reliable and reasonably priced energy supply, the Municipality of North Cowichan (North Cowichan) is keen on further exploring the feasibility of solar photovoltaic (PV) installations on several civic community buildings. This extends to understanding the likely business case for residential home installations, a move aimed at guiding potential policy and programming strategies.

As part of this initiative, Urban Systems was engaged to complete preliminary solar PV modelling for the following community buildings: Municipal Hall and Public Works, Cowichan Aquatic Centre, Fuller Lake Arena, and the Community Firehall.

The modelling estimates the annual electrical generation potential of a solar PV system for each site of interest and assesses the business case and financial metrics of the proposed installations. Various factors, such as rooftop azimuth, site shading restrictions, available areas for solar panels, and overall power consumption, have been considered in the analysis.

Moreover, Urban Systems has also conducted a desktop-based assessment to evaluate the likely business case for four residential solar installation scenarios. These scenarios consider an all-electric home and a non-electrically heated home, with the PV system sized either to eliminate BC Hydro Tier 2 charges or cover all electricity use (on a net basis). As each home in the community has unique attributes that can directly influence the electricity production of a solar project, Urban Systems assumed that each solar PV system would perform under near-optimal conditions.

While this report aims to provide comprehensive insight into the business case of installing solar PV systems in the community, it is important to remember that site-specific details of each scenario considered were not fully accounted for, as this was considered out of the scope of this assessment. Thus, the performance of each system reviewed (including the residential scenarios) may differ from that reported herein. However, we are confident that the assessment is sufficient to inform future policy and programming by North Cowichan.

Should North Cowichan wish to refine this assessment beyond the scope of this work, Urban Systems would be pleased to do so. Additionally, various assumptions and modelling strategies for this assignment can be varied – based on the direction of the Municipality – as needed to further inform future policy and programming efforts.

2.0 ABOUT SOLAR ENERGY

Solar PV systems capture energy from the sun and convert it into electricity for use in homes and buildings.

Grid-tied systems (such as the one shown in **Figure 2-1**) have the ability to send excess power produced by solar installations to the BC Hydro grid.

Each solar PV system is sized and developed to meet a site's specific requirements. This includes consideration of:

- System connection to the grid
- Site (roof) surface area
- Azimuth (building orientation)
- Roof slope
- Site shading
- Electricity demands of the building

Figure 2-1 below provides an overview of the equipment required for a grid-tied system.

As North Cowichan is connected to BC Hydro's grid, the image below represents a solar PV project similar to that which could be installed on community buildings and homes in the region via BC Hydro's Net Metering program. A battery storage solution was not considered as part of this analysis, given their material capital cost and the potential for homes and buildings to simply connect to BC Hydro infrastructure. This is the most cost-effective and favourable strategy solar PV projects in BC under the current regulatory and policy environment.

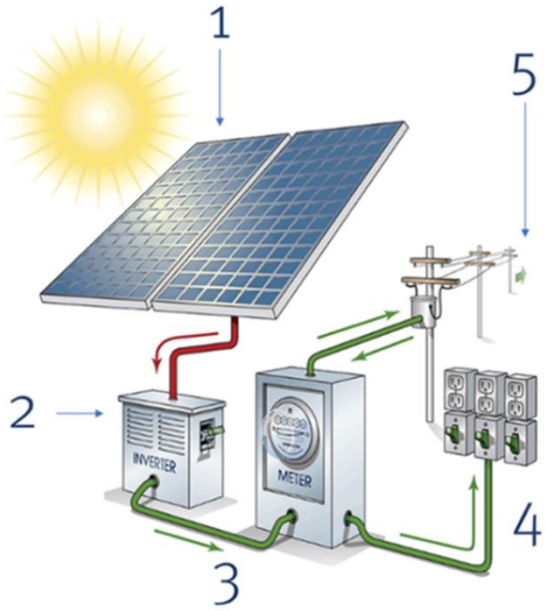

Figure 2-1: Operation of a Grid-Tied Solar PV System

1. Solar Panels: Sunlight falls on solar panels during daylight hours. The solar panel converts the sun's energy into Direct Current (DC) electricity which is sent to the inverter;
2. Inverter: The inverter converts the DC electricity into Alternate Current (AC) electricity which can be readily used for consumption;
3. Bi-directional meter: If there is more solar production than consumption at any given time, excess electricity is sent to the utility company through the bi-directional meter. The meter tracks how much energy is consumed or produced and sent to the grid;
4. Power for a building: After travelling through the bi-directional meter, solar power can be used to power lights, plugs, and appliances in the building; and
5. Utility power is provided when the building demand exceeds solar energy production. See **Section 3.0** for details on how BC Hydro rates and programs support micro-generation in British Columbia.

3.0 BC HYDRO NET METERING (SELF-GENERATION) PROGRAM

At this time, BC Hydro's only active electricity procurement/self-generation program is the Net Metering Program.

This program allows BC Hydro customers to produce their own renewable energy with systems up to 100 kW in capacity. The program is designed to be a "demand side management" program to help customers reduce their overall BC Hydro billing costs. As North Cowichan is not a municipal utility, power cannot be resold from a solar installation through a virtual Net Metering Program. In other words, all power generated must be used by the building on which the solar panels are installed, or "sold back" to BC Hydro for credits to be used at a later date.

Before February 14, 2019, BC Hydro offered two additional electricity procurement programs: the Standing Offer Program (SOP) and the Micro-Standing Offer Program. These programs, which have since been indefinitely suspended, allowed project developers to sell electricity from renewable energy projects up to 15 MW in capacity.

Since the suspension of the Standing Offer Program and the Micro-Standing Offer Program, renewable energy projects with a maximum capacity of 100 kW can be developed under the Net Metering Program. These projects are intended for self-generation (meaning the electricity generated is to be used by the building on which the system is installed), and most are roof or ground-mounted solar PV installations on a BC Hydro customer's home or business.

Under the Net Metering Program, if the solar PV installation (or other renewable energy system) generates more electricity than the home or business needs, credits are applied to the BC Hydro account. These credits can be used to offset future energy use, such as when the solar PV installation cannot generate enough electricity to meet the building's demands. Any credits remaining from excess electricity generation at the end of a one-year period are purchased from the customer by BC Hydro at the wholesale (Mid-C) average annual market rate from the year prior. In recent years, this rate has been less than $0.06/kWh, thus discouraging projects from being oversized (i.e. sized to produce more than the total electricity consumption of the account). At this time, surplus credits can not be transferred between different BC Hydro accounts.

It is worth noting that BC Hydro regularly reviews the Net Metering Program. As part of these reviews, BC Hydro explores the applicability of various program structure changes and evolutions. For example, in the past, BC Hydro has consulted on potential changes that included virtual net metering, larger

capacity installations, pricing structures and so on. The Net Metering Evaluation Report[1] from 2020 outlines some of the topics explored and considered for the program. BC Hydro is currently proposing changes to the Net Metering program via its application to the BC Utilities Commission via the 2024 Rate Desi. Additional information is available on BC Hydro's website[2].

Should North Cowichan wish to develop solar PV projects at a larger scale, they would have to participate in a Call for Power by BC Hydro, which typically requires the completion of a detailed solar feasibility study for the utility scale project, and/or entering a partnership with a solar PV developer.

3.1 BC HYDRO SOLAR AND BATTERY REBATE PROGRAM

In July 2024, BC Hydro announced a new solar and battery rebate program for homes and businesses. Homeowners can apply to BC Hydro's Net Metering program and receive up to $5,000 to support the installation of solar panels on their home, and can receive an additional $5,000 to support the installation of battery energy storage systems (BESS)[3]. Under this program, BC Hydro also provides businesses with rebates of up to $25,000 for solar installations and $25,000 for BESS[4].

Residential customers who sign up for this rebate agree to future changes to the "Self-Generation Net Metering Rate" structure, which is currently under review by the BC Utilities Commission. A review of the submission of BC Hydro's application to the BC Utilities Commission suggests that such changes may include time-of-day pricing for excess generation and other amendments that will likely be brought forward in the "Self-Generation Service Rate". The details of these proposed changes are limited, and therefore, there remains uncertainty regarding how they may influence the financial outcomes of future investments in solar PV systems.

The links provided in the footnotes below provide additional information, including the terms and conditions of the program.

4.0 BC HYDRO RATE SCHEDULES

BC Hydro's electricity rates vary based on the amount of electricity a home, business or building uses per year. In the context of a solar PV assessment, understanding the rate structure of the account is important to inform the business case of a project. In other words, the electricity generated by the solar project displaces electricity that would have otherwise been purchased from BC Hydro.

The General Service Business rates vary depending on the amount of electricity used by the account holder over the course of a year. This electricity usage is measured in both kWh and kW by BC Hydro.

Table 4.1 below provides a summary of BC Hydro's General Service Business Rates and which rates apply to each of the sites considered in this report.

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[1] See https://app.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/2020_10_30_COMPL_G_168_20_RS_1289_NM_EVAL_RPT.pdf

[2] https://www.bchydro.com/toolbar/about/strategies-plans-regulatory/rate-design/current-activities.html

3 Additional details on this program are available here: https://www.bchydro.com/powersmart/residential/rebates-programs/solar-battery.html?utm_source=direct&utm_medium=redirect&utm_content=solarrebate

4 Additional details on this program are available here: https://www.bchydro.com/powersmart/business/programs/business-solar-battery.html

It should be noted that in addition to the energy charges summarized in the table below, accounts serviced under the General Service Business Rate are also charged a basic (daily) charge, demand charge, and a power factor surcharge.

Table 4.1: Summary of BC Hydro's General Service Business Rates[5]

Rate Schedule	Rate Criteria	Energy Charge (As of Spring 2024)	Asset
Small General Service Rate (1300)	Business customers with an annual peak demand less than 35 kW.	$0.1240 / kWh	Firehall
Medium General Service Rate (1500)	Business customers with an annual peak demand between 35 and 150 kW, and use less than 550,000 kWh of electricity per year.	$0.0958 / kWh	None
Large General Service Rate (1600)	Business customers with an annual peak demand of at least 150 kW, or use more than 550,000 kWh of electricity per year.	$0.06 / kWh	Municipal Hall and Public Works, Aquatic Centre, and Skate Park, Fuller Lake Arena

For residential homes (Rate Schedule 1101), BC Hydro customers are charged based on a tiered rate structure. In addition to a fixed basic daily charge, BC Hydro customers are charged one rate for electricity usage that falls under a certain threshold in each billing period (Tier 1), and a higher rate for all electricity use above that threshold in the billing period (Tier 2).

Energy charges associated with the Tier 1 and Tier 2 rates are as follows:

- Tier 1: $0.1097 / kWh for the first 1,350 kWh in an average two-month billing period (average of 22.1918 kWh per day)
- Tier 2: $0.1408 / kWh for all electricity use over the 1,350 kWh Tier 1 threshold in the same billing period

Given the above, the higher the BC Hydro rate, the better the business case for a net metering solar PV project. For example, a system with the same project installation cost and generation performance will have a better business if displacing Tier 2 charges at $0.1408/ kWh versus a project displacing Large General Service charges at $0.06 / kWh.

5.0 CIVIC BUILDING SOLAR PV ANALYSIS

As part of this initiative, we have undertaken desktop-based solar PV modelling for the following community buildings:

- Municipal Hall and Public Works
- Cowichan Aquatic Centre
- Fuller Lake Arena
- Community Firehall

5 Please refer to https://app.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/business-rates.html for additional information.

To complete this analysis the following tasks were advanced:

- Reviewed BC Hydro account data and summarized each building's baseline electricity use
- Developed a solar PV project concept with the goal of maximizing the solar project to 100 kW as per the Net Metering program and available roof space. If applicable, the project was sized to generate sufficient electricity to "net out" the total electrical consumption of the building
- Completed an electricity generation analysis using Helioscope
- Completed a preliminary business case analysis of the solar PV project concept.

These key tasks and their results are described in further detail throughout the following report sections.

5.1 REVIEW BC HYDRO ACCOUNT DATA

To support the development of solar PV system concepts for the civic buildings of interest, BC Hydro billing data was reviewed and summarized to develop an annual electricity usage estimate.

The electricity usage for each building of interest is summarized in **Table 5.1** below.

Table 5.1: BC Hydro Usage Per North Cowichan Building

Building Name	Address	Annual Energy Usage (kWh)	Annual Usage Charges ($)
Municipal Hall and Public Works	7030 Trans Canada Hwy	444,800	$27,152
Cowichan Aquatic Centre	2653 James Street	2,166,720	$132,307
Fuller Lake Arena	2876 Fuller Lake Road	692,400	$42,216
Firehall	1681 Robert Street	45,002	$5,677

5.2 DEVELOP SOLAR PV PROJECT CONCEPT

Using Helioscope: Advanced Solar Design Software[6] and RETScreen Clean Energy Management Software[7], a solar PV project concept was developed for each of the buildings of interest. These software programs referenced the previously summarized baseline electricity usage data for each building, BC Hydro account billing information (i.e. rate schedule) Google Earth imagery, and other relevant information available for this desktop assessment, which is described in additional detail below.

5.2.1 SOLAR PV CONCEPTUAL PLANS

In preparing a rooftop solar project configuration, a number of key factors were considered, including:

- **Azimuth of the rooftop:** The azimuth, also known as the orientation of the rooftop, is a key consideration when selecting an optimal solar PV system site. An ideal rooftop azimuth for maximum solar energy generation is directly south, or 180°. For this analysis, the energy production estimates considered the existing azimuth of each building's rooftop.

[6] Refer to https://www.helioscope.com/ for additional information on the Helioscope program.
[7] Refer to https://www.nrcan.gc.ca/maps-tools-publications/tools/data-analysis-software-modelling/retscreen/7465 for additional information on RETScreen.

- **Site shading**: Shading from a tree or buildings in proximity to the solar installation can cause significant losses in energy generation potential, particularly if solar panels are shaded during the early afternoon. Where possible, consideration was made for shading impacts.
- **Roof area:** Ideally, a rooftop site for the solar PV system would be large enough to support the development of a solar installation. Roof areas used for solar panels should have minimal rooftop structures, such as air conditioning units, vents, or skylights, which would block the solar panels from being mounted to the roof. Rooftops are often preferred for solar PV installations (as opposed to ground-mounted systems on land or parking lots) as it is cheaper to install racking and mounting equipment. Ground-mounted systems require additional foundations and mounting equipment, which are more expensive than those required for rooftop installations.

Based on a desktop review of the site selection factors listed above, the following figures show the conceptual project layouts developed for each site. All photos have been taken from the initial solar PV modelling completed in Helioscope software. A summary of key assumptions used in the solar modelling, along with a comparison of the monthly solar energy generation vs. the monthly electricity usage of the building, is also provided below.

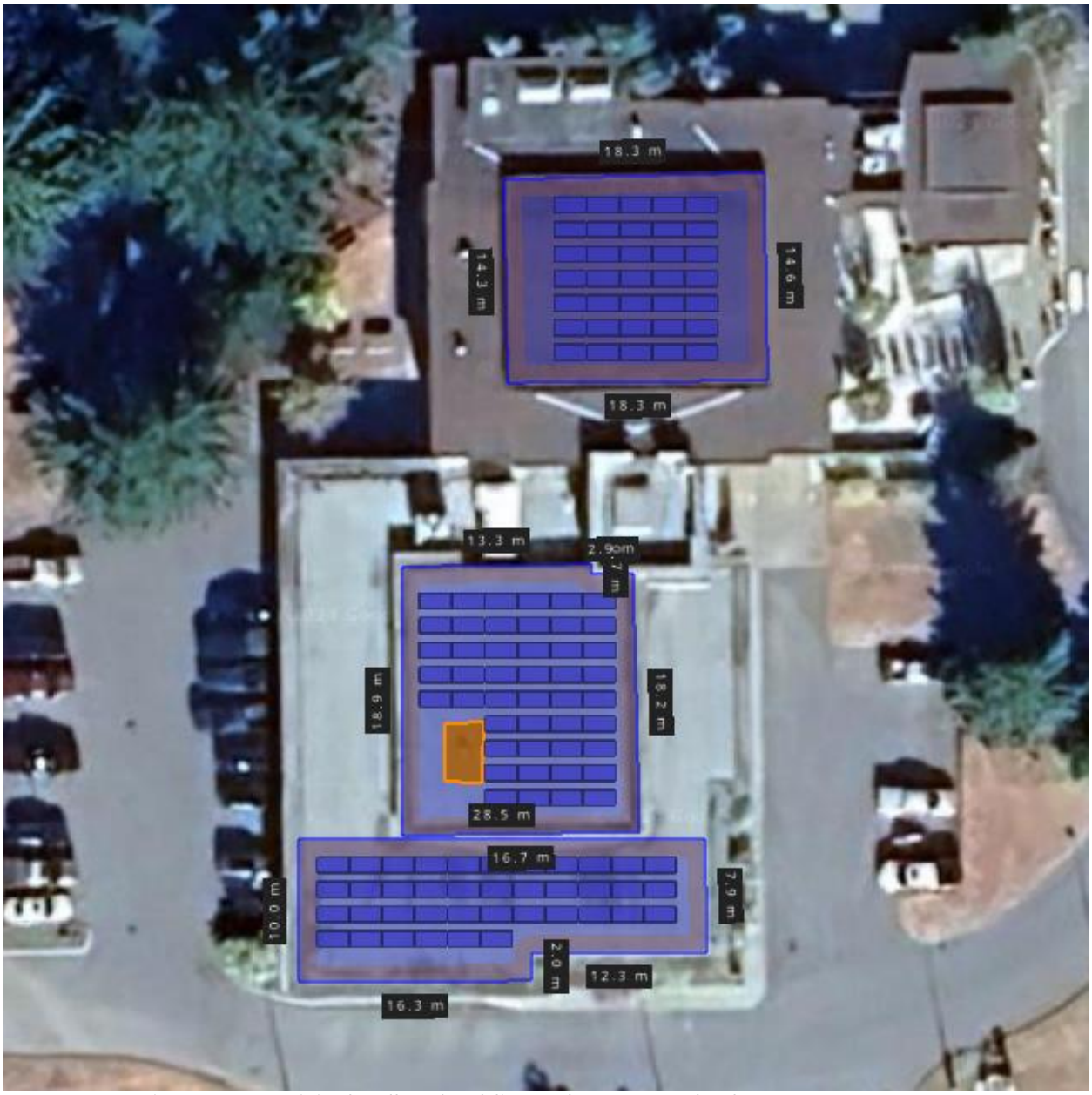

Figure 5-1: Municipal Hall and Public Works: Proposed Solar PV System Layout

Table 5.2: Municipal Hall and Public Works: Key Parameters Used in Solar PV System Concept

Parameter	Value Used
Total System Capacity (kW)	66 kW
Number of Panels	120 panels
Estimated Annual Electricity Generation (kWh)	75,900 kWh

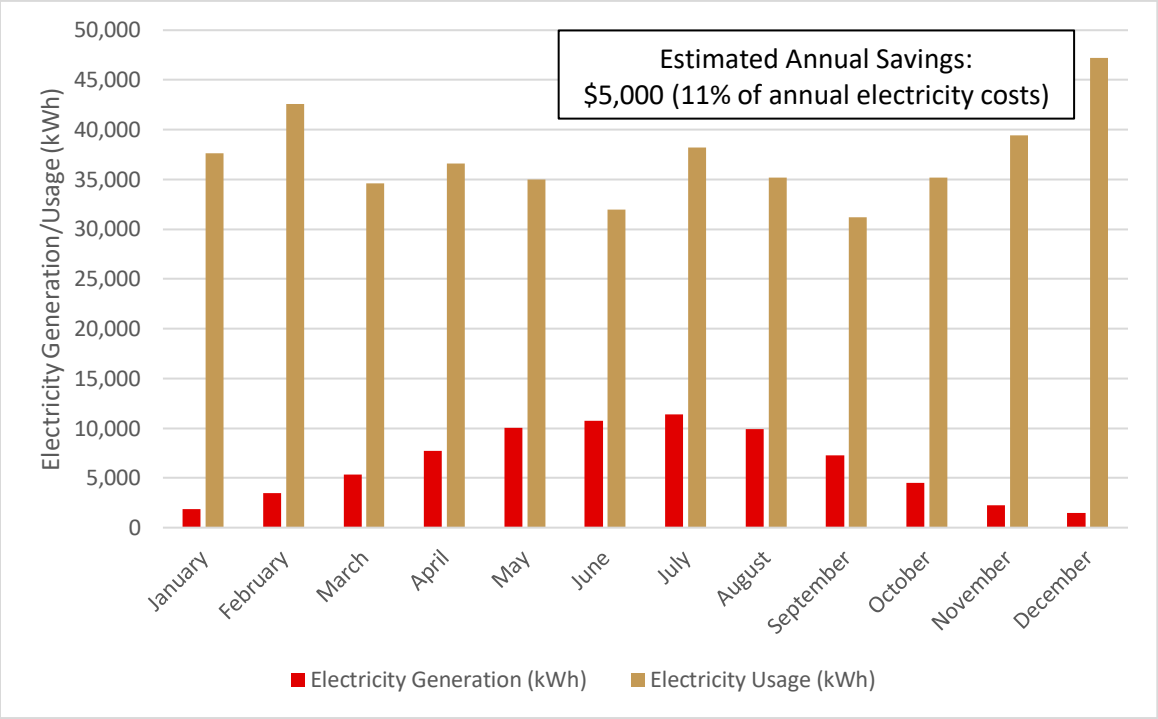

Figure 5-2: Municipal Hall and Public Works: Estimated Monthly Electricity Generation vs. Usage

As shown in the figure above, the available roof area of the Municipal Hall will likely not provide sufficient space for a 100 kW system. Other solar options, such as a ground-mounted installation or a solar "canopy" over the parking lot could be considered; however, these systems are significantly higher in cost than a roof mounted system and therefore were not considered further. Additionally, planning for the Public Works Building will commence soon, so a rooftop array has not been modeled for this facility.

Figure 5-3: Aquatic Centre: Proposed Solar PV System Layout

Table 5.3: Aquatic Centre : Key Parameters Used in Solar PV System Concept

Parameter	Value Used
Total System Capacity (kW)	31 kW
Number of Panels	57 panels
Estimated Annual Electricity Generation (kWh)	36,000 kWh

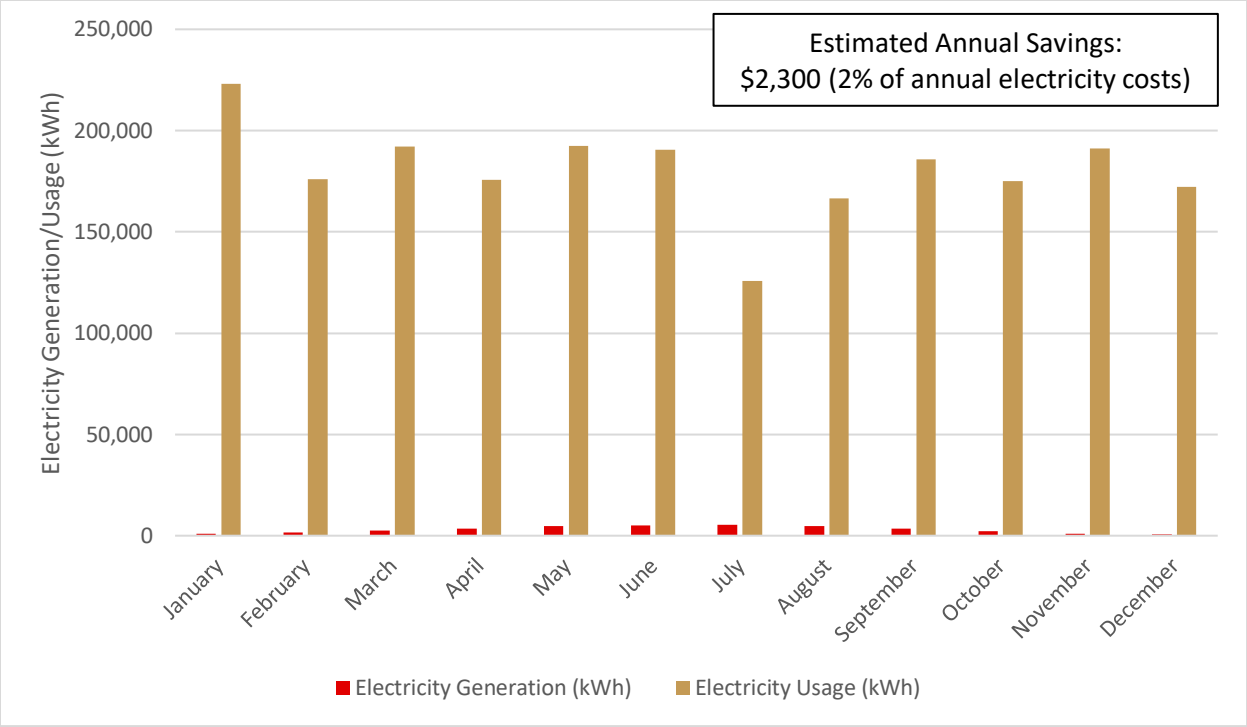

Figure 5-4: Aquatic Centre: Estimated Monthly Electricity Generation vs. Usage

Figure 5-5: Fuller Lake Arena: Proposed Solar PV System Layout

Table 5.4: Fuller Lake Arena: Key Parameters Used in Solar PV System Concept

Parameter	Value Used
Total System Capacity (kW)	100 kW
Number of Panels	182 panels
Estimated Annual Electricity Generation (kWh)	107,200 kWh

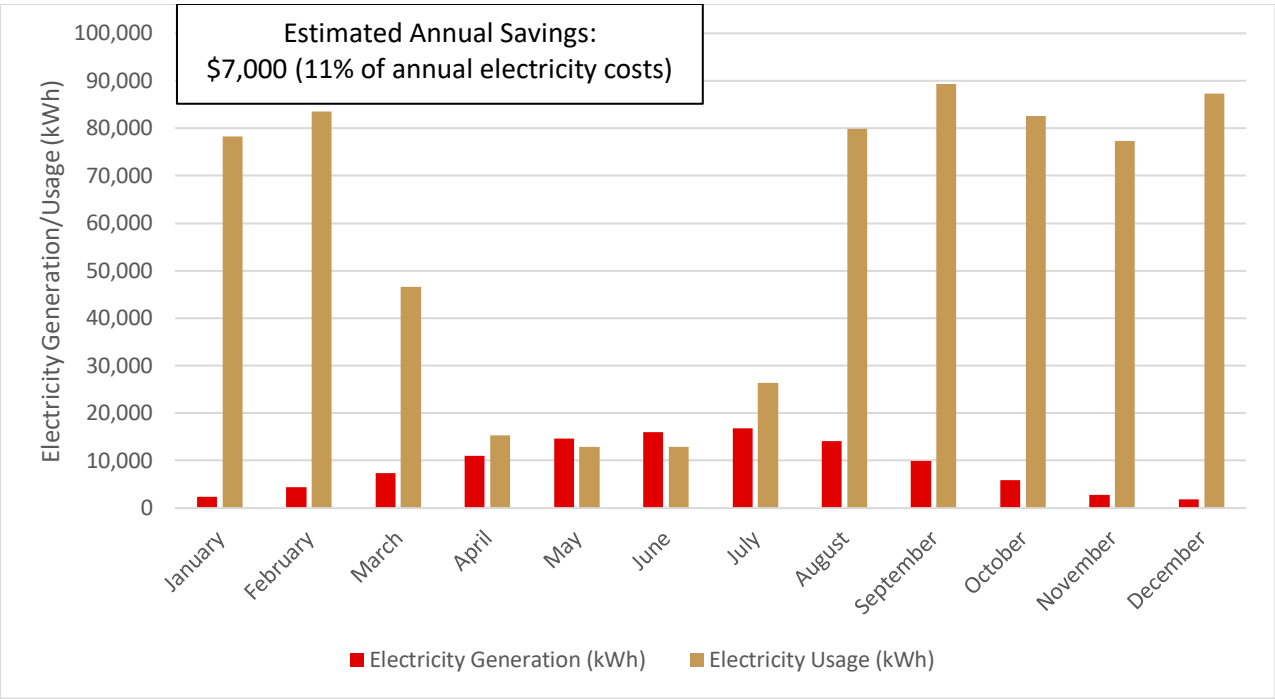

Figure 5.5: Fuller Lake Arena: Estimated Monthly Electricity Generation vs. Usage

Figure 5-6: Community Firehall: Proposed Solar PV System Layout

Table 5.6: Community Firehall: Key Parameters Used in Solar PV System Concept

Parameter	Value Used
Total System Capacity (kW)	18 kW
Number of Panels	33 panels
Estimated Annual Electricity Generation (kWh)	20,100 kWh

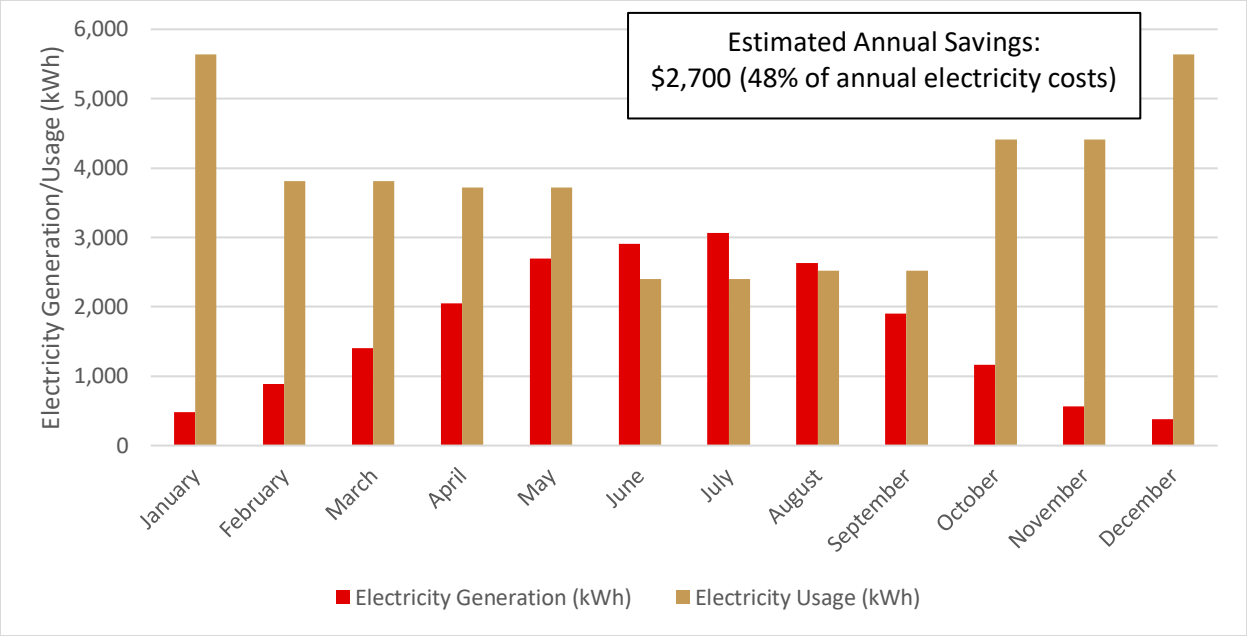

Figure 5-7: Community Firehall: Estimated Monthly Electricity Generation vs. Usage

It should be noted that Crofton firehall location is currently under construction. An expansion project is underway, and the building will be designed to be solar ready, but the panels not installed. The modeling shown in this report is intended to show a high-level estimate of what a solar installation could look like on the existing building.

5.3 BUSINESS CASE ANALYSIS SUMMARY

Based on the previously summarized system configurations, a business case analysis was completed to estimate the system costs, electricity cost savings, and overall financial viability of each solar PV system reviewed.

5.3.1 FINANCIAL AND ECONOMIC ASSUMPTIONS

The financial and economic assumptions presented in **Table 5.7** below were used throughout the business case analysis of the solar PV systems.

Table 5.7: Financial and Economic Assumptions

Parameter	Value
Cost per Watt Installed	$2.00 / W ($2,00 / kW)
Contingency (25%)	25%
Fuel Cost Escalation Rate	2%
Inflation Rate	2%
Discount Rate	5%
Debt Interest Rate	5%
Debt Term	25 years

Parameter	Value
Project Life	25 years
Offset Energy Charges	Per Building Rate Schedule
Net Metering Surplus Energy Rate	N/A
Greenhouse Gas Emissions Displacement	N/A[8]

The value of $2.00 / W installed ($2,000 / kW) was selected based on recently completed projects and/or obtained quotes from BC-based solar PV contractors for projects of a similar scale constructed over the past 3-5 years. A 25% contingency was applied to the project development cost to account for potential variations in installation costs.

As this work's scope excluded a structural review of each building (recommended prior to any installation), there may be additional costs associated with roof improvements required to support the weight of the panels. Such costs have not been accounted for as part of this analysis and such costs can be significant.

In addition, it should be noted that no cost has been included for the removal and disposal of the solar panels. At this time, Urban Systems is unaware of any situations where the solar panels have had to be removed from a rooftop, and as such is unaware of the costs associated with solar panel removal and disposal.

It should be noted that the project life value of 25 years is based on the typical 25-year warranty period of solar panels. During the 25-year warranty period, the solar panels are guaranteed to produce a certain percentage of their initial electricity output (typically 80% or above). After the warranty period ends, the panels are no longer guaranteed to meet the production threshold outlined in their warranty. The panels can still produce energy past the end of their warrantied life, though the amount of energy produced is often lower than the electricity production levels at the beginning of their use.

Using the assumptions presented above, the results of the business case analysis are as follows in **Table 5.8**.

[8] While there are some direct greenhouse emissions from the BC Hydro system (11.3 tonnes of CO2-equivalent per gigawatt hour), for this assignment, we have assumed that the emission reductions from any project would have a negligible impact to North Cowichan's emissions profile. This aligns with BC Government policy which assumes that BC's electrical grid is "carbon neutral"

Table 5.8: Summary of Results of Solar PV System Business Case Analysis

Building Name	Annual Energy Usage (kWh)	Annual Usage Charges	Proposed Solar Capacity (kW)	Estimated Annual Generation (kWh)	Approximate System Cost	Approximate System Cost with BC Hydro Rebate	Estimated Annual Savings	Estimated % Reduction in Total Energy Costs	Financially Viable without Grant Funding?
Municipal Hall and Public Works	444,800	27,152	66	75,900	$165,000	$140,000	$4,956	11%	No
Cowichan Aquatic Centre	2,166,720	132,307	31	36,000	$77,500	$52,500	$2,351	1%	No
Fuller Lake Arena	692,400	42,216	100	107,244	$250,000	$225,000	$7,003	11%	No
Firehall	45,002	5,677	18	20,133	$45,500	$27,300	$2,722	48%	Yes

6.0 RESIDENTIAL SOLAR PV ANALYSIS

6.1 SCOPE

This section assesses the business case of solar photovoltaic systems installed on an average single-family detached home in North Cowichan. This analysis considered the following scenarios:

- An all-electric home, with the PV system sized to eliminate (or "net out") BC Hydro Tier 2 charges
- An all-electric home, with the PV system sized to accommodate (or "net out") all electricity use
- A non-electrically heated home, with the PV system sized to eliminate (or "net out") BC Hydro Tier 2 charges
- A non-electrically heated home, with the PV system sized to accommodate (or "net out") all electricity use

Tier 1 and Tier 2 charges are described in Section 3.0. These charges were referenced throughout this business case assessment. This assessment also considers BC Hydro's recently announced solar panel rebates[9] and, to the extent possible, the billing structure[10] that will likely be incurred should residents utilize the rebate. As previously noted, the Time of Day pricing has not been approved by the BC Utilities Commission (currently optional), and the Time of Day analysis presented throughout the report is for illustrative purposes only, as details are subject to change. With that, customers can voluntarily participate in the Time of Day billing structure and may find it to be financially attractive should they be able to shift their demand to off-peak times. Customers are encouraged to use BC Hydro's "Rate Estimator" to compare this optional rate structure based on past usage.

It is important to note that the analysis is based on an example of electricity use in a home for which data could be secured. As such, the analysis presented herein should be considered preliminary and illustrative, given the dynamic nature of residential energy use. For a more detailed assessment, a homeowner should engage a qualified contractor/energy advisor to review historical energy use patterns to assess the costs and benefits of a solar PV system on their BC Hydro billing.

Table 6.1 exhibits the average electricity use for a single-family detached home within BC, according to BC Hydro[11]. This represents the assumed "baseline" electrical consumption to inform the size and scale of each residential project scenario considered.

Table 6.1: Average Electricity Consumption for a Typical BC Residential Account

Home Type	Heating Type	Average Monthly Energy Use
Single-family detached home	Electric	1,279 kWh
Single-family detached home	Non-electric	728 kWh

[9] Please refer to https://www.bchydro.com/powersmart/residential/rebates-programs/solar-battery.html for additional information.

[10] Referenced from: https://www.bchydro.com/work-with-us/alliance/news-features/time-of-day-pricing.html

[11] See: https://www.bchydro.com/powersmart/residential/energy-explained.html

6.2 APPROACH AND KEY ASSUMPTIONS

Using RETScreen Expert, a solar PV system was configured to meet the required energy output to "net out" Tier 2 charges and a home's total electricity consumption. Each configuration was used to assess system size, energy output, and a simple payback period. **Table 6.2** summarizes the key assumptions referenced in the assessment.

Table 6.2: Key Assumptions Used in Residential Assessment

Parameter	Value
Cost per Watt Installed	$2.8 / W ($2,800 / kW)
BC Hydro Rebate[12]	$1,000 / kW (Up to $5,000)
Capacity Factor	13.5%
Output (kWh/kW installed)	1,165 kWh/kW
Offset Energy Charges	Per BC Hydro Rate 1101 Schedule
Net Metering Surplus Energy Rate	N/A

It is important to note that a higher cost per watt installed was referenced for the residential system relative to the civic buildings, given the reduced size and scale of a residential system. Similar to the assumption of civic installation costs, this value is based on Urban Systems' engagement and knowledge of the installed cost of smaller systems. If conditions are favourable and ideal, the cost for such a system could be less than the assumed $2.8/W, and conversely, it is possible that a system installation is greater than the assumed $2.8/W installed. To reflect this possibility of a lower-cost system installation, a sensitivity analysis was completed to review the costs and benefits of solar installations at $2.5/W and $2.0/W installed.

The energy performance (capacity factor and electricity output) of the systems considered is based on several factors, including:

- Solar resource in North Cowichan
- Limited to no shading
- The panels are installed with a southern orientation (azimuth)
- An assumed roof slope of 45 degrees
- Typical equipment efficiencies and ratings
- Typical system losses from inverters, panels and other equipment

The above assumptions aim to reflect a "favourable" system installation.

As discussed in additional detail in Appendix A, a high-level analysis was completed to consider the change in annual electricity costs should residents adopt BC Hydro's optional Time of Day rate structure. Again, this assessment was completed for illustrative purposes only, and is not representative of all homes in North Cowichan.

[12] Referenced from https://www.bchydro.com/powersmart/residential/rebates-programs/solar-battery.html

6.3 RESULTS

The **Table 6.3** below summarizes the results of this analysis.

Table 6.3: Summary of Business Case Assessment for Residential Solar PV Systems in North Cowichan ($2.8/W)

Single Family Detached Home - Electric Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	7,248	15,348
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	6.25	13.25
Estimated System Cost	$19,600	$17,500	$37,100
Estimated System Cost (with BC Hydro Rebate)	$14,600	$-	$32,100
Estimated Annual Savings ($, Tier 1 and Tier 2 Rates)	$933	$1,072	$2,005
Estimated Annual Savings ($, Time of Day Rates)	$1,710		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	18.5		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	18.8		
Single Family Detached Home - Gas Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	636	8,736
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	1	8
Estimated Cost	$19,600	$2,800	$22,400
Estimated Cost (with BC Hydro Rebate)	$14,600	$-	$17,400
Estimated Annual Saving ($, Tier 1 and Tier 2 Rates)	$933	$94	$1,027
Estimated Annual Savings ($, Time of Day Rates)	$1,041		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	21.8		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	16.7		

To understand the potential business case of a residential system at a lower $/W cost, a sensitivity analysis was completed. This sensitivity analysis considered a $2.00/W and a $2.50/W installation cost, as summarized in **Table 6.4** and **Table 6.5** below.

Table 6.4: Summary of Business Case Assessment for Residential Solar PV Systems in North Cowichan ($2.5/W)

Single Family Detached Home - Electric Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	7,248	15,348
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	6.25	13.25
Estimated Cost	$17,500	$15,625	$33,125
Estimated Cost (with BC Hydro Rebate)	$12,500	$-	$28,125
Estimated Annual Saving ($, Tier 1 and Tier 2 Rates)	$933	$1,072	$2,005
Estimated Annual Savings ($, Time of Day Rates)	$1,710		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	16.5		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	16.4		
Single Family Detached Home - Gas Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	636	8,736
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	1	8
Estimated Cost	$17,500	$2,500	$20,000
Estimated Cost (with BC Hydro Rebate)	$12,500	$-	$15,000
Estimated Annual Saving ($, Tier 1 and Tier 2 Rates)	$933	$94	$1,027
Estimated Annual Savings ($, Time of Day Rates)	$1,041		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	19.5		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	14.4		

Table 6.5: Summary of Business Case Assessment for Residential Solar PV Systems in North Cowichan ($2.0/W)

Single Family Detached Home - Electric Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	7,248	15,348
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	6.25	13.25
Estimated Cost	$14,000	$12,500	$26,500
Estimated Cost (with BC Hydro Rebate)	$9,000	$-	$21,500
Estimated Annual Saving ($, Tier 1 and Tier 2 Rates)	$933	$1,072	$2,005
Estimated Annual Savings ($, Time of Day Rates)	$1,710		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	13.2		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	12.6		
Single Family Detached Home - Gas Heat			
	BC Hydro Tier 1 Rates	**BC Hydro Tier 2 Rates**	**Total**
Estimated Annual Electricity Use (kWh)	8,100	636	8,736
Approx. System Size Needed to "Net Out" Annual Electricity Use (kW)	7	1	8
Estimated Cost	$14,000	$2,000	$16,000
Estimated Cost (with BC Hydro Rebate)	$9,000	$-	$11,000
Estimated Annual Saving ($, Tier 1 and Tier 2 Rates)	$933	$94	$1,027
Estimated Annual Savings ($, Time of Day Rates)	$1,041		
Simple Payback (yrs., Tier 1 and Tier 2 Rates)	15.6		
Simple Payback (yrs., with BC Hydro Rebate/TOD Rates)	10.6		

6.4 A NOTE ON ENERGY STORAGE

The size of a solar battery depends on a household's energy usage and the capacity of the solar PV system. As noted above, a typical home in BC uses between 730 – 1,280 kWh per month.

If a resident wishes to cover 100% of their energy usage, a household will require a battery with a capacity of around 30 kWh per day. However, most homes will not cover 100% of their energy usage with solar power and will instead aim for around 50%.

So, for a typical home in BC, a 10-15 kWh solar battery system would usually be sufficient. Remember, this is an estimate, and actual values can vary depending on an individual's circumstances, such as the size and orientation of the home, energy consumption habits, and the size of the solar PV system.

The cost of a solar battery can vary widely based on the brand, technology, and capacity. As of 2022, the average cost of solar batteries ranges from $250 to $400 per kilowatt-hour. A 15 kWh battery translates to an approximate cost between $3,750 and $6,000. However, these are average prices and actual costs can vary. Some high-end models, such as the Tesla Powerwall (which has a capacity of 13.5 kWh), can cost upwards of $10,000 to $15,000 when installation costs are included.

Most net metering projects in BC do not include storage given the material costs and a limited financial benefit from doing so under the rate pricing regime for residential BC Hydro accounts and the Net Metering program.

However, the new rebate program offered by BC Hydro includes a $5,000 rebate for energy storage and the potential/optional adoption of a time-of-day pricing structure. As such, there's likely an additional benefit to adding energy storage to a system installation. Further analysis of this scenario is out of scope of this assessment. To complete such an assessment, a HOMER modelling exercise would be needed. Alternatively, residents in North Cowichan could directly engage a qualified contractor/energy advisor to review historical energy use patterns to assess the costs and benefits of an energy storage solution on the BC Hydro billing.

7.0 CONCLUSION

In conclusion, the importance of energy sustainability in fostering the economic and social health of a community is undeniable. It is integral that communities have access to affordable, stable, and reliable energy sources.

The Municipality of North Cowichan has acknowledged this and expressed interest in exploring the feasibility of installing solar PV systems on various civic community buildings and residential settings.

This report offers a comprehensive business case assessment for a range of solar PV project configurations in North Cowichan.

Desktop solar PV modelling was carried out for the Municipal Hall and Public Works, Cowichan Aquatic Centre, Fuller Lake Arena, and the Community Firehall.

Each site had a specific project configuration developed to estimate its annual electricity generation potential, project costing, and likely business case. Factors considered in the analysis included rooftop orientation, site shading restrictions, available area for solar panels, and overall building power consumption.

Furthermore, the report evaluated the business case of four residential installation scenarios, specifically netting out BC Hydro Tier 2 charges in all-electric and non-electrically heated homes and accommodating all electricity use in both types of homes. These assessments were also conducted on a desktop basis.

This analysis and its findings indicate that the business case for solar PV projects is likely to be poor without material grant funding.

Beyond a project's business case, there are often other important drivers for investing in solar PV projects. For example, solar PV systems can bring communities in British Columbia a sense of empowerment and resilience. Community-based and residential projects reduce reliance on BC Hydro's grid, fostering a more independent and sustainable energy future at the community level. This community-based approach can spark collaboration and knowledge sharing around renewable energy, climate action and sustainability. As such, solar power can offer a visible commitment to environmental stewardship, setting a positive example for businesses, residents and other community stakeholders.

APPENDIX A: SOLAR PV ASSESSMENT WITH TIME OF DAY RATES

A high-level analysis was completed to consider the change in annual electricity costs should residents adopt BC Hydro's proposed time of day (TOD) rate structure. It should be noted that this assessment was completed for illustrative purposes only and is not representative of all homes in North Cowichan. In addition, the proposed rate structure is still under review by the BC Utilities Commission and may be modified.

Should additional data on hourly residential electricity usage become available, this analysis could be further refined to determine the change in electricity costs with solar and TOD rates over a larger sample size.

In order to complete this illustrative analysis, hourly BC Hydro data and solar PV generation data from a 2-kilowatt system was analyzed for four key dates during a year:

- March 20th (halfway between winter and summer solstice)
- June 20th (summer solstice, lightest day of the year)
- September 20th (halfway between summer and winter solstice)
- December 20th (winter solstice, darkest day of the year)

The analysis of this hourly data allowed the project team to consider BC Hydro's proposed TOD rates on a house with a solar PV system. The proposed TOD rates are as follows:

Current rates:

- Tier 1 Pricing: $0.1097/kWh
- Tier 2 Pricing: 0.1408/kWh

Proposed TOD rates:

- Overnight Pricing (Tier 1 rates, 11pm to 7am): $0.0597/kWh
- Off-Peak Pricing (Tier 1 rates, 7am to 4pm, 9 to 11pm): $0.1097/kWh
- On-Peak Pricing (Tier 1 rates, 4pm to 9pm): $0.1597/kWh
- Overnight Pricing (Tier 2 rates, 11pm to 7am): $0.0908/kWh
- Off-Peak Pricing (Tier 2 rates, 7am to 4pm, 9 to 11pm): $0.1408/kWh
- On-Peak Pricing (Tier 2 rates, 4pm to 9pm): $0.1908/kWh

Using the hourly data and TOD rates for the four dates identified above, the estimated solar generation and BC Hydro electricity usage were extrapolated for the year to estimate the total change in costs should a resident receive BC Hydro's solar PV rebate and sign up for the new TOD rates.

This analysis is summarized on a monthly basis in **Table A1** below. It should be noted that this analysis s for an all-electric home, did not consider battery energy storage systems (BESS).

Table A1: Summary of TOD Rate Analysis with Solar PV

Month	Sum of Total Usage (With Solar, kWh)	Sum of Total Charges (With Solar, TOD Rates)	Sum of Total Charges (Tier 1 and 2 Rates)
January	1,509	$198	$192
February	1,105	$141	$135
March	743	$86	$84
April	693	$83	$77
May	464	$55	$51
June	468	$53	$51

Month	Sum of Total Usage (With Solar, kWh)	Sum of Total Charges (With Solar, TOD Rates)	Sum of Total Charges (Tier 1 and 2 Rates)
July	727	$85	$82
August	648	$75	$71
September	561	$70	$62
October	1,056	$139	$129
November	1,197	$166	$148
December	1,443	$190	$183
Total	**10,615**	**$1,342**	**$1,267**

As shown in the table above, the TOD rates result in a slightly higher annual electricity cost than the Tier 1 rates. However, this analysis is for illustrative purposes only, and may vary from home to home based on energy usage patterns and daily solar PV generation.