HES PV

Nova Scotia Solar-Friendly Communities Study

Final Report – September 2021

Prepared for:

Canadian Renewable Energy Association
WIND. SOLAR. STORAGE.

Association canadienne de l'énergie renouvelable
ÉOLIEN. SOLAIRE. STOCKAGE.

Solar-Friendly Communities Study

Final Report – September 2021

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About HES PV

HES PV is a Canadian PV system consultant, designer and equipment supplier participating in the Canadian solar industry for over 25 years. We are the largest and most diverse solar distributor in Canada with decades of solar and battery storage system experience spanning small residential solar, commercial solar, remote microgrids and utility scale solar projects. We provide customers with unparalleled product knowledge, access to market-leading solar and storage equipment and technical support. HES PV has warehouses in Victoria, Vancouver, Edmonton, Calgary, Toronto, Barrie, Montreal and Halifax.

EXECUTIVE SUMMARY

The following Nova Scotia Solar-Friendly Communities Study is intended to grow the residential solar PV market in Nova Scotia by reducing the cost and barriers associated with installing a solar PV system.

To achieve this objective, a series of recommendations have been put forward aimed at:

- Reducing the cost and barriers to building and electrical permits and grid interconnection related to solar installations;
- Improving solar financing programs through lower interest rates and longer payback periods;
- Improving solar education and awareness among homeowners and municipal staff to reduce the time and effort required by installers to explain solar PV technology and net metering; and
- Identifying municipal solar PV strategies through planning, zoning, land-use policies and public education.

Project outcomes include increased solar PV uptake across the province, reducing red tape associated with planning and installing a solar PV system, and creating more jobs in the solar sector across the province.

Two online surveys were conducted with members of Efficiency Nova Scotia's Solar Trade Network. The first survey addressed questions pertaining to Nova Scotia's Enhanced Net Metering Program including the interconnection request, plans review, electrical and building permitting and inspection process. The second survey included questions on customer sales and acquisition and solar financing. Results of these surveys were used to inform the work of the study.

Our research indicated that the proportion of solar hardware costs vs. soft costs in Nova Scotia is approximately 55%-45%. Reducing soft costs will therefore have a significant impact on improving the affordability and accessibility of solar PV in Nova Scotia. Our findings indicate that this can be achieved through:

- more streamlined permitting processes
- reduced permitting fees
- more and improved solar financing programs
- elimination of HST on solar PV systems
- more public solar education
- training for electrical and building inspectors
- municipal policies that encourage solar-ready homes, solar access/easements and siting requirements for larger ground mount systems.

The following recommendations are proposed to reduce the cost and barriers associated with installing a solar PV system.

Table 1: Summary of Recommendations Aimed to Reduce Solar Soft Costs in Nova Scotia

Issue	Recommendation(s)
Length of time and labour costs associated with processing Interconnection Request, Plans Review and Net Metering applications	*That Nova Scotia Power implement an online process for the Interconnection Request and Equipment Information Form and Net Metering applications.* *That Nova Scotia Power introduce an accelerated/ streamlined plans review process for net metering systems under 30 kW.*
Nova Scotia is the only jurisdiction in Canada to mandate two inspections. This increases labour costs and length of time required to complete inspection process.	*That the Province move to a single inspection process similar to other jurisdictions across the country. Nova Scotia Power could maintain a virtual rough-in inspection process to incorporate this process into a single inspection.* *That approval of electrical permits where a review or clarification is not required take no more than 14 business days.*
Nova Scotia Power now installs smart meters for solar customers. Although the new meters have bi-directional capability, Nova Scotia Power has not yet deployed the ability to push the new configuration over the network. As a result, if a customer currently with a smart meter wants to install a grid-tied solar PV system, they still require a meter exchange.	*That Nova Scotia Power deploy the ability to readily convert previously installed smart meters to bi-directional capability in order to enable a homeowner to more quickly energize their newly installed solar PV system.*
Levels of knowledge among Nova Scotia Power electrical inspectors vary across the province. Not all may be familiar with the latest solar PV technology.	*That HES provide a one-day training session for Nova Scotia Power electrical inspectors to ensure all inspectors are working from the same rules, regulations and practices. The training would also include presentations on the latest solar PV equipment and technology.*
Electrical permit fees in Nova Scotia tend to be higher than other jurisdictions, particularly Ontario and British Columbia.	*That Nova Scotia Power offer a fixed electrical permit fee for certain residential systems under 30 kW.*
When including engineering fees, solar building permits can be expensive and time consuming to complete. Some municipalities in other jurisdictions have waived building permits in cases where the solar installation is under 10kW and flush mount to the roof.	*That municipalities in Nova Scotia adopt a solar building permit process based on simple and complex installations. Residential installations under 10 kW AC flush mount to the roof would be considered simple installations and exempt.* *That municipalities offer an online building permit process as currently being offered by HRM.*

Issue	Recommendation(s)
Levels of knowledge among Nova Scotia municipal building inspectors vary across the province.	*That HES PV provide a one-day training session for Nova Scotia Building Officials Association to ensure all municipal building inspectors are working from similar rules, regulations and practices.*
HST adds 15 percent additional cost to a solar PV system. Currently Nova Scotians who purchase electricity directly from Nova Scotia Power are exempt from the provincial portion of the HST. This should also apply to Nova Scotians who self-supply utilizing solar PV. The Province of British Columbia has eliminated the provincial portion of the HST on solar PV systems.	*That the Province consider exempting the provincial portion of the HST on solar PV installations.*
Not all Nova Scotia municipalities offer PACE programs to finance solar PV systems. Nova Scotia PACE Programs could benefit from lower interest rates and longer payback periods. A number of PACE programs in Nova Scotia require a 1:1 debt-savings ratio in which the cost of clean energy upgrades, program fees, and cost of borrowing must be less than or equal to the estimated energy savings over the financing period. While the debt-to-savings ratio may seem compelling for consumer protection and reducing lending risks, there is little evidence to suggest that improvements with positive cash flows lead to lower rates of defaults.	*That all Nova Scotia municipalities consider adopting a PACE program with financing up to $25,000, with a payback period of at least 15 years and interest rate under 4 percent.* *That the one-to-one debt-savings ratio be eliminated and replaced with a credit check.*
The Nova Scotia Go Solar Guide developed by Efficiency NS and CanSIA represents a great way to educate homeowners on solar PV. Having homeowners read this document in advance would reduce the time and effort required by the installer to educate the customer. This can lower sales and acquisition costs which can be passed on to the homeowner.	*That staff from Efficiency Nova Scotia, Halifax Solar City, PACE Atlantic and other solar financing programs share the Nova Scotia Go Solar Guide with their installers and that they encourage all installers to share the guide with their customers.* *That municipalities post the Nova Scotia Go Solar Guide on their website to better educate homeowners on solar PV technology.*
Solar-ready guidelines applied to new homes and commercial buildings enable customers to easily add a solar PV system at a later time should they choose to do so. This results in lower installation costs.	*That municipalities work with the Canadian Home Builders Association – Nova Scotia, Construction Association of Nova Scotia, Solar Nova Scotia, Canadian Renewable Energy Association and the local solar installer industry to adopt solar-ready guidelines that encourage solar PV installations on new residential and commercial construction.*

Issue	Recommendation(s)
Solar access and easement policies provide a level of comfort to solar PV owners by protecting their system from future shading issues as a result of land-use changes to neighbouring properties.	*That municipalities consider developing solar access and/or solar easement policies within their existing land-use planning framework.* *That municipalities work with developers on solar easement and solar access policies to enable the creation of new solar-ready subdivisions.*
As solar PV continues to proliferate in Nova Scotia, municipalities should start considering amendments to their zoning and land-use bylaws to accommodate various sized systems including battery storage and large ground mounts. This will be increasingly important when the Province's Shared Solar Program moves forward.	*That municipalities include a comprehensive definition of solar energy systems in their zoning bylaws including battery storage linked to solar PV systems.* *That the bylaw include definitions that distinguish between roof-mounted and ground-mounted installations of various sizes. The bylaw should also identify which projects require separate review and which installations are eligible to bypass zoning review and apply directly for a building permit.*
Municipalities can play a key role in educating the public and their employees on solar PV technology. This can reduce the amount of time required by installers to educate homeowners on the various issues associated with installing a solar PV system.	*That municipalities develop a Solar PV public education strategy by posting relevant solar materials and links on their website.* *That municipalities educate their own employees on solar PV technology – particularly building officials and planning staff.* *That municipalities consider hosting a public education session on solar PV technology similar to the previous sessions led by Solar Nova Scotia.*

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Photo courtesy of WattsUp Solar.

1. INTRODUCTION

In the Fall of 2020, the Canadian Renewable Energy Association (CanREA) engaged HES PV to undertake a Nova Scotia Solar-Friendly Communities Study.

The study objective is to grow the residential solar PV market in Nova Scotia by reducing the costs and barriers associated with installing a solar PV system. To achieve the objective, a series of recommendations based on best practices are included in the study. These recommendations aim to:

- Reduce the cost and barriers to building and electrical permits and grid interconnection related to solar installations;
- Improve solar financing programs through lower interest rates and longer payback periods;
- Improve solar education and awareness among homeowners and municipal staff to reduce the time and effort required by installers to explain solar PV technology and net metering; and
- Identify municipal solar strategies through planning, zoning, land-use policies and public education.

Project outcomes include increased solar PV uptake across the province, reduced red tape associated with planning and installing a solar PV system, and creating more jobs in the solar sector across the province.

2. BACKGROUND

Since the launch of Nova Scotia's SolarHomes Program in 2018, residential solar has grown substantially across the province. In 2018, Nova Scotia had 206 net metered installations with a total nameplate capacity of 1622 kW AC. As of December 31, 2020, there were 2451 net metered customers with a total rated generated capacity of 19.8 MW. Nova Scotia Power estimates an additional 1200 net metered customers could be connected by the end of 2021.[1]

The cost of solar PV technology and manufacturing has fallen by more than 80 percent over the past ten years due to technological innovation along with increased production and adoption. However, the non-

[1] Nova Scotia Power, Regulation 3.6 – 2020 Net Metering Report. January 29, 2021.

hardware costs or "soft costs" associated with solar PV installations have not declined as quickly. Soft costs encompass everything other than equipment (solar panels, racking, wiring, etc).

Since 2018, the following challenges have arisen related to solar soft costs including:

- Long wait times associated with the interconnection request, plans review, and electrical inspections.
- That Nova Scotia mandates two electrical inspections – a rough-in and final – when other jurisdictions across Canada only have one.
- The high cost of obtaining a structural engineer stamped drawing as part of the municipal building permit process.
- Inconsistencies in the level of knowledge among electrical and building inspectors.
- The inability to easily convert an existing smart meter to be bi-directional for new solar customers.
- High costs of sales, marketing and customer acquisition.
- Higher interest rates and shorter payback periods associated with solar financing programs.

All of these issues can add delays and/or increased costs for the customer. Long wait times and delays related to plans review, permitting, inspection and interconnection processes can lead to higher labour and overhead costs on the part of the installer. It also results in delays in energizing the system, causing lost solar production on behalf of the homeowner.

Photo by Lee Visual courtesy of Solar Ascent.

It is estimated that every megawatt (MW) of solar generated creates 25 to 35 jobs in the solar sector. The Nova Scotia Residential Solar Market Outlook & Labour Force Survey (2019), a report from Dunsky Energy Consulting commissioned by the Canadian Solar Industries Association, projected up to 178 MW of solar by 2030 in Nova Scotia; corresponding to approximately 22,000 residential solar installations and over 1100 jobs. Over 50 percent of these jobs are expected to be solar installers.[2] It is important to note that the study only referenced the residential sector and did not factor in the further potential for solar jobs in the commercial, industrial and institutional sectors.

On April 7, 2021, the Nova Scotia Department of Energy and Mines announced changes to the Electricity Act to enable the establishment of a community ownership framework for net metering. This "Shared Solar" program is aimed at reducing barriers to solar adoption for communities and businesses. It will enable those renting an apartment to adopt solar energy through a shared ownership or subscription model.[3]

In February 2021, the Province announced a contribution of $5.5 million through its Green Fund for the SolarHomes Program. The new funding will enable the life of the program to be extended for an additional two years.

In May 2021, the Federal Government launched the $2.6 billion, 7-year, Greener Homes Program providing up to $5,000 per home for energy efficiency upgrades including solar PV. To qualify, homeowners must obtain a pre-retrofit EnerGuide home energy evaluation before completing at least one retrofit that is both eligible and recommended by their energy advisor in their report. In Nova Scotia, the Canada Greener

[2] CanSIA, Nova Scotia Residential Solar Market Outlook and Labour Force Study, April 2019.
[3] https://novascotia.ca/news/release/?id=20210407004.

Homes Grant is co-delivered with Efficiency Nova Scotia's Home Energy Assessment program. With the launch of this new program, homeowners wishing to offset the overall cost of their solar PV system will have the option of the Green Homes or SolarHomes Program – they cannot be stacked together for the purpose of solar.

Over time these legislative changes and grant programs will cumulatively result in further growth in residential net metering, which in turn will help toward achieving the province's goal of 80% renewable electricity by 2030 while creating jobs and driving private sector investment in Nova Scotia's clean technology sector. At the same time, by adapting more efficient policies and practices toward connecting net metering customers, Nova Scotia Power can help limit administrative overhead in the face of growing demand for these connections, ultimately helping to manage costs for the benefit of all ratepayers.

3. METHODOLGY

The study used the following methodology:

1. Two online surveys of Efficiency Nova Scotia's Solar Trade Network. The first survey addressed questions pertaining to Nova Scotia's Enhanced Net Metering Program including the interconnection request, plans review, electrical and building permitting and inspection process. The second survey included questions on customer sales and acquisition and solar financing. 26 out of a possible 67 respondents completed the initial survey for a response rate of 39 percent. 17 respondents completed the second survey for a response rate of 25 percent. Survey responses will be referenced throughout the document when addressing the various topics. *A summary of the survey results may be found in Appendices A, B and C.*
2. A further survey of staff at eight municipalities that have experienced growth in solar PV. *Questionnaire may be found in Appendix D.*
3. Analysis of solar soft costs in Nova Scotia, highlighting specific areas to be targeted for improvement.
4. Identification of average cost per watt of a typical residential solar PV system within Nova Scotia and estimated reduced costs of a similar system if recommendations were implemented to lower soft costs.
5. Outlined impacts of the interconnection application process and fees associated with installing a solar PV System in Nova Scotia and how they can be streamlined.
6. Developed model electrical inspection guidelines related to the Enhanced Net Metering Program.
7. Outlined best practices in streamlining municipal solar permitting process.
8. Assessed the various solar financing options available to residential customers in Nova Scotia.
9. Estimated sales and acquisition costs passed on to customers by installers that employ sales-oriented companies to generate leads.
10. Outlined best practices in municipal planning strategies, land-use bylaws and policies and public education that promote increased uptake of solar PV.
11. Provided recommendations based on items 1-10 identified in the methodology. Each recommendation targets the appropriate organization responsible for amending the particular program or regulation identified. This would mainly include Nova Scotia Power, the Province and municipalities.

4. AVERAGE COST PER WATT

In 2020, Halifax Solar City reported that an average 9.5 kW residential rooftop solar PV system cost $2.42 per watt excluding HST and SolarHomes rebate; this figure was $2.51 in 2019.[4] 2020 data provided by Efficiency Nova Scotia indicated that an average 9.9 kW residential rooftop solar PV system installed under the SolarHomes Program had an average cost of $2.48 per watt excluding HST and rebate.[5] 75 percent of survey respondents reported an average cost per watt between $2.20 and $2.80 for systems larger than 5 kW.

5. SOLAR SOFT COSTS

The cost to install a solar photovoltaic (PV) system includes two broad categories: hardware costs and soft costs. Hardware costs include all equipment required to install the system: modules, inverters, racking and balance of system components including wiring, switches, junction/combiner boxes, etc.
The non-hardware or soft costs include:

- Building and electrical permits (cost, labour, processing time)
- Electrical inspection process
- Plans review process
- Installation costs (labour/profit)
- Harmonized Sales Tax (HST)
- Customer sales, acquisition and marketing
- Supply chain costs – (costs to transport and store equipment)
- Financing costs such as loans or leases.

These business processes and administrative costs can increase the time and money required to install a solar energy system – costs that are then passed on to customers.[6]

In Nova Scotia, the split between hardware and soft costs to install a 9.5 kW residential rooftop solar PV system is approximately 55 percent hardware and 45 percent soft costs.

Table 2 and Figure 1 below represents the breakdown of hardware and soft costs for a typical 9.5 kW residential roof-mounted solar installation.

The two most expensive components of hardware costs include modules and inverters. Modules represent 41 percent of total hardware costs and 23 percent of overall system cost. Inverters represent 32 percent of total hardware costs and 18 percent of overall system cost. Installation represents the largest component

Photo by Lee Visual courtesy of Solar Ascent.

[4] Data provided by Kevin Boutilier, Clean Energy Specialist with Halifax Regional Municipality.
[5] Data provided by Dave Corning, Program Manager, Efficiency Nova Scotia.
[6] SolSmart, A Toolkit for Local Governments, https://solsmart.org/solar-energy-a-toolkit-for-local-governments/introduction/.

of soft costs at 69 percent of soft costs and 31 percent of overall system cost.

Table 2: Hardware-Soft Cost Breakdown for a 9.5 kW Nova Scotia Residential Roof-Mounted Solar Installation

Average cost per watt of a 9.5 kW system before HST and rebate	$2.42 per watt ($22,990)

HARDWARE COSTS			
Item	**Cost**	**Percentage of Soft Costs**	**Percentage of Total System Cost**
Modules - 430 watts 72 Cell (22 in total)	$5248.10	41%	23%
Inverters/Optimizers	$4124.25	32%	18%
Racking	$1994.20	16%	9%
Racking	$1994.20	16%	9%
Hardware - PV Equipment Costs (excluding HST)	**$12,697.68**	**Represents 55% of Total System Cost**	

SOFT COSTS			
Item	**Cost**	**Percentage of Soft Costs**	**Percentage of Total System Cost**
Permits & Fees	$1352	13%	6%
Customer Acquisition	$1852.62	18%	8%
Installation Costs	$7087.70	69%	31%
Total Soft Costs	**$10,292.32**	**Represents 45% of total system cost**	

Figure 1. Hardware-Soft Cost Breakdown for a 9.5 kW Nova Scotia Residential Roof-Mounted Solar Installation

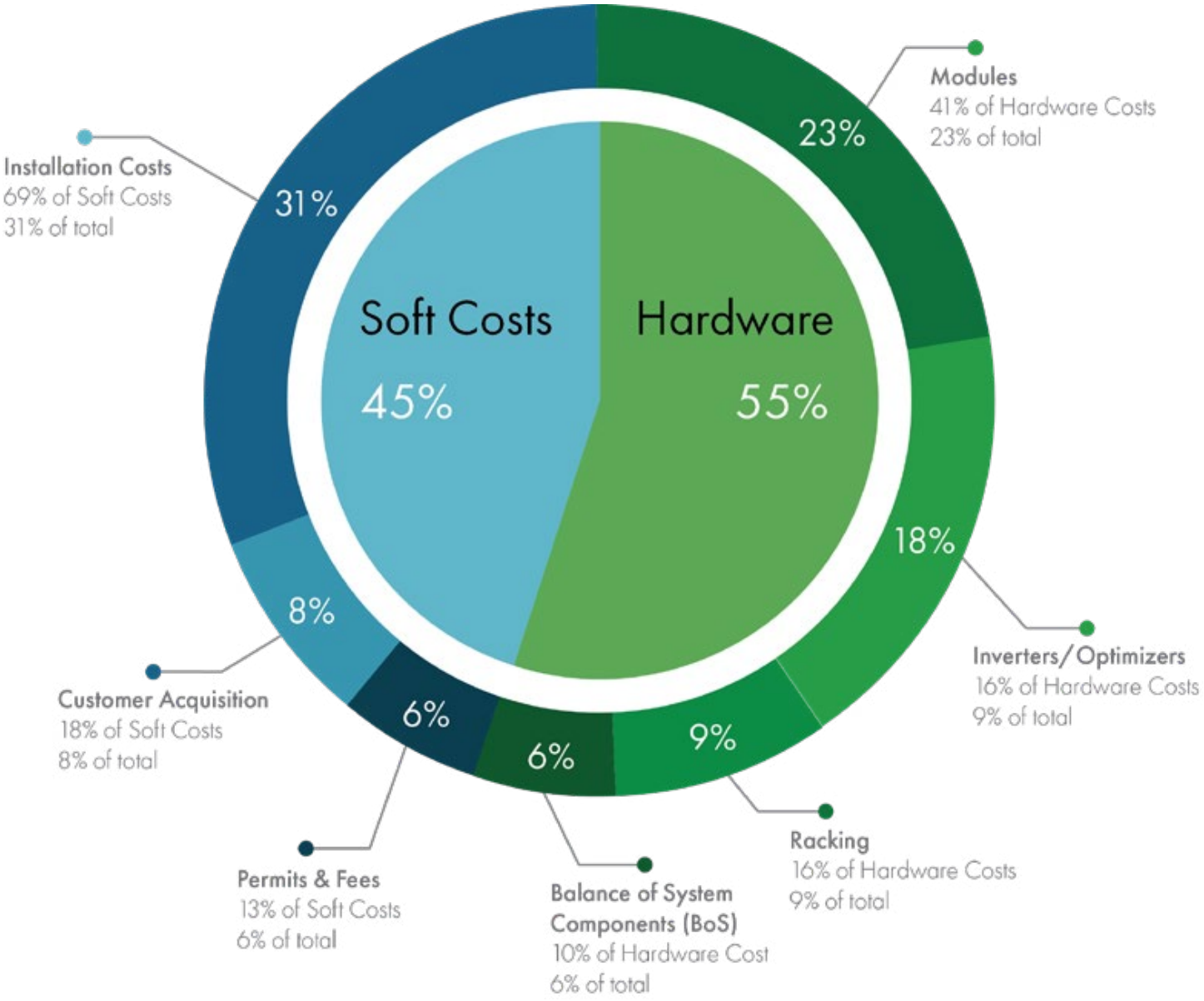
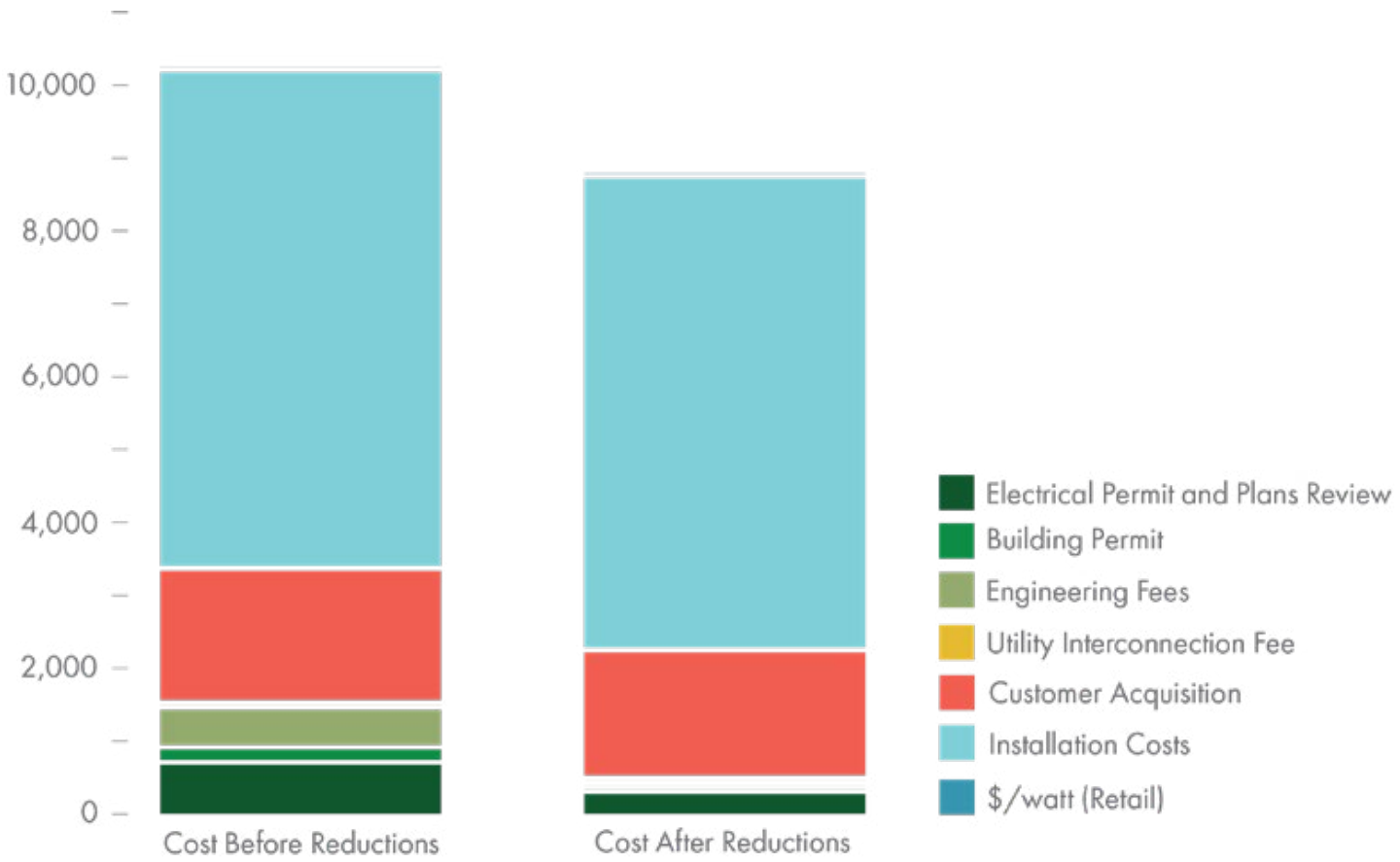


Table 3 and Figure 2 below compares the costs of a 9.5 kW residential grid-tied solar PV system in Nova Scotia with current soft costs versus reduced soft costs. These reductions would include eliminating the cost for municipal building permits and engineering fees (under certain conditions), reduced costs for electrical permits, and reduced installation costs. *By reducing or eliminating these soft costs results in overall lower system costs: from $2.42 per watt to $2.26 per watt; a savings of over $1500.*

Table 3: Cost Breakdown of a 9.5 kW Residential Grid-Tied Solar PV System in NS Including Soft-Cost Reduction

Soft Cost	Current Cost Before Reductions	Cost After Soft-Cost Reductions
Electrical Permit and Plans Review	$587 + $115 = $702	$172 + $115 = $287
Building Permit	$150	$0.00
Engineering Fees	$500	$0.00
Utility Interconnection Fee	$0.00	$0.00
Customer Acquisition	$1852.62	$1,759.99
Installation Costs	$7087.70	$6,733.32
Installed Cost (Retail)	$22,990	$21,477.99
$/watt (Retail)	$2.42	$2.26

Figure 2. Cost Breakdown of a 9.5 kW Residential Grid-Tied Solar PV System in NS Including Soft-Cost Reduction

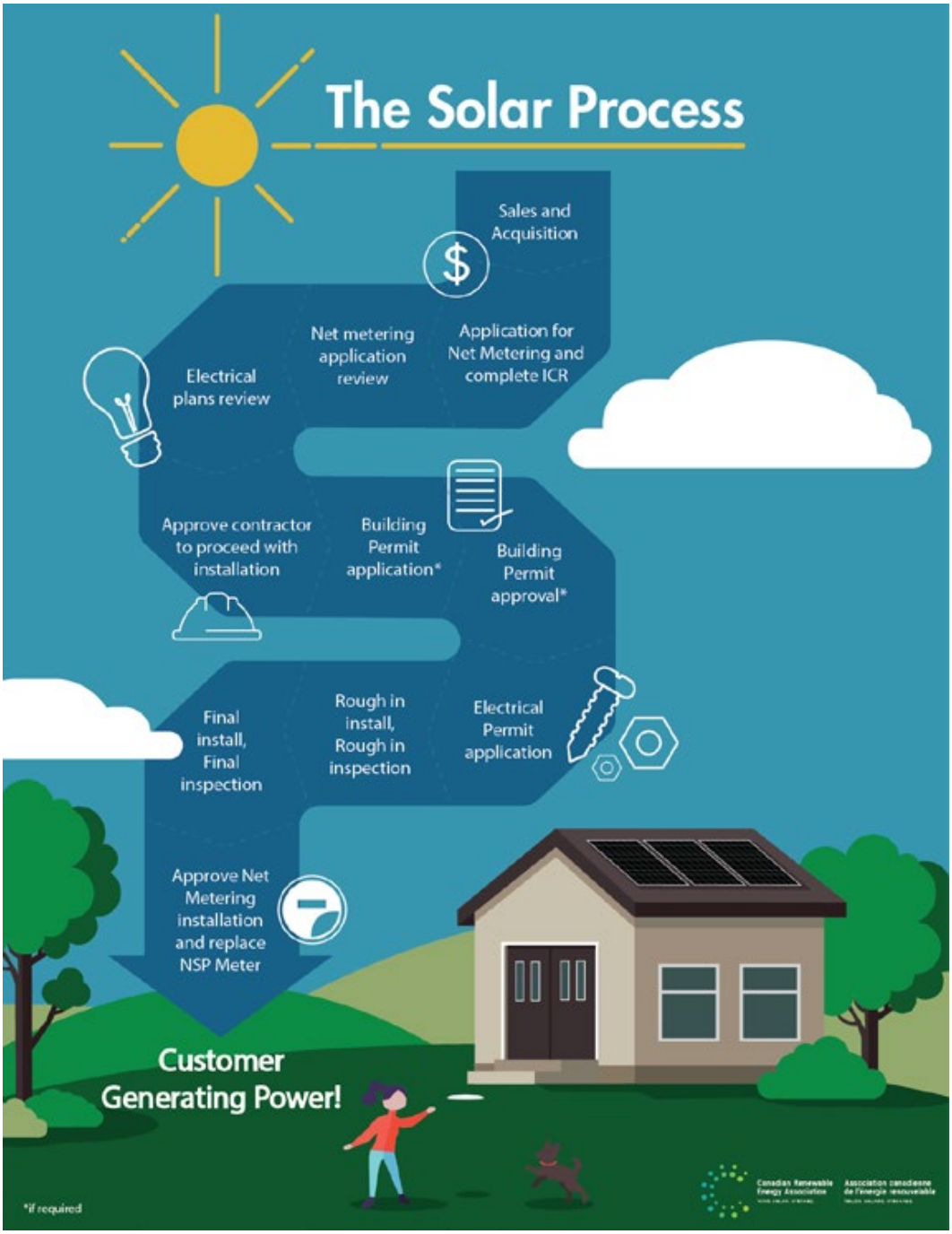


6. NOVA SCOTIA POWER ENHANCED NET METERING APPLICATION AND INTERCONNECTION PROCESS

Nova Scotia Power estimates that on average, the Enhanced Net Metering Interconnection process takes 6-8 weeks from the time a complete and accurate Interconnection Request (ICR) is received until the final inspection takes place. 43 percent of survey respondents agreed with this timeframe. Another 32 percent indicated the process took longer than 8 weeks while 25 percent indicated 3 to 6 weeks.

Figure 3 below represents a flow chart outlining this process from initiating the sale until installation of bi-directional meter.

Figure 3: The Solar Process



Nova Scotia Power outlines the following eight steps required to undertake the Enhanced Net Metering application process:[7]

1. Contact NS Power to answer any questions you might have about your distribution zone and generator sizing.
2. Read and understand requirements of NS Power's Interconnection Guidelines Document.
3. Complete all information in the appropriate Net Metering Connection Request and Equipment Information Form (10kW and less or 10kW-100kW).
4. Submit form including all necessary attachments either by email or regular mail.
5. NS Power verifies details of Interconnection Request.
6. Make arrangements for electrician to take out writing permit and have all electrical inspections performed/passed.
7. Upon notification from NS Power, complete and mail in Net Metering Interconnection Agreement.
8. Once signed, NS Power will schedule a meter change to install bi-directional meter. Upon installation, customer connected.

7. IMPACTS OF INTERCONNECTION PROCESS ON SOLAR INSTALLATION

In order to connect a residential solar system to the grid, the utility requires installers to complete the Interconnection Request and Equipment Information Form (ICR). The utility also requires the customer to sign a Net Metering Class 1 Interconnection Agreement. *The ICR form is attached as Appendix E.*

Nova Scotia Power does not charge an interconnection fee, but the customer is responsible for costs incurred in delivering the net metering service beyond the standard connection costs to regular customers. Some Canadian utilities charge anywhere from $400 to $1700 for interconnection fees. *For a breakdown of interconnection fees by utility, see Appendix F.*

The ICR process includes providing detailed information on solar modules, inverters, rapid shutdown equipment, interconnection transformer and fuses, interconnection circuit breakers and protective equipment. This process can have significant impacts on an overall project – particularly the labour costs to complete the ICR and the time required to receive approval from the utility.

In the online survey, respondents were asked to put a dollar figure on how much these processes added to the overall cost of an install. Answers ranged from $100 to over $700. The largest cohorts were between $100-$200 and $400-$500.

One of the ways to reduce wait times and costs is to offer an online process for interconnection requests and net metering applications. Ontario's electricity distribution utilities offer an online application form, and British Columbia is currently working to develop something similar. Nova Scotia Power is considering options for an online process which is widely supported by survey respondents. Nova Scotia Power's first phase will be to create an online mechanism for submitting the ICR with an aim to improve the quality of applications. There are no immediate plans for creating an interactive online portal, but it may be considered in the longer term.

[7] https://nspower-stage-ca.aws.silvertech.net/images/default-source/default-album/chart-20for-20net-20metering.jpg?sfvrsn=61273427_2

Recommendation	*That Nova Scotia Power implement an online process for the Interconnection Request and Equipment Information Form and Net Metering Applications.*

8. ELECTRICAL INSPECTION PROCESS

Solar PV electrical inspections are necessary to comply with national and provincial electrical codes and to ensure public safety. In Nova Scotia, a three-step process is required to undertake electrical inspections: plans review, rough-in inspection and final inspection.

The following section outlines the electrical inspection process in Nova Scotia including ways to improve/streamline based on the following:

- Exempting electrical plans review for certain sized systems.
- Reducing number of inspections.
- Reducing inspection window of time (how long it takes from the time NS Power notifies the installer until when the inspection takes place).
- Moving to a system of virtual inspections.
- One-day electrical inspector training with interactive code discussions to ensure all inspectors are working from the same rules, regulations and practices. The session would also highlight the latest solar PV equipment currently available.

8.1 Electrical Plan Review Requirements

Section 7.0 of the ICR outlines the Plans Review process that must be followed by all customers applying to the Enhanced Net Metering Program. This is a lengthy process that is typically completed by the solar installer and requires the following steps:

- Electrical Single-Line Diagram
- Manufacturers Information and Approvals
- Equipment Labelling
- Site Plan
- Protective Device Data
- Point of Contact.

Nova Scotia Power recently introduced a new process to reduce and improve the plans review process whereby contractors can re-use a pre-approved plan design at different locations. Majority of survey respondents indicated they have not taken advantage of this process. Because most systems are not alike, it makes it difficult for installers to take advantage of a pre-approved plan design.

The online survey included a question on whether Nova Scotia Power should have a policy in place that limits the plans review process to more complicated systems defined as commercial systems and/or any system over 30 kW. Over 80 percent of respondents agreed with this position.

Recommendation	*That Nova Scotia Power introduce an accelerated/streamlined plans review process for net metering systems under 30 kW.*

8.2 Reducing Number of Electrical Inspections

Nova Scotia is the only jurisdiction in Canada requiring two inspections – a rough-in and final. This is mandated by the Province through the Department of Labour and Advanced Education and not Nova Scotia Power.

The purpose of the rough-in inspection is to ensure the cables, wiring, inverters, and disconnect switches are properly installed and that the system is properly grounded prior to the installation of the solar modules.[8] The final inspection occurs after the modules are installed and considers the warning labels that must be securely fastened to the disconnect switches and breaker panel. The electrical contractor must be present during the final inspection. Both the rough-in and final could be combined into a single inspection. Currently the rough-in inspection is conducted by the installer submitting electronic photos to the inspectors; it is a rare occurrence where an inspector would access the roof. As a result, this process could be rolled into the final inspection.

Survey respondents overwhelmingly supported the move to a single inspection process. Over 70 percent of respondents indicated that the two-stage electrical inspection process did not contribute significantly toward increased overall quality and safety of the solar installation process.

8.3 Inspection Window of Time

When asked about the number of days it took for the final electrical inspection to occur, answers varied. 57 percent indicated between 6-10 days while close to 30 percent answered 11-20 days.

Photo courtesy of Sea Coast HVAC.

8.4 Moving Towards a System of Virtual Inspections

During the Covid-19 response, Nova Scotia Power temporarily instituted a virtual review process for some rough-in electrical inspections to reduce in-person contact. This was widely supported by survey respondents who indicated they would like to see the rough-in inspection move permanently to a virtual process.

8.5 Electrical Permit Approvals

Survey respondents indicated various wait times associated with Nova Scotia Power approving electrical permits where a review or clarification was not required. 35 percent of respondents indicated 10 days or less while 35 percent indicated between 11-20 days and another 35 percent between 21 days and more than 31 days.

[8] Solar Nova Scotia. Solar Interconnection 101, 2019, 7-8. http://solarns.ca/sites/solarns.ca/files/2018-11/NS_Solar_Interconnection_101_2019.pdf

Recommendations	
	• *That the Province move to a single inspection process similar to other jurisdictions across the country. Nova Scotia Power could maintain a virtual rough-in inspection process to incorporate this process into a single inspection.* • *That approval of electrical permits, where a review or clarification is not required, take no more than 14 business days.*

8.6 Installation of Bi-Directional Meter

Prior to Nova Scotia Power's transition to smart meters, there were long wait times associated with the installation of the bi-directional meter. In the past, Nova Scotia Power would order the bi-directional meter following approval of the final inspection. By the time it was delivered and installed, the process could take anywhere from 2-6 weeks. There was also a cost to the customer of over $300 to purchase the meter.

Since Nova Scotia Power's transition to smart meters, wait times have improved dramatically. Now bi-directional smart meters are able to be installed within a week of the final inspection. There is also no charge to the customer for the new meter.

Although the new smart meters have bi-directional capability, Nova Scotia Power has not yet deployed the ability to push the new configuration over the network. As a result, if a customer currently with a smart meter wants to install a grid-tied solar PV system, they still require a meter exchange.

Recommendation	
	That Nova Scotia Power deploy the ability to readily convert previously installed smart meters to bi-directional capability in order to enable a homeowner to more quickly energize their newly installed solar PV system.

8.7 Level of Knowledge Among Electrical Inspectors

The majority of survey respondents (65 percent) agreed or somewhat agreed that electrical inspectors were knowledgeable and helpful during the inspection process. 30 percent indicated that their level of knowledge varied while 5 percent somewhat disagreed with this statement. Some installers acknowledged differences in level of knowledge among inspectors within and outside of HRM. Inspectors working within HRM have gained much more experience given the vast number of solar installations taking place within the municipality.

Recommendation	
	That HES provide a one-day training session for Nova Scotia Power Electrical Inspectors to ensure all inspectors are working from similar rules, regulations and practices. The training would also include presentations on the latest solar PV equipment and technology.

9. ELECTRICAL PERMITTING FEES

9.1 Implementing Fixed Fees based on System Size

Electrical permits–which fall under the Canadian Electrical Code–are mandatory for all solar PV installations. They are issued to ensure compliance with the many components of a solar PV system including–but not limited to–modules, wires, inverters, connectors, and disconnects. The code outlines a process for installing the components of a solar PV system in a safe manner. Components that are certified and tested for solar PV installations must be installed in accordance with the code and the manufacturer's installation instructions. Most residential PV systems are simple from an electrical standpoint and can be designed by a solar or

electrical contractor. In some circumstances, an electrical engineer may be required depending on the complexity of the system.

Within Nova Scotia, electrical permits are administered through Nova Scotia Power. The utility has a sliding scale for electrical permit fees based on the installed value of the installation. For solar installations valued between $10,001-$15,000, the electrical permit fee is $462; between $15,001-$25,000, $587. The survey conducted by HES PV found that 60 percent of respondents paid between $300-$400 while 35 percent paid between $401-$500.

In Ontario, electrical permits are based on the following scale:

- 10kW or less: $290
- >10 kW to 250 kW: $1,079
- 251 kW to 500 kW: $2,696
- More than 500kW: $5,391[9]

On January 1, 2019, the Province of British Columbia introduced a new set of lowered fees for electricity production and storage systems, such as renewable energy systems, generators, and batteries. The fees are no longer charged by system cost but rather a flat fee based on a residential or commercial install. Under this new system, a residential solar PV system without other electrical work represents a flat rate of $172. A commercial solar system is $283.[10]

When asked if Nova Scotia Power should offer a fixed electrical permit fee for certain residential systems under 30 kW, over 80 percent of respondents agreed. *It is important to note that any changes in electrical permit fees would require approval from Nova Scotia Utility and Review Board.*

Recommendation	*That Nova Scotia Power offer a fixed electrical permit fee for certain residential systems under 30 kW.*

9.2 Plans Review Fee

Nova Scotia Power charges a flat fee of $115 for the Plans Review process. Over 52 percent of respondents indicated the fee was reasonable while 48 percent found it unreasonable.

10. MUNICIPAL BUILDING PERMIT PROCESS – BEST PRACTICES

Building permits and engineering approvals are necessary for any structural modification at the residential, commercial, or industrial scale. The purpose of a building permit is to prevent dangerous and potentially fatal modifications to structures, as well as providing a uniform method of structure modification.
Flush mount residential solar installations do not require any structural modification. These systems have a proven track record in the world market for safety and therefore should be exempt from the building permit process which can be expensive and time-consuming. Many municipalities are leading the way in this realm including Calgary, San Jose, San Diego, Palo Alto, and Portland. These municipalities have implemented "no permit and engineering costs" for specific residential situations. This represents an example of creating a reasonable policy to benefit solar homeowners and installers.

[9] Ontario Electrical Safety Authority: Electrical Inspection Fee Guide, 2017.
[10] New electrical installation permit fees for renewable energy systems, Technical Safety BC, https://www.technicalsafetybc.ca/blog/new-electrical-installation-permit-fees-renewable-energy-systems

10.1 Solar Building Permits in Nova Scotia

At least five Nova Scotia municipalities issue solar building permits – Halifax, Municipality of Kings, Town of Wolfville, Town of New Glasgow and Municipality of Pictou. As more solar is installed throughout the province, it is important that all Nova Scotia municipalities be informed on solar PV technology and best practices related to solar building permits.

To obtain a building permit for a solar PV installation within these five municipalities requires the installer to submit the following information:

- a copy of plans showing system design including all structural elements
- an engineered design including mechanical connection details of the solar collectors to the roof
- plans indicating if any structural alterations are required.[11]

Photo courtesy of Molen Services.

HRM charges a fee of $150 for the building permit; the Municipality of the County of Kings $50. The Town of Wolfville charges $4.00 per $1000 of value of construction plus a $50 base fee. The Town of Wolfville requires an additional process for the engineer to sign off on a letter of undertaking which significantly increases engineering fees. The Town of New Glasgow and the Municipality of Pictou charge $25 for the building permit plus $2.50 per $1000 of estimated value of construction.[12]

Across the country, solar building permit fees vary by jurisdiction from a low of $50 to high of $1000. For a cross-Canada comparison of building permit fees by municipality, see Appendix G.

Required engineering reports represent the most significant cost to obtaining a building permit. Survey respondents reported a variety of fees ranging from under $300 to over $700. This represents a significant added cost to installing a solar PV system.

HRM indicates that they aim to review an application permit within 5 business days.[13] In terms of length of time to receive approval for a building permit including all paperwork and engineering reports, 43 percent of survey respondents indicated 10-15 days while close to 20 percent indicated 21-30 days.

During the pandemic, HRM enabled installers to complete the building permit application online which has resulted in significant time savings and reduced labour costs. The move to an online permit process was widely supported by the survey respondents.

[11] https://www.halifax.ca/sites/default/files/documents/home-property/building-renovating/SolarFall2016.pdf
[12] https://www.newglasgow.ca/images/stories/Eng_PubWorks/County_of_Pictou_-_Building__Development_Permit_Package_March_12_2014.pdf
[13] https://www.halifax.ca/sites/default/files/documents/home-property/building-renovating/Solar%20Application%202020.pdf

10.2 Simplified Permitting Process

The term "simplified permit process" refers to an organized permitting process by which a majority of small PV systems (under 10 kW) can be permitted quickly and easily. It does not apply to all types of PV systems. It is intended to simplify the structural and electrical review of a small PV system project, establish guidelines that determine when a PV project is within the boundaries of a typical, well-engineered system, and minimize the need for detailed engineering studies and unnecessary delays. The streamlined process is not intended to circumvent the engineering process but rather to show clear conformity to code requirements.

The overwhelming majority of survey respondents (over 85 percent) support a municipal policy that exempts systems under 10 kW flush mounted to the roof from a permit.[14]

10.3 Best Practices in Municipal Permitting including Exemptions

The U.S. Department of Energy, through the Solar America Board for Codes and Standards, has led initiatives to develop an expedited permit process outlining a simpler set of rules and requirements for electrical and building permits for solar PV projects. A number of municipalities in the United States have introduced processes to streamline the permitting process including:

- Developing standard systems that meet certain criteria under 10 kW in size that are exempt from the building review process that normally applies to all systems.
- Offering solar-specific websites that walk potential customers and new installers through local jurisdictions' solar permitting process and required documentation.
- Communicating regularly via email to the local solar industry regarding updates and code changes.
- Offering a unique solar-specific roof permit.
- Providing online permitting systems that have the potential to greatly reduce permit related labour costs.
- Imposing a cap or waiving building permit fees on all solar energy systems.

The City of Santa Barbara, California streamlined its permitting process for both residential solar and residential solar with battery energy storage systems through a process called On-Demand Permitting (ODP). ODP eliminates the plans review phase in permitting and issues a permit immediately, as long as the proposed project meets minimum requirements. Solar systems rated less than 10 kW with optional energy storage systems less than 47 kWh are eligible.

Within Canada, HES PV has prepared best practice guidelines for municipal solar permitting based on simple and complex solar PV installations. Under a simple installation, no building permit would be required. More complex systems involving a change to the roof structure, use of ballast or ground mount systems would trigger a building permit. A number of Canadian municipalities have adopted this model including Calgary, Vancouver, and Colwood, B.C. *For suggested guidelines as prepared by HES PV, see Appendix H.*

[14] https://solsmart.org/permitting/

10.4 Level of Knowledge Among Building Inspectors

The majority of survey respondents had mixed reviews with respect to the level of knowledge and helpfulness of building inspectors. 47 percent indicated their knowledge varied while 42 percent disagreed that they were knowledgeable and helpful. Moreover, none of the municipalities surveyed indicated that their building inspectors were trained in solar PV. This indicates that training would be beneficial to get municipal building inspectors up to speed with solar PV technology and the installation process.

Recommendations	
	• *That municipalities in Nova Scotia adopt a solar building permit process based on simple and complex installations. Residential installations under 10 kW AC flush mount to the roof would be considered simple installations and exempt.* • *That municipalities offer an online building permit process as currently being offered by HRM.* • *That HES PV provide a one-day training session for Nova Scotia Building Officials Association to ensure all municipal building inspectors are working from similar rules, regulations and practices.*

11. HARMONIZED SALES TAX (HST)

In Nova Scotia the HST adds 15% to the overall cost a solar PV system (5% federal and 10% provincial).

HST exemptions provide a way to incentivize and thus increase deployment of solar PV installations. This would apply to both individuals and businesses that install solar PV. Because solar will be a key mechanism for the Province to meet future GHG reduction and renewable energy targets, it is in the Province's best interest to develop strategies that increase solar uptake. These exemptions would also assist to maintain solar momentum as the SolarHomes Program winds down over the next few years.

Sales tax incentives typically provide an exemption from the provincial and/or federal sales tax for the purchase of a solar PV system. This type of exemption helps reduce the upfront costs of a solar installation. The Province could consider eliminating the provincial portion of the HST on the installation of solar PV systems while lobbying the Federal Government to eliminate their portion. Currently Nova Scotians who purchase electricity directly from Nova Scotia Power are exempt from the provincial portion of the HST on their electricity bills. This should also apply to Nova Scotians who self-supply utilizing solar PV.

Within Canada, British Columbia exempts solar installations from the provincial sales tax. In the United States, 25 states offer sales tax exemptions for solar energy. Arizona, for example, provides a sales tax exemption for the retail sale of solar energy devices and for the installation of solar energy devices by contractors. Colorado exempts from the state's sales and use tax all sales, storage, and use of components used in the production of alternating current electricity from a renewable energy source. The exemption also includes all sales, storage, and use of components used in solar thermal systems.[17]

Recommendation	
	That the Province consider exempting the provincial portion of the HST on solar PV installations.

[17] https://www.seia.org/initiatives/solar-tax-exemptions

12. SOLAR FINANCING

The upfront cost of a solar installation can be a daunting prospect for many new solar customers. This can deter some homeowners from proceeding with the project, thus decreasing the deployment of systems throughout the province. Solar customers in Nova Scotia are fortunate to have various financing options to install a solar PV system. The most popular are municipal property assessed clean energy (PACE) programs.

PACE enables homeowners to finance the cost of a solar PV system through a low-cost loan provided by the municipality through a local improvement charge. Various private sector options are also available including Credit Union Atlantic's Energy Efficient Financing, a Community Economic Development Investment Fund (CEDIF) offered through Nova Solar Capital, a leasing option offered through Polaron Solar Energy and home equity lines of credit.

12.1 PACE Programs

Several municipalities offer PACE programs to finance energy efficiency upgrades and, in some cases, solar PV systems. They are designed to help homeowners pay for their upgrades with the money they save on heating, cooling and electricity costs.

The most successful solar PACE program in Nova Scotia is Halifax Solar City. Launched in 2010, it is the first program of its kind in Canada. The municipality places a voluntary Local Improvement Charge (LIC) on the property after the solar contractor is paid at the end of the project. The LIC is an additional annual charge separate from the property owner's annual property tax bill. The LIC payments are made over a period of 10 years at a fixed interest rate of 4.75% with the option for the property owner to pay the balance in full and remove the lien at any time without penalty.[18] Loan amounts are up to 75 percent of the property's assessed value.

The Town of Wolfville, in partnership with PACE Atlantic, launched a PACE program in April 2021 called Switch. The program provides homeowners with zero percent financing towards energy efficiency upgrades including solar PV. Loan amounts are based on 15 percent of the assessed value of the home up to a maximum of $40,000 with a payback period of 15 years.[19]

Solar Colchester is another PACE program launched in 2019 by the Municipality of the County of Colchester. The program has recently partnered with PACE Atlantic. Similar to Wolfville's Switch program, it offers homeowners zero percent financing towards energy efficiency upgrades including solar PV. Loan amounts are based on 15 percent of the assessed value of the home up to a maximum of $40,000 with a payback period of 15 years.

The Clean Foundation administers PACE programs on behalf of seven municipalities called Clean Energy Financing. However only three of these municipalities – the Town of Bridgewater, Town of Amherst and Municipality of Cumberland - offer financing up to $20,000 to $25,000 – enough to cover the cost of installing a solar PV system. Even within these limits, there are additional criteria. For homes with full assessed property values of more than $150,000, the maximum eligible amount is lesser of $20,000 or 10% of the full assessed property value.[20]

Utilizing PACE to finance a solar PV system can convert a large upfront cost into a series of smaller more manageable monthly payments. Even with loan interest, a solar installation still provides an attractive return on investment and significant savings on electricity costs.

[18] Efficiency Nova Scotia and Canadian Solar Industries Association, Nova Scotia Go Solar Guide, 2019, 10.
[19] https://pace-atlantic.org/wp-content/uploads/2021/05/Switch-FAQs-Wolfville-V2.2.pdf
[20] https://cleanenergyfinancing.ca/.

12.2 Improving PACE Programs

A number of PACE programs within Nova Scotia require a 1: 1 debt-savings ratio in which the cost of clean energy upgrades, program fees, and cost of borrowing must be less than or equal to the estimated energy savings over the financing period. While the debt-to-savings ratio may seem compelling for consumer protection and reducing lending risks, there is little evidence to suggest that improvements with positive cash flows lead to lower rates of defaults.[21] Ability to pay rather than a legislated debt-to-savings ratio could be used in underwriting and program eligibility in order to protect consumers and the municipality.[22]

While Nova Scotia has a number of public and private sector programs to help homeowners offset the costs of installing solar PV, the 10-year payback period is well below existing paybacks for residential solar systems.[23] Introducing longer-term solar financing programs of 20 plus years could help to increase uptake in the immediate and longer term.

A solar financing survey initiated by HES PV in March 2021 found that in areas of the province where no PACE programs existed, homeowners were using available savings, lines of credit and mortgage financing to pay for their solar installation. Over 80 percent of respondents indicated that having greater access to low financing options like PACE would have a significant impact in terms of attracting more customers while over 90 percent indicated that such financing is important in closing a sale. 70 percent of respondents indicated that having access to PACE has increased their business.

Survey respondents also provided valuable feedback on PACE programs based on the following:

- **Interest Rates:** Over 90 percent of respondents indicated that PACE interest rates should be no more than 4 percent.
- **Maximum loan amounts:** 33 percent indicated $30,000 while 60 percent favoured the Halifax Solar City model – 75 percent of the assessed value of the property.
- **Amortization:** 87 percent indicated 10-15 years.
- **Debt to Savings Ratio:** Over 60 percent of respondents indicated the debt-to-savings ratio should be eliminated and substituted with a credit check.

Table 4 below compares PACE financing using 4.75% interest rate over ten years versus 3.00% interest over 15 years. Moving from 10 to 15 year with a 3.00% interest rate results in lower monthly payments (a savings of $82.27 per month) plus an overall reduction in the final cost (a savings of $347.73).

Table 4 : Example Comparing PACE program at 4.75% over 10 years vs. 3% over 15 Years

	Solar Financing at 4.75% over 10 years	Solar Financing at 3.00% over 15 years
System Cost Before Financing	$22,988.78	$22,988.78
Interest Rate	4.75%	3.00%
Monthly Payments	$241.03	$158.76
Total Interest Paid	$5,935.08	$5,587.35
Final Cost	**$28,923.86**	**$28,576.13**

[21] Clean Energy Finance and Investment Authority, Residential Property Assessed Clean Energy: A Connecticut Program Viability Assessment (2015), 51. https://www.cesa.org/wp-content/uploads/R-PACE-CT-Viability-Assessment.pdf.
[22] Pembina Institute, Property Assessed Clean Energy in Canada, June 2020, 16.
[23] Dunsky Energy Consulting, Nova Scotia Residential Solar Market Outlook and Labour Force Study, April 2019, 13.

Recommendation	*That all Nova Scotia municipalities consider adopting a PACE program with financing up to $25,000, with a payback period of at least 15 years and interest rate under 4 percent.* *That the one-to-one debt-savings ratio be eliminated and replaced with a credit check.*

13. CUSTOMER SALES AND ACQUISITION

Customer sales and acquisition refers to the amount of time and money a company spends to educate customers in order to sell a residential solar system. It includes all costs to obtain leads as well as all sales and marketing strategies related to closing a sale.[24] This process includes a number of components such as system design and proposal, explaining the various solar technologies, net metering, financing options and general solar education.

Survey results indicated that the cost for a solar company to acquire a customer, ranges anywhere from 0 to more than 9 percent of total system cost. Results are highlighted in Table 5 below:

Table 5: Cost for a Solar Company to Acquire a Customer as a Percentage of Overall System Cost

Percentage of Respondents	Cost for a solar company to acquire a customer as a percentage of overall system cost
40 percent	1-3 percent
27 percent	3-5 percent
7 percent	5-7 percent
13 percent	0 percent
13 percent	More than 9 percent

The survey also included a question on what part of the sales process took the longest to educate customers. General solar education took the longest followed by net metering, system design and proposal, various technologies and financing options.

47 percent of survey respondents indicated they used various forms of social media to increase sales while 13 percent utilized search-engine optimization on their website. Only 7 percent employed a full or part-time salesperson.

An excellent customer education tool is the Nova Scotia Go Solar Guide developed by Efficiency Nova Scotia in partnership with the Canadian Solar Industries Association. Created specifically for Nova Scotians, this guide is designed to:

- Help homeowners understand the economic and environmental benefits of generating their own electricity with solar PV.
- Provide information on solar programs and services available in Nova Scotia and how to use these programs to reduce the cost of their system.
- Explain the solar PV installation process from start to finish, with guidance on choosing an appropriately sized system, selecting a qualified solar installer, assessing system costs, estimating system performance, and reducing risk.[25]

[24] https://www.greentechmedia.com/articles/read/costs-to-acquire-us-residential-solar-customers-are-high-and-rising
[25] *Nova Scotia Go Solar Guide*, Efficiency Nova Scotia and Canadian Solar Industries Association, 2019, 4.

While 70 percent of survey respondents were aware of the guide, only 30 percent indicated they shared the guide with their customers. By getting the guide in front of potential customers could result in reduced time and effort required by the installer to educate the homeowner on the various solar processes.

Recommendations	*That staff from Efficiency Nova Scotia, Halifax Solar City and other solar financing programs share the Nova Scotia Go Solar Guide with their installers and that they encourage all installers to share the guide with their customers.* *That municipalities post the Nova Scotia Go Solar Guide on their website to better educate homeowners on solar PV technology.*

14. MUNICIPAL PLANNING STRATEGIES, LAND-USE BYLAWS AND POLICIES THAT PROMOTE INCREASED UPTAKE OF SOLAR PV

Municipal approaches to planning, zoning, and development can have a significant impact on solar PV growth. When done correctly, planning and zoning can help facilitate the rapid expansion of solar energy while balancing other development priorities in the community.

Municipalities use a variety of documents to plan for future development. These documents help the municipality manage competing priorities and provide guidance on where and how development should occur. Zoning and development standards reflect the vision and goals set forth in a municipality's planning documents. As such, integrating solar into the planning process is critical in establishing a foundation for the long-term growth of the local solar market.[26] Municipalities will need to incorporate various land-use and zoning tools to accommodate this increased growth in larger projects.

Under the Municipal Government Act (MGA), municipalities in Nova Scotia create municipal planning strategies to provide a cohesive vision for the future of the community, as well as a policy framework for land use and development control. The MGA provides councils with the power to make statements of policy with respect to a broad range of activities including future development, land use, public lands, transportation, municipal services, municipal development, coordination of public programs, and any other matters related to the physical, social or economic development of the municipality.

The following references within the MGA could be utilized by municipalities to expand solar opportunities. These would include developing policy statements on:

- Generating, using, and conserving energy
- Climate change mitigation and adaption
- Promoting social well-being
- Residential, commercial and industrial uses.[27]

In 2020, the Halifax Regional Municipality adopted HalifACT (Acting on Climate Together) - a long-term climate change plan aimed at reducing emissions and helping communities adapt. The plan guides efforts to reduce emissions by conserving energy and increasing access to clean energy sources. It also helps

[26] https://solsmart.org/solar-energy-a-toolkit-for-local-governments/planning-zoning-development/.
[27] Nova Scotia Municipal Government Act: https://novascotia.ca/just/regulations/regs/mgaminimum.htm.

communities adapt by raising awareness and helping people prepare.[28] The plan commits that all buildings be net zero by 2050, that 1300 MW of solar by installed by 2050 including 3-4 MW over the next two years. The plan also commits to 100% EV adoption by 2030.

14.1 Solar Electricity for Community Buildings Program


Photo courtesy of Molen Services.

In 2017, the Nova Scotia Department of Energy and Mines introduced the Solar Electricity for Community Buildings Program enabling eligible community groups and organizations (including municipalities) to generate up to 75kW of solar PV electricity on their roofs or properties and sell it to their utility under a 20-year contract through a power purchase agreement. The program aimed to support community participation in renewable energy generation and learn more about how solar electricity can help Nova Scotia continue its clean energy transition.[29] The program concluded in 2019 with 23 municipalities participating generating over 1.3 MW of solar electricity.

14.2 How Municipalities can Support Solar-Ready Homes

Solar-ready codes for new construction – including residential and commercial – can help make future solar installations easier and more cost effective.

In 2020, Natural Resources Canada, in partnership with the Canadian Solar Industries Association, launched the Planning and Decision Guide for Solar PV systems, a guide that builders and solar PV consultants can use together to quickly address the areas of the construction process that solar PV will affect. This tool helps with the smooth integration of solar PV systems into new builds with a quick-to-use summary worksheet as well as in-depth information on each step of the solar PV integration process. This guide is an excellent resource toward the design and construction of solar-ready homes.

The following is a list of solar-readiness code components that should be thoughtfully considered by municipalities:

- Roof load bearing specifications should be sized to bear the weight of a solar installation.
- The roof should be oriented to maximize solar capacity. The greatest production will occur when a roof is south facing, angled between 30 and 45 degrees.
- Roof types should be compatible with solar installation mounting.
- Non-solar rooftop equipment (HVAC systems, chimneys, vents) should be placed to avoid shading of solar equipment and to maximize the amount of continuous roof space.
- Electrical panels should be sized to accommodate a future solar system.
- There should be enough space in the utility room or outside for a solar DC-AC inverter
- Conduit for wiring should be placed from the roof to the electrical panel.
- Solar-ready codes should be mandated for both new residential buildings (one and two- family dwellings) along with commercial buildings (multi-family, workplaces, mixed-use). Solar-ready codes

[28] https://www.halifax.ca/about-halifax/energy-environment/halifact-2050-acting-climate-together.
[29] https://novascotia.ca/solar/solar-electricity-community-buildings.asp

can be included in the building code or zoning bylaws. Common requirements/guidelines include: arranging for homes to be built on an east-west line to maximize rooftop solar potential, building dedicated electric wiring in attics so PV systems can be added at a later date without opening walls or ceilings, and building large southern facing windows to provide for passive solar heating.[30]

There are many advantages for homeowners in building a solar-ready home or incorporating solar at the time of construction including lower installation costs, optimizing solar production, as well as the option of adding the cost to the mortgage. These guidelines also benefit builders by offering them the tools to provide an environmentally-conscious, low-cost upgrade to new homes. Manufacturers and installers benefit by encouraging market uptake of solar energy systems.[31]

Our municipal survey reported that the majority of municipalities were not overly familiar with solar-ready guidelines indicating the benefits of training municipal staff in this area.

Recommendation	*That municipalities work with the Canadian Home Builders Association – Nova Scotia, Construction Association of Nova Scotia, Solar Nova Scotia, Canadian Renewable Energy Association and the local solar installer industry to adopt solar-ready guidelines that encourage solar PV installations on new residential and commercial construction.*

14.3 Solar Access and Easements

As the proliferation of solar occurs across the province, the issue of solar access will become increasingly important, particularly in urban areas where solar access and urban densification goals may conflict. For example, issues can arise when a property owner installs a rooftop PV system and a neighbour wants to build a second-story addition that would potentially shade the system, reducing its electricity output.

Solar access ensures access to the amount of sunlight required for a solar PV system to operate at planned capacity. To date, there have been relatively few documented solar access cases to offer guidance, although municipalities are beginning to consider various policy options to address these issues.[32]

One option for municipalities is to incorporate solar access permits into their land-use bylaw. These are established automatically when an owner receives a permit for a solar PV system. These permits do not require voluntary agreements between neighbours. Municipalities can structure these permits to balance the need to protect solar access while allowing some shading to occur. For example, a municipality may allow a solar PV system to be shaded up to 5 percent before mitigation is required.[33]

Another option for municipalities to consider are solar easements which allow property owners to legally protect their access to sunshine enabling maximum output of a solar PV system. A legally-binding solar easement includes a detailed description of easement and the specific area where it applies. This often includes specific vertical and horizontal angles that must remain open to sunlight, or maximum heights and widths of shrubbery and buildings close to the property line. Easements can also be specific to certain times and dates during the year – for example, a solar easement specific to summer months when a neighbour's trees are in full bloom. Solar easements also list any circumstances in which it can be canceled or voided, and any incurred penalties for breaking the solar easement agreement.[34]

Municipalities can work together with developers on solar easements for new solar-ready subdivisions.

[30] https://www.energy.gov/eere/solar/homebuilders
[31] *Solar-Ready Guidelines, 1.*
[32] https://www.nrel.gov/state-local-tribal/blog/posts/solar-access-issues-and-policy-options.html
[33] https://solsmart.org/solar-energy-a-toolkit-for-local-governments/planning-zoning-development/
[34] https://news.energysage.com/what-is-a-solar-easement/

These restrictions may be signed as part of a covenant — a bi-lateral agreement between the municipality and the developer.

A potential solution to growing solar in urban environments is community or shared solar which provides a mechanism for accessing the benefits of solar while avoiding potential shading conflicts among neighbours. It might also offer an avenue for compensation in which a developer or property owner who ends up shading a neighbor's solar PV system due to new development or construction could provide compensation by purchasing shares in a community solar installation equivalent to the solar capacity that was shaded.[35]

Photo courtesy of Molen Services.

14.4 U.S Examples of Solar Access and Easement Policies

In the United States, more than 40 states have some form of solar access or solar rights laws, but most are voluntary and allow (but do not mandate) neighbours to directly negotiate solar easements with each other.[36] Below are some examples:

- California – Shade Control Act establishes that any tree or shrub that shades more than 10% of the area around a previously installed PV system is considered a private nuisance such that a PV system owner could seek court action against a neighbor to abate the nuisance (in this case, shading).
- Iowa - Allows for voluntary solar easements and authorizes local legislative bodies to develop "solar access regulatory boards" to review applications for solar easements.
- Massachusetts – Authorized municipalities to establish zoning bylaws and permitting processes to protect solar access, in addition to allowing solar easements.
- New Mexico – Adapted the prior appropriations approach (i.e., first in time, first in right) to guarantee solar access. The state went a step further in attaching that right to the "real property" on which a solar energy system is sited, making the right transferrable to subsequent property owners.
- Several municipalities – including Ashland, Oregon; Boulder, Colorado; and Sunnyvale, California – have also enacted solar access policies.[37]
- The Metropolitan Land Planning Act for the twin cities of Minneapolis-St. Paul, Minnesota requires that all local comprehensive plans contain "an element for the protection and development of access to direct sunlight for solar energy systems."[38]

Recommendations

- *That municipalities consider developing solar access and/or solar easement policies within their existing land-use planning framework.*
- *That municipalities work with developers on solar easement and solar access policies to enable the creation of new solar-ready subdivisions.*

[35] https://www.nrel.gov/state-local-tribal/blog/posts/solar-access-issues-and-policy-options.html
[36] https://www.nrel.gov/state-local-tribal/blog/posts/solar-access-issues-and-policy-options.html
[37] https://www.nrel.gov/state-local-tribal/blog/posts/solar-access-issues-and-policy-options.html
[38] https://metrocouncil.org/Communities/Planning/Local-Planning-Assistance/Solar.aspx?source=child.

14.5 Best Practices in Zoning for Solar

Zoning bylaws can have a direct influence on the amount of solar energy installed in a community. A National Renewable Energy Laboratory (NREL) study in the United States found a strong correlation between higher levels of installed solar capacity per capita and references to solar in the local code.

If zoning is not directly referenced in municipal zoning, it can leave the community and solar energy system owners vulnerable. A resident could oppose a neighbour's installation or sue the municipality for allowing a land use that is not defined or explicitly allowed in land-use regulations. This can result in a significant barrier to adoption and implementation of solar technologies.[39]

It is important for municipalities to include a comprehensive definition of solar energy systems in their zoning bylaws, in order to avoid any potential misinterpretations. This includes broadly defining solar energy systems to incorporate both passive and active solar energy collection and electricity generation, as well as water heating. It should also include battery storage linked to solar PV systems and allow the review of storage equipment as part of, rather than separate from, the solar energy system. Additionally, defining and distinguishing between roof-mounted and ground-mounted installations of various sizes will allow subsequent sections of the bylaw to identify which projects require separate review, and which installations are eligible to bypass zoning review and apply directly for a building permit.[40]

The Province of Nova Scotia recently passed legislation permitting the development of shared solar. This will enable all Nova Scotians – including those living in apartment buildings, to access solar electricity. It is important that municipalities begin amending their zoning bylaws to facilitate and encourage the uptake of shared solar projects and to ensure large ground-mount systems are appropriately sited.
The following zoning bylaw language from Chisago County, Minnesota represents a municipal example of how proper zoning can permit ground-mounted solar PV systems to be integrated as both an accessory and primary use:

1. *Ground-mounted solar PV systems shall be regulated as follows:*
    a) *Ground-mount systems are permitted accessory uses in all districts in which buildings and structures are permitted.*
    b) *Ground-mount systems require a Solar Site Permit and Building Permit.*

Photo courtesy of Supernova Energy.

[39] https://solsmart.org/solar-energy-a-toolkit-for-local-governments/planning-zoning-development/.
[40] https://solsmart.org/solar-energy-a-toolkit-for-local-governments/planning-zoning-development/.

2. Solar Farms: *Ground-mount solar PV arrays which are the principle use on the property, that are designed for providing energy to off-site users or export to the wholesale market shall be a permitted use in the Agricultural District.*
    a) *Solar Farms which are sited upon a contiguous or aggregate site area footprint larger than 20 acres (8.09 hectares) in size (commonly owned/controlled or not so) shall require a Conditional Use Permit. The Code has additional language restricting solar farms in floodplains, requiring a setback from protected natural areas and requiring a decommissioning plan.*[41]

Recommendations	*That municipalities include a comprehensive definition of solar energy systems in their zoning bylaws including battery storage linked to solar PV systems.* *That the bylaw include definitions that distinguish between roof-mounted and ground-mounted installations of various sizes. The bylaw should also identify which projects require separate review and which installations are eligible to bypass zoning review and apply directly for a building permit.*

14.6 How Municipalities Can Promote Solar Education to Reduce Costs

As part of the sales process, installers must educate homeowners on how solar works, the net metering process, installation procedures, billing and a number of other topics. HES PV estimates that up to one-third of customer acquisition costs go towards educating the customer on solar. If customers are able to be pre-educated on the various aspects of installing a solar PV system, these costs could be reduced to 15%. This can result in reducing system costs by 10 cents per watt.

Education is also the key factor in public acceptance and adoption of solar PV. Municipalities can play a key role in this process as it is relatively simple, has little expenditure, brings down barriers and builds solar familiarity in communities. Moreover, increasing solar public awareness showcases how municipalities are tackling climate change.

It is important that municipalities educate more than just homeowners on solar PV but include municipal staff – particularly building inspectors and planners. For example, if building permit staff become more knowledgeable on PV systems, they will be able to process applications more quickly and efficiently. Our survey results among solar installers indicated that the level of knowledge among building inspectors could be improved. This represents a great opportunity for municipalities to engage building inspectors and planners in solar PV training.

Specific topics for municipalities to address in a solar public awareness strategy include:

- Highlighting the economic and environmental benefits of generating your own electricity with solar PV.
- Outlining how net metering works.
- Explaining the solar PV installation process from start to finish, with guidance on choosing an appropriately sized system, selecting a qualified solar installer, assessing system costs, estimating system performance, and reducing risk.
- Providing information on solar programs and services available within the municipality and how to use

[41] https://www.chisagocounty.us/DocumentCenter/View/5877/Solar-Energy-Systems-Ordinance-2014-1120-1?bidId=.

these programs to reduce system costs.

- How to select an appropriate installer and what questions to ask.
- When you might consider adding battery storage to your grid-tied system.

Photo courtesy of WattsUp Solar.

Much of this information can be housed on the municipal website using links to existing sites that offer this information.

The following education materials should be made available:

- Nova Scotia Go Solar Guide - Mandatory reading for any homeowner interested in going solar – answers many of the topics highlighted above.
- Solar Nova Scotia's Interconnection 101 Guide – A step-by-step guide for Nova Scotia homeowners on the processes required to connect their solar PV system to the grid.
- Solar PV fact sheet
- Frequently Asked Questions (FAQ's)
- HES PV Installer Selection Guide.

Building a library of materials on the municipal website represents a good first step. Municipalities that would like to go further should consider holding public information sessions as an opportunity to bring together all of the stakeholders to present useful materials. Local installers are often more than willing to offer their time at these events to answer any questions from the public.[42]

Recommendations	
	That municipalities develop a Solar PV public education strategy by posting relevant solar materials and links on their website.
	That municipalities educate their own employees on solar PV technology – particularly building officials and planning staff.
	That municipalities consider hosting a public education session on solar PV technology similar to the previous sessions led by Solar Nova Scotia.

[42] In 2019, Solar Nova Scotia conducted over 50 Discover Solar sessions across the province with over 1000 people attending. The purpose of these sessions was to educate homeowners on the benefits of solar PV technology. Each session outlined key vocabulary, frequently asked questions, introduction to PV technology, production factors, financing options and roles and responsibilities of the homeowner, the installer, Nova Scotia Power and Efficiency Nova Scotia.

15. CONCLUSION

Findings from the study highlight the following four key takeaways:

1. Nova Scotia is well positioned for significant solar growth over the next several years

In 2020, there was a total of 2451 net metered customers with a total rated generated capacity of 19.8 MW. This represents a 400 percent increase in the number of installations and a 733 percent increase in total nameplate capacity since 2018. Nova Scotia Power estimates an additional 1200 net metered customers by the end of 2021. Growth is poised to continue over the coming years, driven in part by potential incentives for residential solar net metering at both provincial and federal levels.

2. While solar soft costs in Nova Scotia are lower than many jurisdictions across Canada and the United States, there is still room for improvement.

The percentage breakdown of solar hardware costs to soft costs in Nova Scotia is approximately 55-45. This is much lower than many jurisdictions across the United States where soft costs can be as high as 65 percent of total system cost.

Some of the key ways to reduce solar soft costs in Nova Scotia include:

- Amending the building permit process to define simple and complex installations where simple installations would be exempt from permitting.
- Moving to a single inspection process similar to other jurisdictions across Canada.
- Enabling more Nova Scotians to access PACE programming to finance a solar PV system.
- Removing the provincial portion of the HST from the sale of solar PV systems.
- Implementing online processes for ICR and net metering applications as well as building permits would speed up wait times while reducing labour costs.
- Limiting plans review to larger and more complicated systems will lower labour costs while enabling homeowners to energize their systems more quickly.
- Implementing more streamlined process for electrical permitting fees which will lower costs for the homeowner.

3. Nova Scotia municipalities will play an increasingly important role in growing the solar PV market across the province while lowering soft costs.

Municipalities can play an important role in educating homeowners and their staff on solar PV by developing a Solar PV public education strategy. Educating homeowners will reduce the amount of time required by solar installers to educate the customer thus lowering their sales and acquisition costs which can be passed on to the customer in the form of savings.

Municipalities can demonstrate their support for solar by adopting solar-ready guidelines that encourage solar PV installations on new residential and commercial construction.

Municipalities can promote increased uptake of solar PV by developing solar access and/or solar easement policies within their existing land-use planning framework. This will protect solar PV owners from future shading issues.

With the announcement of the Province's Share Solar Program, municipalities will need to update their zoning and land-use bylaws to include a comprehensive definition of solar energy systems, including battery storage linked to solar PV systems. Of particular importance will be establishing appropriate siting rules for large ground mount systems which will begin to occur once the program is finalized.

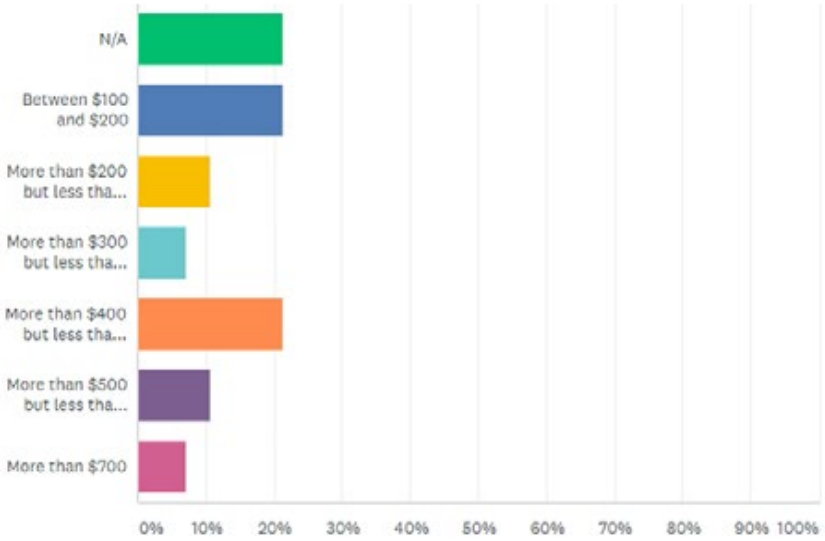
4. Ongoing training and development of electrical and building inspectors will be important in order to keep current with changes to electrical code and PV technology.

Solar PV technology is changing at a rapid rate. New products are introduced into the market annually. It is important that building and electrical inspectors are kept up-to-date as new equipment is introduced.

Photo courtesy of Molen Services.

Based on such factors as cost over-runs, time delays, length of time to complete application and impacts to customers, please estimate how much the interconnection process adds to your overall system cost.

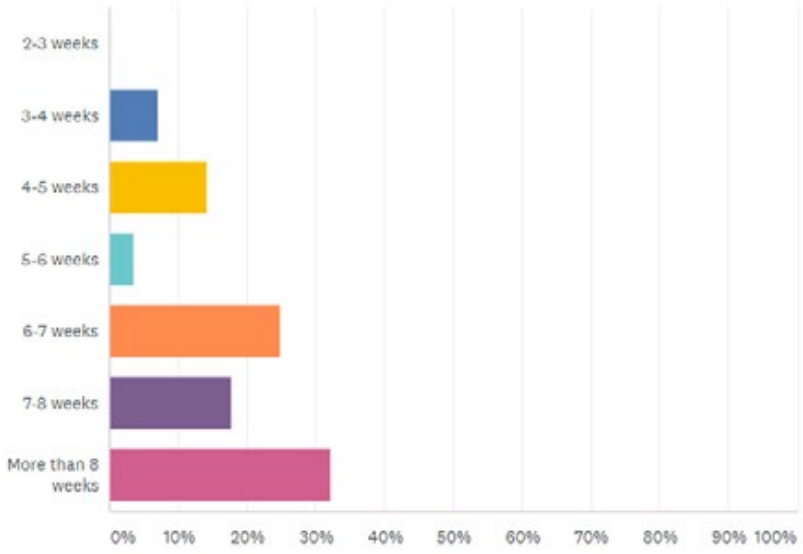
Answered: 28 Skipped: 0



ANSWER CHOICES	RESPONSES	
N/A	21.43%	6
Between $100 and $200	21.43%	6
More than $200 but less than $300	10.71%	3
More than $300 but less than $400	7.14%	2
More than $400 but less than $500	21.43%	6
More than $500 but less than $600	10.71%	3
More than $700	7.14%	2
TOTAL		28

NS Power estimates that on average, the Enhanced Net Metering Interconnection process takes 6-8 weeks from the time a complete and accurate Interconnection Request (ICR) is received until the final inspection takes place. From your own experience, what is the average timeframe (number of weeks) to complete this process?

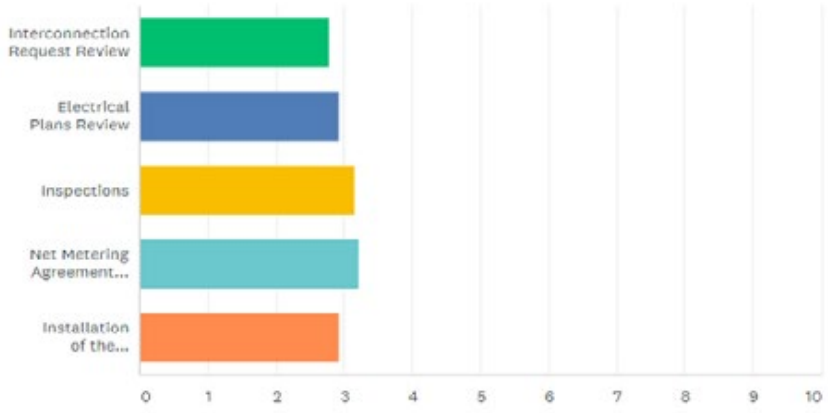
Answered: 28 Skipped: 0



ANSWER CHOICES	RESPONSES	
2-3 weeks	0.00%	0
3-4 weeks	7.14%	2
4-5 weeks	14.29%	4
5-6 weeks	3.57%	1
6-7 weeks	25.00%	7
7-8 weeks	17.86%	5
More than 8 weeks	32.14%	9
TOTAL		28

In your experience, what aspects of the Enhanced Net Metering Interconnection process adds the most time to complete an install? Please rank each item from 1-5 with 1 being the least amount of time to 5 being the most amount of time.

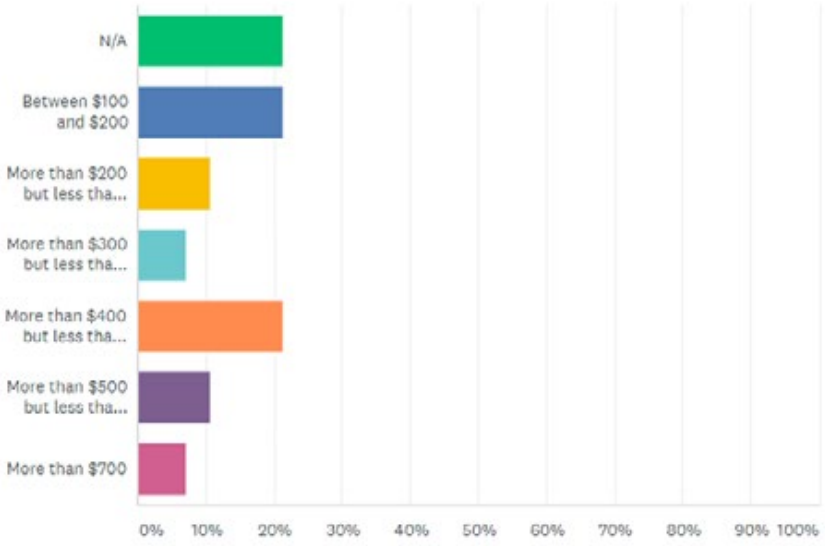
Answered: 28 Skipped: 0



	1	2	3	4	5	TOTAL	SCORE
Interconnection Request Review	28.57% 8	7.14% 2	14.29% 4	14.29% 4	35.71% 10	28	2.79
Electrical Plans Review	16.00% 4	20.00% 5	20.00% 5	28.00% 7	16.00% 4	25	2.92
Inspections	14.81% 4	22.22% 6	29.63% 8	29.63% 8	3.70% 1	27	3.15
Net Metering Agreement Execution	26.92% 7	23.08% 6	15.38% 4	15.38% 4	19.23% 5	26	3.23
Installation of the Bi-directional Meter	10.71% 3	32.14% 9	21.43% 6	10.71% 3	25.00% 7	28	2.93

Based on such factors as cost over-runs, time delays, length of time to complete application and impacts to customers, please estimate how much the interconnection process adds to your overall system cost.

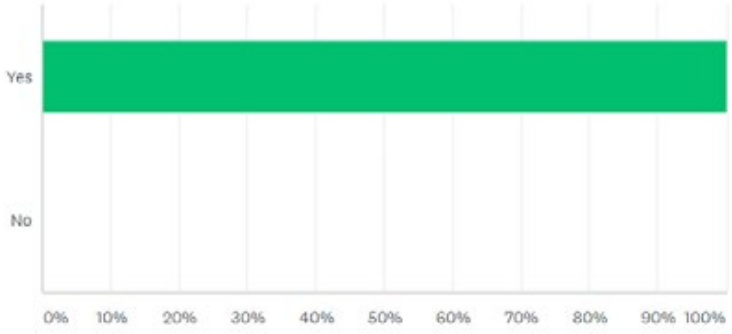
Answered: 28 Skipped: 0



ANSWER CHOICES	RESPONSES	
N/A	21.43%	6
Between $100 and $200	21.43%	6
More than $200 but less than $300	10.71%	3
More than $300 but less than $400	7.14%	2
More than $400 but less than $500	21.43%	6
More than $500 but less than $600	10.71%	3
More than $700	7.14%	2
TOTAL		28

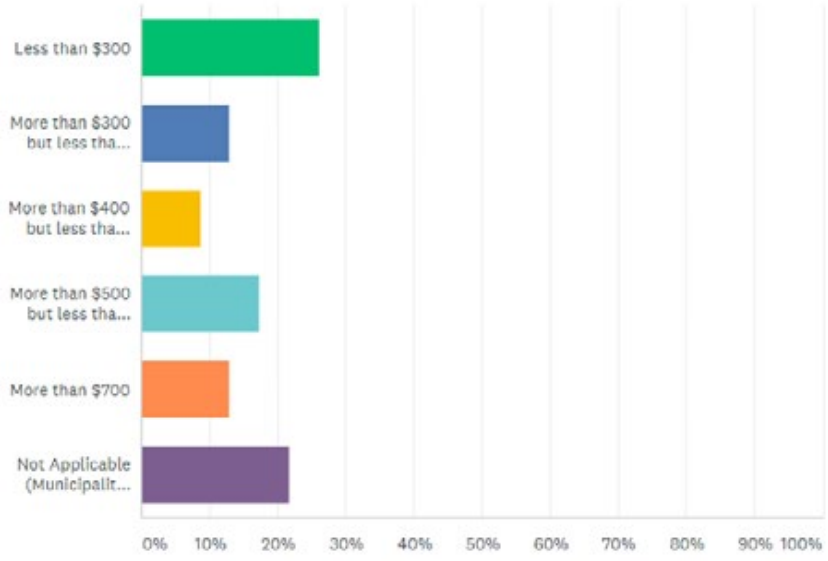
Nova Scotia Power is considering options for an online process for interconnection requests and net metering applications. Would you consider using an online tool to process the interconnection request?

Answered: 27 Skipped: 1



On average, how much are engineering firms charging for their stamped reports as part of the municipal permitting process?

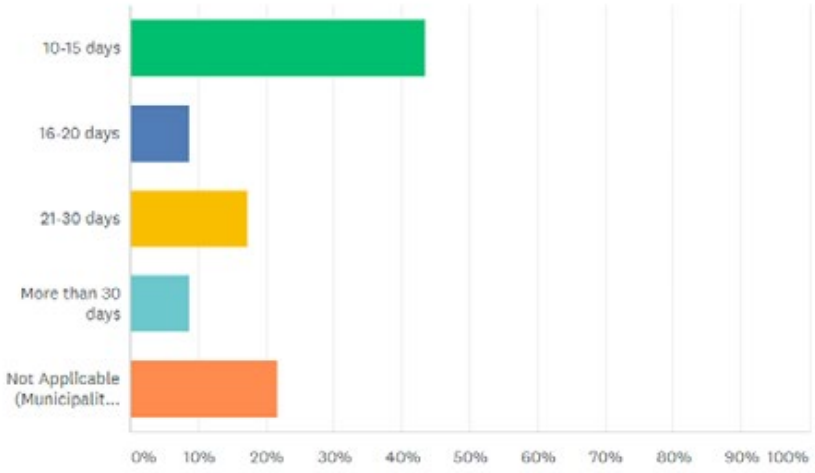
Answered: 23 Skipped: 5



ANSWER CHOICES	RESPONSES	
Less than $300	26.09%	6
More than $300 but less than $400	13.04%	3
More than $400 but less than $500	8.70%	2
More than $500 but less than $600	17.39%	4
More than $700	13.04%	3
Not Applicable (Municipalities where I install do not issue building permits)	21.74%	5
TOTAL		23

For those municipalities that require solar building permits, on average, how many days does it take to receive approval for a municipal solar permit including all paperwork and required engineering reports?

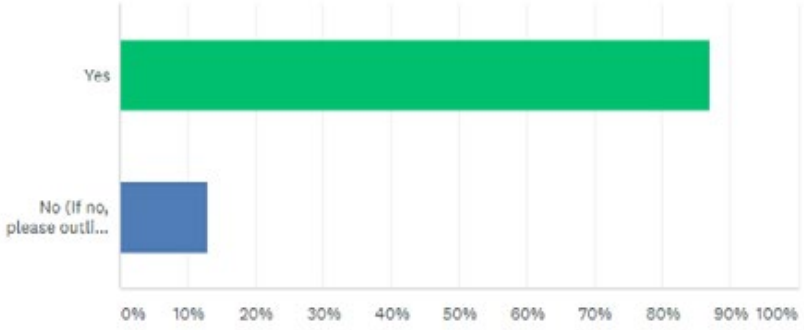
Answered: 23 Skipped: 5



ANSWER CHOICES	RESPONSES	
10-15 days	43.48%	10
16-20 days	8.70%	2
21-30 days	17.39%	4
More than 30 days	8.70%	2
Not Applicable (Municipalities where I install do not issue building permits)	21.74%	5
TOTAL		23

HRM has recently developed an online permit application system. Do you think other municipalities should offer the ability to complete the solar permitting process online?

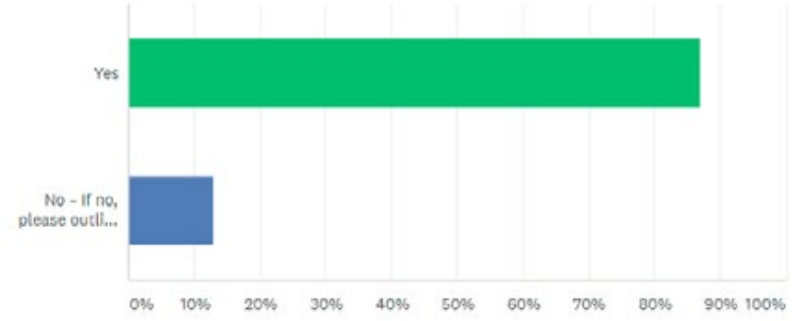
Answered: 23 Skipped: 5



ANSWER CHOICES		RESPONSES	
Yes		86.96%	20
No (If no, please outline your reasons why).	Responses	13.04%	3
TOTAL			23

Do you think municipalities should have a policy in place that exempts certain systems from a permit (i.e. systems under 10 kW flush mounted to the roof)?

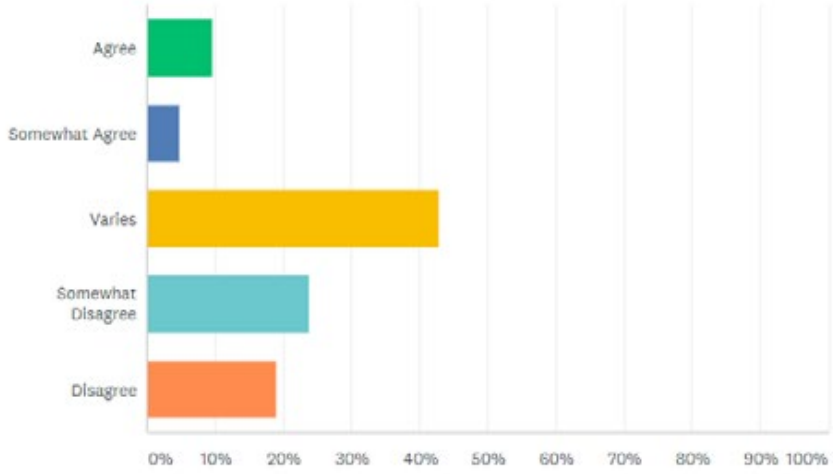
Answered: 23 Skipped: 5



ANSWER CHOICES		RESPONSES	
Yes		86.96%	20
No - If no, please outline your reasons why.	Responses	13.04%	3
TOTAL			23

In your own experience, do you agree or disagree that municipal building inspectors are knowledgeable and helpful during the inspection process?

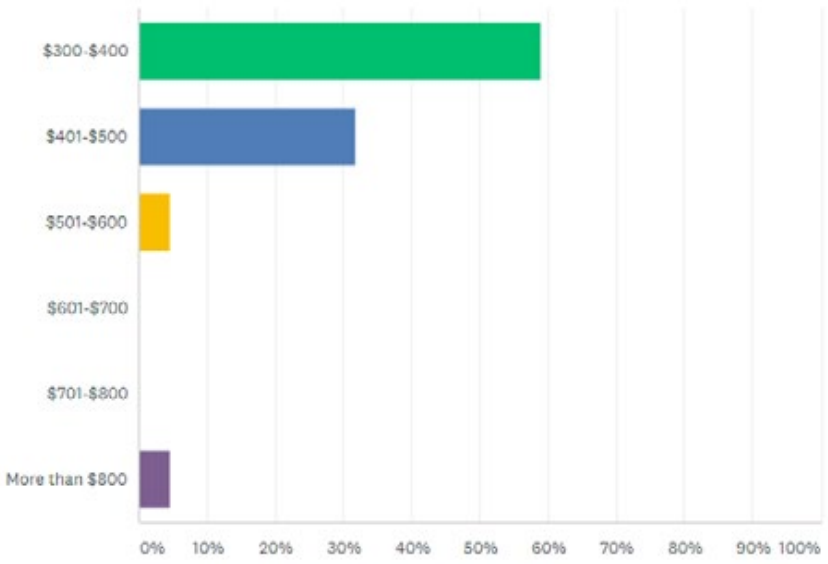
Answered: 21 Skipped: 7



ANSWER CHOICES	RESPONSES	
Agree	9.52%	2
Somewhat Agree	4.76%	1
Varies	42.86%	9
Somewhat Disagree	23.81%	5
Disagree	19.05%	4
TOTAL		21

On average, what are you paying for your electrical permitting fee?

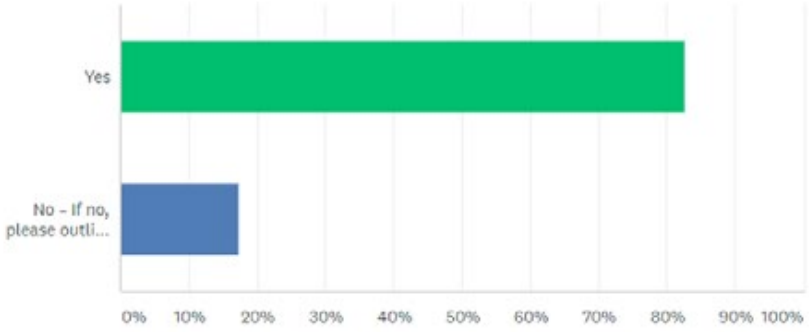
Answered: 22 Skipped: 6



ANSWER CHOICES	RESPONSES	
$300-$400	59.09%	13
$401-$500	31.82%	7
$501-$600	4.55%	1
$601-$700	0.00%	0
$701-$800	0.00%	0
More than $800	4.55%	1
TOTAL		22

Do you think Nova Scotia Power should have a fixed electrical permit fee for certain residential systems (i.e. under 30 kW)?

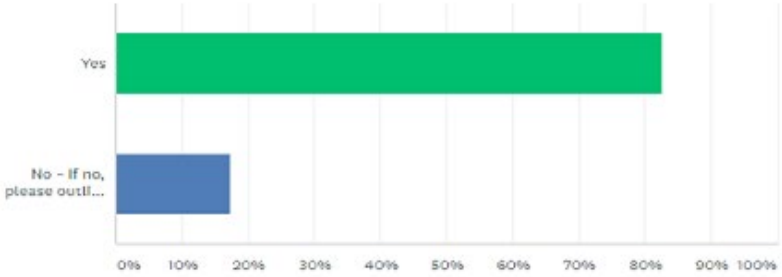
Answered: 23 Skipped: 5



ANSWER CHOICES		RESPONSES	
Yes		82.61%	19
No - If no, please outline your reasons why.	Responses	17.39%	4
TOTAL			23

The plans review process is mandatory for all net metering applications and is found under Section 7.0 of the Interconnection Request Form. It includes electrical one-line diagram, manufacturers information and approvals, equipment labelling, site plan and protective service data. Do you think Nova Scotia Power should have a policy in place that limits the plans review process to more complicated systems defined as commercial systems and/or any system over 30kW?

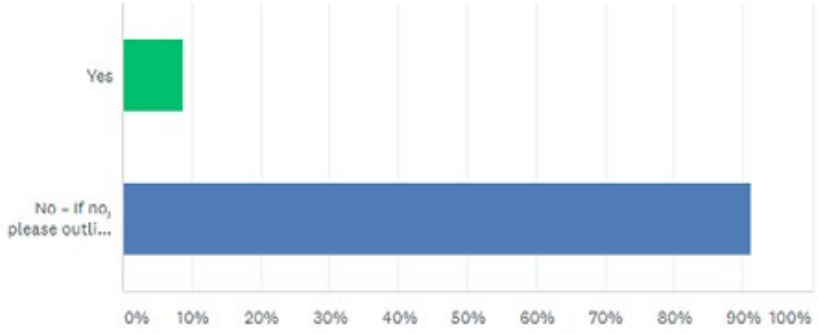
Answered: 23 Skipped: 5



ANSWER CHOICES		RESPONSES	
Yes		82.61%	19
No - If no, please outline your reasons why.	Responses	17.39%	4

NS Power has recently introduced a new process to reduce and improve the plans review process whereby contractors can re-use a pre-approved plan design at different locations. Have you taken advantage of this process?

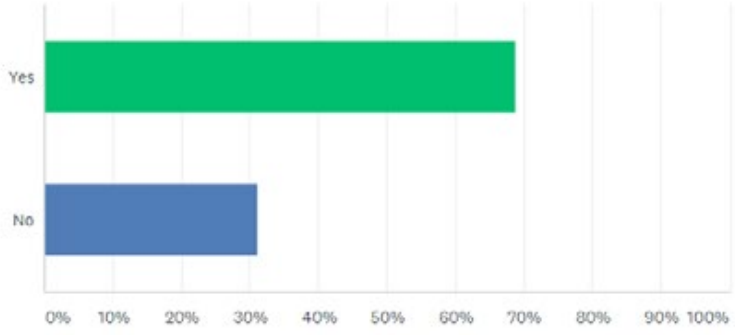
Answered: 23 Skipped: 5



ANSWER CHOICES		RESPONSES	
Yes		8.70%	2
No - If no, please outline your reasons why.	Responses	91.30%	21
TOTAL			23

Do you have experience working with PACE programs?

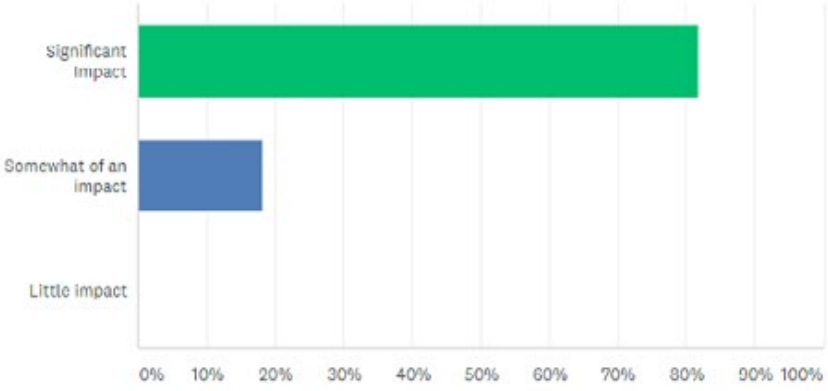
Answered: 16 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	68.75%	11
No	31.25%	5
TOTAL		16

All other conditions being the same, what would be the impact of greater availability of low-cost financing in terms of attracting more customers?

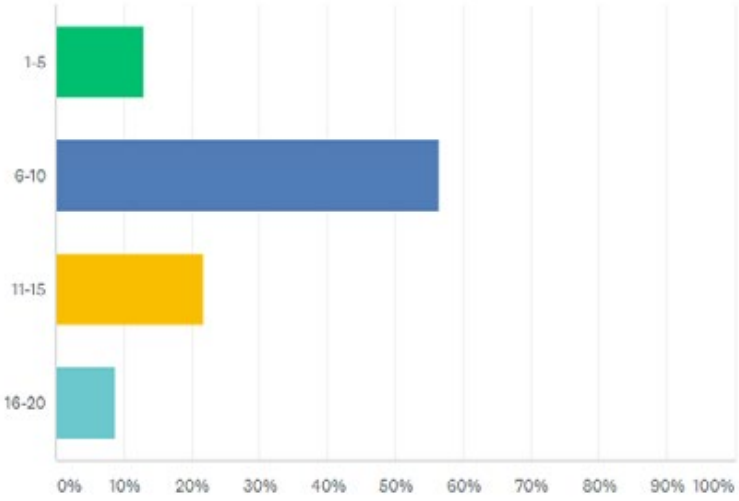
Answered: 11 Skipped: 7



ANSWER CHOICES	RESPONSES	
Significant Impact	81.82%	9
Somewhat of an Impact	18.18%	2
Little impact	0.00%	0
TOTAL		11

Two electrical inspections are required by NS Power during the interconnection process. In your experience, when ready to be scheduled, approximately how many days does it typically take for the final electrical inspection to take place? Number of days:

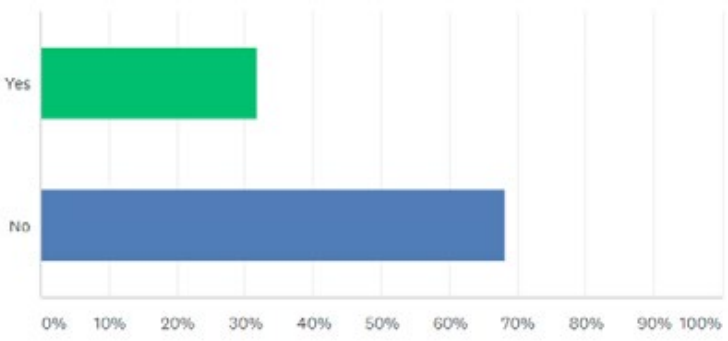
Answered: 23 Skipped: 5



ANSWER CHOICES	RESPONSES	
1-5	13.04%	3
6-10	56.52%	13
11-15	21.74%	5
16-20	8.70%	2
TOTAL		23

In your opinion, does the two-stage electrical inspection process (rough-in and final) contribute significantly toward increased overall quality and safety of the solar installation process?

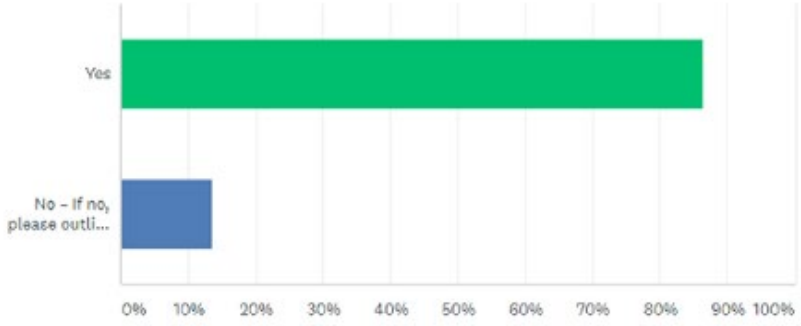
Answered: 22 Skipped: 6



ANSWER CHOICES	RESPONSES	
Yes	31.82%	7
No	68.18%	15
TOTAL		22

During the Covid-19 response, NS Power temporarily instituted a virtual review process for some rough-in electrical inspections to reduce in-person contact. Do you support the permanent institution of a virtual review option?

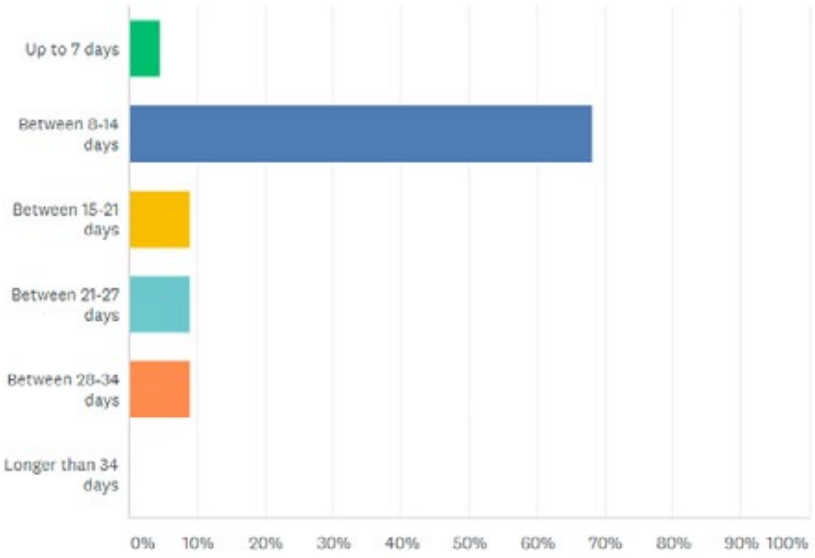
Answered: 22 Skipped: 6



ANSWER CHOICES		RESPONSES	
Yes		86.36%	19
No – If no, please outline your reasons why.	Responses	13.64%	3
TOTAL			22

In your experience, how long does it take Nova Scotia Power to install the bi-directional smart meter following the final inspection?

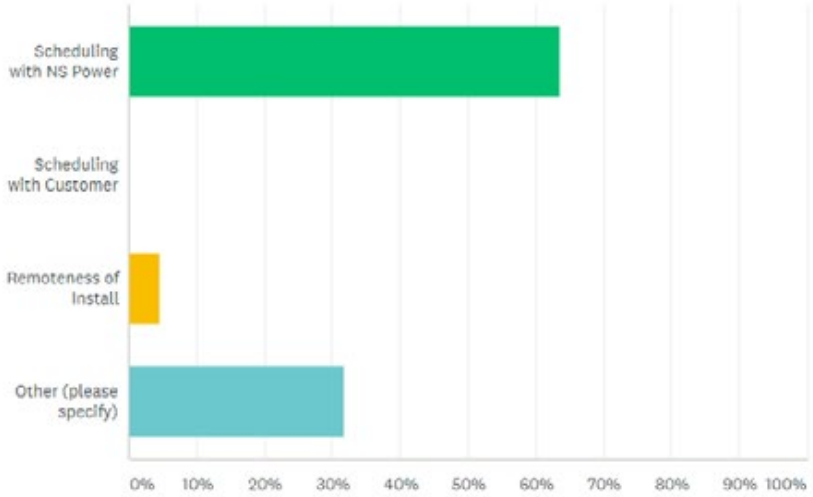
Answered: 22 Skipped: 6



ANSWER CHOICES	RESPONSES	
Up to 7 days	4.55%	1
Between 8-14 days	68.18%	15
Between 15-21 days	9.09%	2
Between 21-27 days	9.09%	2
Between 28-34 days	9.09%	2
Longer than 34 days	0.00%	0
TOTAL		22

In your experience, what is the main cause of the delay to install the bi-directional smart meter? Please select one answer from the options below.

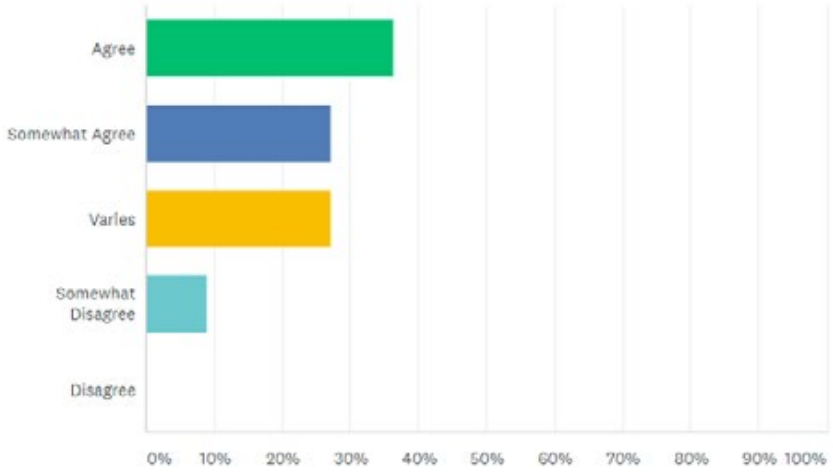
Answered: 22 Skipped: 6



ANSWER CHOICES		RESPONSES	
Scheduling with NS Power		63.64%	14
Scheduling with Customer		0.00%	0
Remoteness of Install		4.55%	1
Other (please specify)	Responses	31.82%	7
TOTAL			22

In your own experience, do you agree or disagree that NS Power's electrical inspectors are knowledgeable and helpful during the inspection process?

Answered: 22 Skipped: 6

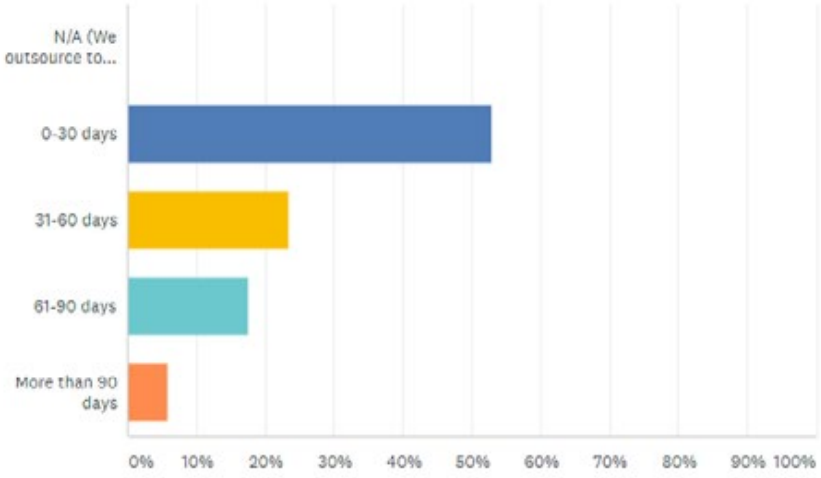


ANSWER CHOICES	RESPONSES	
Agree	36.36%	8
Somewhat Agree	27.27%	6
Varies	27.27%	6
Somewhat Disagree	9.09%	2
Disagree	0.00%	0
TOTAL		22

Appendix B

How many days does it take to process a sale from the time you initiate contact with the customer until the final sale?

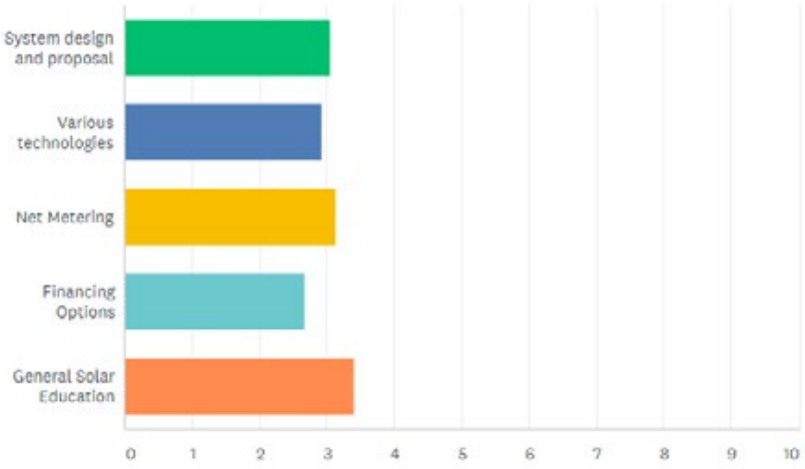
Answered: 17 Skipped: 1



ANSWER CHOICES	RESPONSES	
N/A (We outsource to a 3rd party)	0.00%	0
0-30 days	52.94%	9
31-60 days	23.53%	4
61-90 days	17.65%	3
More than 90 days	5.88%	1
TOTAL		17

In your experience, what part of the sales process takes the longest to educate customers based on the following? Please rank from 1 to 5, with 1 taking the least amount of time and 5 taking the most amount of time.

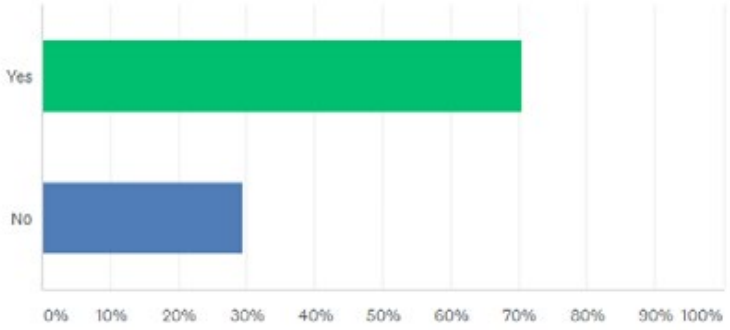
Answered: 18 Skipped: 0



	1	2	3	4	5	TOTAL	SCORE
System design and proposal	18.75% 3	31.25% 5	12.50% 2	12.50% 2	25.00% 4	16	3.06
Various technologies	13.33% 2	20.00% 3	20.00% 3	40.00% 6	6.67% 1	15	2.93
Net Metering	18.75% 3	25.00% 4	18.75% 3	25.00% 4	12.50% 2	16	3.13
Financing Options	22.22% 4	0.00% 0	33.33% 6	11.11% 2	33.33% 6	18	2.67
General Solar Education	23.53% 4	29.41% 5	23.53% 4	11.76% 2	11.76% 2	17	3.41

The Nova Scotia Go Solar Guide was developed by Efficiency Nova Scotia in partnership with the Canadian Solar Industries Association to educate homeowners interested in "going solar". It is available online through Efficiency Nova Scotia's website. Are you aware of this guide?

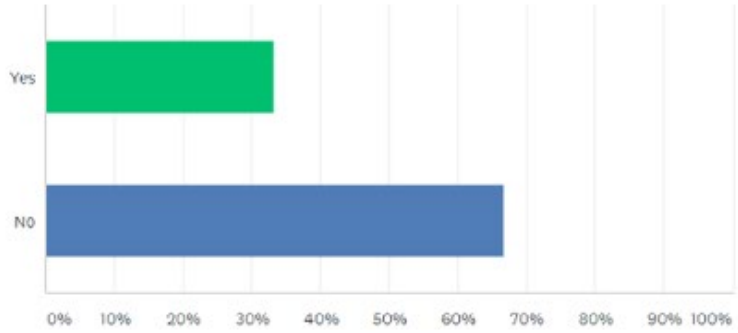
Answered: 17 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	70.59%	12
No	29.41%	5
TOTAL		17

Do you share this guide with your customers?

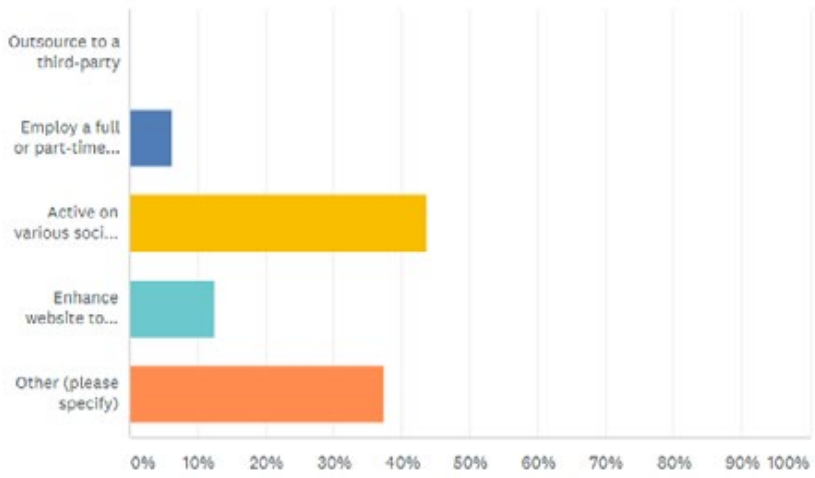
Answered: 12 Skipped: 6



ANSWER CHOICES	RESPONSES	
Yes	33.33%	4
No	66.67%	8
TOTAL		12

What marketing strategies do you undertake to increase sales? Please check off all that apply.

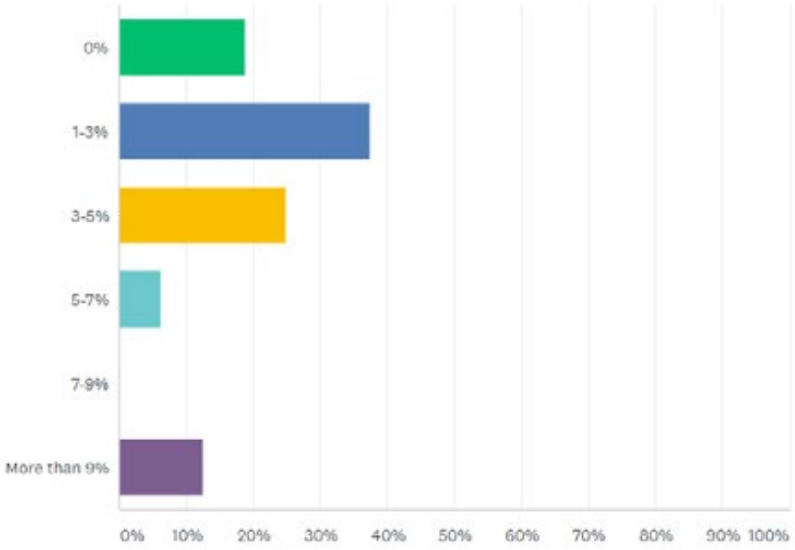
Answered: 16 Skipped: 2



ANSWER CHOICES		RESPONSES	
Outsource to a third-party		0.00%	0
Employ a full or part-time salesperson		6.25%	1
Active on various social media platforms such as Facebook, Linkedin and Youtube		43.75%	7
Enhance website to include search-engine optimization		12.50%	2
Other (please specify)	Responses	37.50%	6
TOTAL			16

What percentage of your total system price would be due to the cost of marketing, customer acquisition and sales?

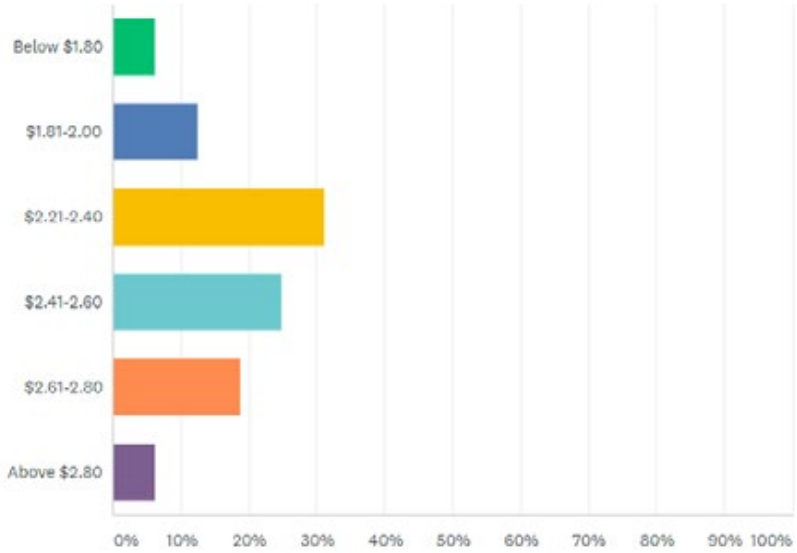
Answered: 16 Skipped: 2



ANSWER CHOICES	RESPONSES	
0%	18.75%	3
1-3%	37.50%	6
3-5%	25.00%	4
5-7%	6.25%	1
7-9%	0.00%	0
More than 9%	12.50%	2
TOTAL		16

What would be your average cost per watt for a turnkey installed system (above 5 kW) excluding HST and SolarHomes rebate? Do we need to ask this again? We already asked it in the first survey.

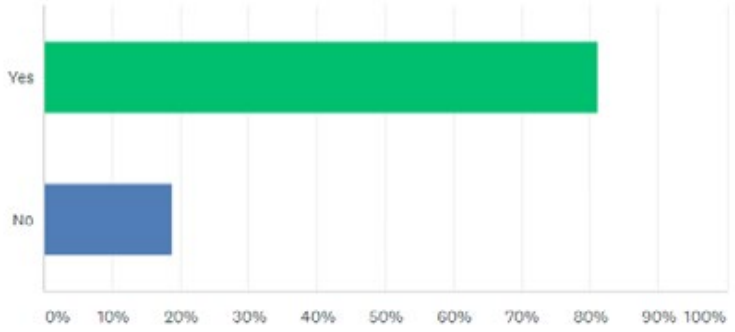
Answered: 16 Skipped: 2



ANSWER CHOICES	RESPONSES	
Below $1.80	6.25%	1
$1.81-2.00	12.50%	2
$2.21-2.40	31.25%	5
$2.41-2.60	25.00%	4
$2.61-2.80	18.75%	3
Above $2.80	6.25%	1
TOTAL		16

Would it make it easier for customers if all municipalities offered a PACE financing program (similar to Halifax Solar City) to install a solar PV system?

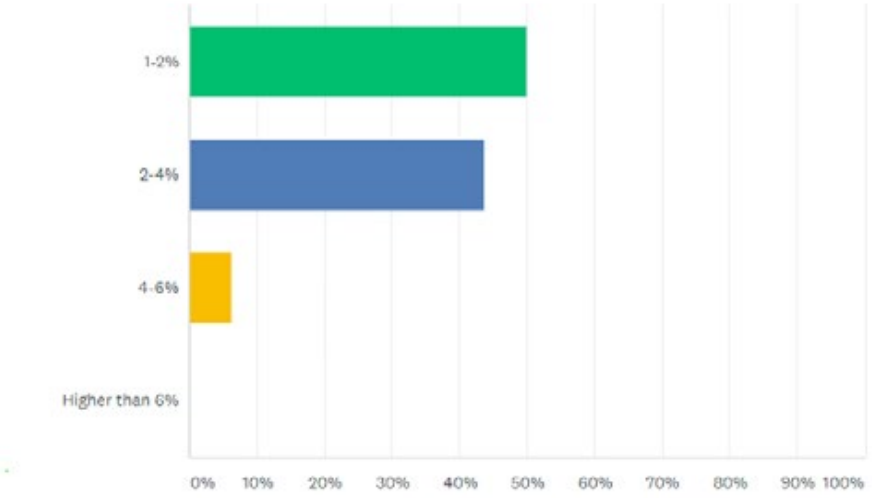
Answered: 16 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	81.25%	13
No	18.75%	3
TOTAL		16

Current PACE programs in Nova Scotia offer interest rates ranging from prime plus .75% to 4.75%. What do think the interest rate should be for a PACE program?

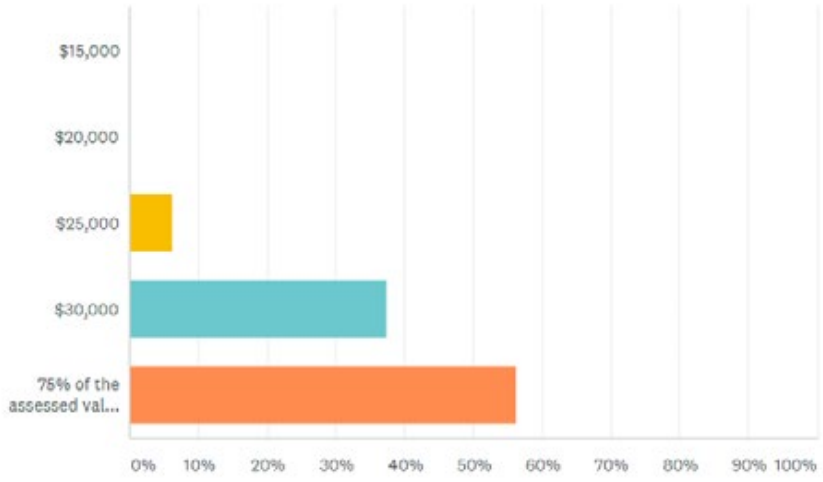
Answered: 16 Skipped: 2



ANSWER CHOICES	RESPONSES	
1-2%	50.00%	8
2-4%	43.75%	7
4-6%	6.25%	1
Higher than 6%	0.00%	0
TOTAL		16

Under a PACE program, what do you think the maximum financing should be to install a solar PV system?

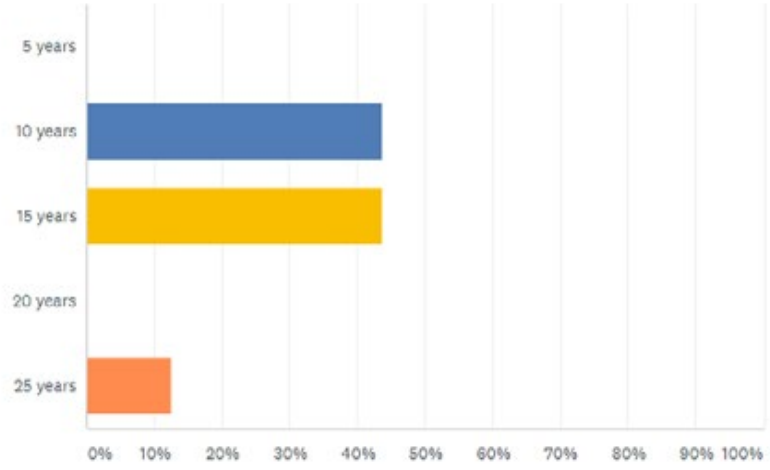
Answered: 16 Skipped: 2



ANSWER CHOICES	RESPONSES	
$15,000	0.00%	0
$20,000	0.00%	0
$25,000	6.25%	1
$30,000	37.50%	6
75% of the assessed value of the property (similar to Halifax Solar City)	56.25%	9
TOTAL		16

Under a PACE program, what do you think the amortization period should be to install a solar PV system?

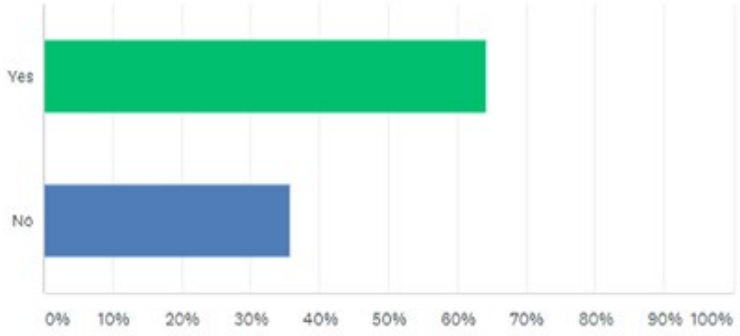
Answered: 16 Skipped: 2



ANSWER CHOICES	RESPONSES	
5 years	0.00%	0
10 years	43.75%	7
15 years	43.75%	7
20 years	0.00%	0
25 years	12.50%	2
TOTAL		16

A number of PACE programs in Nova Scotia have instituted a mandatory debt-to-savings ratio such that the cost of the solar PV system, program fees and cost of borrowing must be less than or equal to the estimated energy savings over the financing period. These programs will only finance a solar PV system that meets this debt-to-savings ratio. Do you think the debt-to-savings ratio should be eliminated from all PACE programs that involve a solar PV installation?

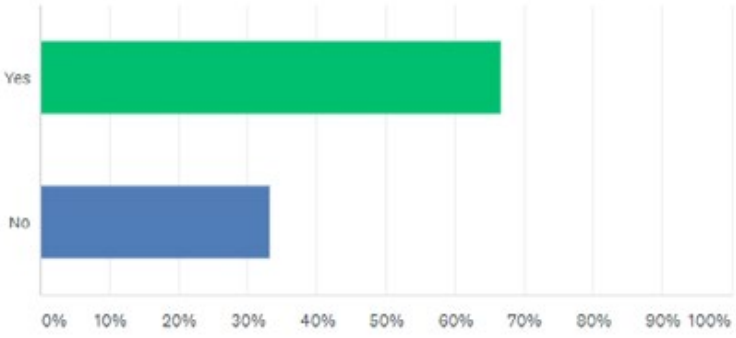
Answered: 14 Skipped: 4



ANSWER CHOICES	RESPONSES	
Yes	64.29%	9
No	35.71%	5

If the debt-to-savings ratio was eliminated in PACE programs, do you think the customer should be required to pass a credit check?

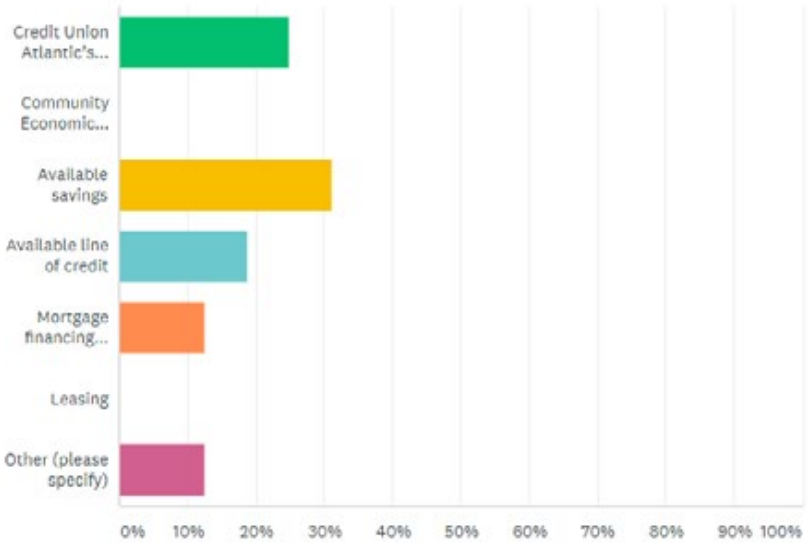
Answered: 15 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes	66.67%	10
No	33.33%	5
TOTAL		15

In areas where PACE is not available, how do your customers most often finance their installations? Please check one response from the options below.

Answered: 16 Skipped: 2



ANSWER CHOICES		RESPONSES	
Credit Union Atlantic's Energy Efficient Financing		25.00%	4
Community Economic Development Investment Fund (CEDIF)		0.00%	0
Available savings		31.25%	5
Available line of credit		18.75%	3
Mortgage financing (refinance, HELOC, etc.)		12.50%	2
Leasing		0.00%	0
Other (please specify)	Responses	12.50%	2
TOTAL			16

Appendix C

5. Based on such factors as cost over-runs, time delays, length of time to complete application and impacts to customers, please estimate how much the interconnection process adds to your overall system cost.

- We just stagger jobs accordingly and complete other steps during the waiting period.
- Hard to estimate this but it really slows down installations.
- The biggest issue is having to resubmit plans when there is no system size change, but equipment changes due to availability. This adds extra work and time, but is not fairly billed to the customer - it is a loss that I absorb.
- Delays are hard to quantify monetarily, but can impact ability to keep crews busy (and earning) and overall customer satisfaction.
- Site visits cost money.

7. What features would you like to see for an online tool to process interconnection requests?

- List of projects / Status of projects / Ability to make changes to equipment / Ability to call for inspections / Ability to submit documents online / Ability for clients to sign documents.
- Lots of drop-down boxes, ability to save key information such as company info to decrease time spent filling in the same data over and over.
- Immediate system sizing feedback.
- Integrated Address and NSP Account information.
- Status updates of the application. Like a tracking number for a shipment.
- Sample template, calculators and a line drawing tool.
- Prompt & interactive support.
- Familiar material should save to your online account and should fast track the approval process.
- User account so all company info is templated. Option for customer to E-sign documents.
- ICR as a fillable web form with ability to upload supporting documents and instant feedback that it has been received. With email submissions there's no reply until 6-7 weeks later when approval notification comes through. Online consent by homeowners similar to SolarHomes submission would be great instead of customers having to physically sign.
- Some kind of time indicator to see what stage it is at. Feedback so that you could communicate with whoever is evaluating it.
- The ability to easily amend the application with changes or new information.
- Shorter Application

- Maybe they could have a list of inverters and modules that are pre-approved for ease of use in the application. It would need a "not listed" option that you enter your own.
- Acknowledgement that all materials have been received, tracking updates of the ICR, save-able content.
- Full application instant approval.

13. In your own experience, do you agree or disagree that municipal building inspectors are knowledgeable and helpful during the inspection process?

- HRM Inspections have been very fast and no issues. I find them very helpful.
- The inspectors clearly lack solar training.
- Have never spoken to a building inspector besides receiving approved inspection via email as no one is required to be on site at the time of the inspection.
- The whole process is a pointless exercise to justify jobs. They only want to inspect after NSP and they cannot justifiably disagree with a Nova Scotia Power inspector
- As in the electrical side, there are varying expectations and interpretations dependent on the inspector.
- Municipal inspectors do not properly inspect the work being performed. I have seen countless installations of overhanging peak and overhanging the edge of the roof. This inspection should take place in the rough-in stage to ensure installers are spacing the lags properly and that the rails are not overhanging the roof.
- They don't look very close. In Kings County they rely heavily on the engineer's report. Which makes sense.
- I have found some building inspectors during new construction are irrational.
- I don't think they do much of an inspection other than to visually confirm the system is installed. It's merely a formality.
- Typically, they have no idea about solar and how any aspect of it works.
- Seems like overkill since NS Power is inspecting all of the installs.

22. Why do you think the two-stage electrical inspection process (rough-in and final) increases overall quality and safety of the solar installation process?

- Issues can be flagged at each stage.
- It ensures all contractors are following all Canadian electrical code requirements.
- It matches the construction inspection requirements, and allows for both visual verification of installation, as well as protection for consumers if there are any deficiencies. No panel removal required if there any corrections to be made.
- With the number of installers, the quality of work is variable. The two inspections help to ensure some measure of protection to homeowners that their system is installed correctly and is code compliant.
- The rough-in allows the opportunity to fix problems earlier before it is too late.
- Must have made a mistake. Should only be a final inspection.
- I feel the two-stage inspection does increase quality and safety. These are major investments by our customers. It is crucial to demonstrate safe and CEC compliant electrical installations.

23. Why don't you think the two-stage electrical inspection process (rough-in and final) increases overall quality and safety of the solar installation process?

- There is nothing to see at the rough-in except racking and a bonding cable for the string inverters that we always do. A couple of pictures would take care of this.
- Takes us a full day to install the rough-in. Inspectors do not require us on site for rough-in.
- Rough-in inspections should not be required for companies who have passed a certain number of rough-in inspections.
- Micro inverter systems do not present the dangers the string inverter systems do. The only reason the 2-stage inspection process was implemented was because of the inherent dangers of managing direct current. As usual microinverter systems got dragged into this problem. In the next generation of solar panels with inverters mounted to the back at the factory there is really going to be nothing much to inspect on the rough-in inspection except the bonding.
- The history of failed systems was due to poor installation.
- I don't believe the inspectors are doing a good enough job inspecting. They won't even get on the roof to look at it.
- Inspectors don't look at much at the rough-in stage. They mostly look at wire management. Our installation quality is above code/inspector requirements.
- Many systems are pre-engineered including most microinverters systems. If things are not done correctly the system will not operate correctly. This is a strong disincentive to the installer cutting corners. Most inverters have overlapping degrees of safety i.e. Ground Fault, AFCI, over and under voltage. As long as the outside disconnect and main circuit breaker for the system are correct the rest is unlikely to operate if not installed correctly. installers may also submit pictures of the array location prior to installing the solar panels.
- Their is definitely a sense in which it just slows the process down.
- Often one of the inspections is a cursory look and the other inspection is a thorough review of the electrical set up. I feel they could accomplish this in one visit.
- A rough-in does not show the inspector very much. The rough-in for a string install is just rails with a ground wire connected.
- There is no need for a rough-in in most cases. The inspectors usually do not go on roofs so how can they really assess from the ground.
- It can be examined in one inspection.
- One inspection would be fine, to ensure all components are safely and properly installed.
- Because everyone should be qualified to install, just need verification by inspector before commission.

27. In your own experience, do you agree or disagree that NS Power's electrical inspectors are knowledgeable and helpful during the inspection process?

- I have found them very helpful/professional on sharing ideas on solar installations pertaining to electrical.
- They are very knowledgeable and will go out of their way to be helpful. Great to deal with!
- NSP inspectors are working to improve overall safety and usage of the grid. It is worth recognizing that in the pursuit of this statement the way in which the code is interpreted will change from time to time. We find all inspectors to be reasonable and professional.
- Depends on the inspector. There are too many differing expectations throughout all of the NSP stages

- from plans review through to final inspection. This is unfair to the installer, electrician, and critically, to the customer.
- Depends on the inspector.
- They are learning about solar too, and the rules are not always the same from one job to the next.
- Some inspectors are very good with it, I have seen an increase in knowledge with all of the inspectors.
- Some are better than others.

28. Please provide any additional comments that you feel would contribute to lowering the soft costs of a solar PV system thus encouraging greater uptake across the province.

- We should have up to 20-year financing to ensure positive cash flow on day one, lower interest rates. Make the Solar for Community Buildings a regular program.
- We would like to see a much faster and easier process so that installation can be completed within a month of a customer signing up.
- Exempt solar from building permits and structural surveys.
- Standardized and practical expectations. A live website that a customer and installer could use to commonly size, design and apply for Efficiency and NSP approval. Continue emphasis on trained, professional installers. More to suggest, but would prefer to discuss via a call.
- Building design fees, inspection fees, cost of equipment.
- Interest fees, smoother application process.
- So called rodent guard is completely useless, ineffective, unnecessary and not required by the electrical code for microinverters but quixotically is required by NSPI.
- Municipal permitting - requiring engineers reports and in some places high permit fees (HRM, Wolfville) seems unnecessary for systems that weigh so little in comparison to building code requirements. They seem to be little more than a formality with no real benefit to anyone.
- We often end up filling out the same information multiple times for NSP & Efficiency NS...They should just use the same form. Duplication wastes time.
- There is too much labelling. When I look at a system with that many labels, I think that since there are so many warnings the customer will ignore them and not realize the real dangers. Most of the labels are redundant. With built-in rapid shutdown, very little chance that anything is any more dangerous than regular household electrical.
- Eliminate municipal permits, reduce inspections, streamline and minimize ICR.
- Have Inspector install bi-directional meter at same time as Final Inspection, upon Final Inspection approval.
- Lower permitting and inspection costs would be great. More staff in the field in rural areas would speed up the process.
- Make it easier. This shouldn't be so difficult.

Municipal Questionnaire

Appendix D

1. Do you currently have a sustainability plan that includes a transition to renewable energy?
2. Do you have a strategy in place to increase solar PV uptake within your municipality both in terms of your own buildings and throughout the community (commercial, industrial and residential sectors)?
3. Do you mandate a building permit for solar rooftop and ground mount installations?
4. Are your building inspectors trained in solar PV?
5. Do you have a strategy in place to increase the uptake of electric vehicles?
6. Have you considered a strategy to develop community solar within your municipality?
7. Are you aware of the PV ready guidelines for new buildings? Would you ever consider making all new buildings PV ready?
8. Are you aware of any barriers to implementing PV systems in your municipality?
9. Are you aware of the Nova Scotia educational materials (including the Nova Scotia Go Solar Guide) for solar PV systems?
10. Would you be willing to put a section on your website to help residents with solar PV-related questions?

Municipalities that Responded:

- Halifax Regional Municipality
- Town of New Glasgow
- Town of Yarmouth
- Town of Wolfville
- Town of Bridgewater
- Municipality of Colchester
- Municipality of the County of Antigonish
- Municipality of the District of Argyle

Interconnection Request and Equipment Information Form - 100 kW or Less

Appendix E

Interconnection Request and Equipment Information Form
(All items shall be completed where applicable)

100 kW or Less

Nova Scotia POWER An Emera Company

Section 1.0 : Customer Information (To be filled out with information regarding the interconnecting customer)	
Customer-Generator (Applicant) and/or Company Name:	
Address (Location of Generator):	Applicant Mailing Address:
Property Identification Number (P.I.D.):	
Is the generator located on property owned by the applicant? ☐ If the generator is not located on the land owned by the applicant the applicant must provide a copy of the document authorizing the generator to be installed on the property that has been registered on the title of the property.	Applicant Telephone:
	Applicant Email Address:

Section 1.1 : Technical Designer Information (To be filled out with information regarding the company, and person responsible for the technical design of the installation)	
Technical Design or Consulting Company:	Telephone:
Technical Contact:	Mailing Address:
Email Address:	

Section 1.2 : Electrical Contractor Information (To be filled out with information regarding the company who will obtain the electrical wiring permit and the site contact person responsible for the electrical installation)	
Name of Electrical Contracting Company:	Company Telephone:
Certificate Number:	Email Address:
Site Contact:	Contact Phone:
Wiring Permit Number:	

Section 2.0 : Energy Reconciliation	
Anniversary Month: (Please circle month for annual energy reconciliation)	JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Expected In-Service Date:	

Section 3.0 : Customer-Generator's Existing NSPI Supply				
Existing NSPI Electric Service Type: ☐ Single Phase ☐ Three Phase				
Primary NSPI Account:	Meter Number:	Amps:	Volts:	HST Number (If Applicable):

Account Number:	Meter Number:	Amps:	Volts:	HST Number (If Applicable):
2				
3				

If you intend to supply generation to more than 3 accounts, please capture account details on a separate piece of paper and include with your application form.

Section 4.0 : Proposed Interconnection Details		
Indicate the appropriate NSPI system interconnection voltage:	☐ Single Phase ☐ 120V ☐ 240V ☐ Other _____	☐ Three Phase ☐ 120/208V ☐ 347/600V ☐ Other _____
Indicate the total generation capacity (kW) and estimated annual energy (kWh)		
Total kW Output:	Estimated Annual kWh:	

Section 5.0 : Generating Equipment Information (See Section 5.2 for Solar Installations)		
Generation Source: ☐ Solar ☐ Wind ☐ Micro-Hydro ☐ Other:		
Generator Type: ☐ Synchronous ☐ Induction		Manufacturer:
Nameplate Rating kVA:	kW:	Model Number:
Number of Units:	Watts per Unit:	Product Certification Information:
Rated Voltage:	Rated Power Factor:	
Frequency:	☐ Single Phase ☐ Three Phase	
Three Phase Connection: ☐ Delta ☐ Wye ☐ Ground Wye		

Section 5.1 : Synchronizer Information (For Synchronous Generators)	
Synchronizer: ☐ Automatic ☐ Manual	Manufacturer:
Manufacturer's Reference Number:	

Section 5.2 : Solar Modules (Where Applicable)	
Module Nameplate Rating (kW):	Manufacturer:
Number of Units:	Model Number:
Dc Output Voltage (each):	Rated Efficiency:
Max. Dc String Voltage (at Inverter):	Product Certification Information:
Manufacturer specification sheets and certification compliance reports shall be provided with all for all solar modules in addition to the interconnection request form. Equipment that does not have a recognized factory certification marking shall be subject to Field Evaluation under the SPE-1000 Model Code.	

Section 5.3 : Inverter Information (Where Applicable)		
Inverter Type: ☐ String ☐ Micro		Manufacturer:
Nameplate Rating kVA: kW:		Model Number:
Number of Units:		Product Certification Information:
Max. Continuous Inverter Output Rating kW:		
Max. Dc Input Voltage:		
AC Output Voltage:		
Rated Power Factor:		
Frequency:	☐ Single Phase ☐ Three Phase	
Manufacturer specification sheets and certification compliance reports shall be provided with all for all inverter based installations in addition to the interconnection request form. Equipment that does not have a recognized factory certification marking shall be subject to Field Evaluation under the SPE-1000 Model Code.		

Section 5.4 : Rapid Shutdown Equipment (Where Applicable)	
Manufacturer:	
Number of Units:	Model Number:
Manufacturer specification sheets and certification compliance reports shall be provided with all for all rapid shutdown equipment in addition to the interconnection request form. Equipment that does not have a recognized factory certification marking shall be subject to Field Evaluation under the SPE-1000 Model Code.	

Section 5.4 : Rapid Shutdown Equipment (Where Applicable)	
Manufacturer:	
Number of Units:	Model Number:
Manufacturer specification sheets and certification compliance reports shall be provided with all for all rapid shutdown equipment in addition to the interconnection request form. Equipment that does not have a recognized factory certification marking shall be subject to Field Evaluation under the SPE-1000 Model Code.	

Section 6.0: Interconnection Transformer and Fuse Information (Where Applicable)			
Nameplate Rating kVA:		Manufacturer:	
Number of Units:		Model Number:	
Primary Volts:	Secondary Volts:	Primary Fuse Data	Type:
Connection: ☐ Single Phase ☐ Three Phase			Size:
Three Phase Connection: ☐ Delta ☐ Wye ☐ Ground Wye			Speed:

Section 6.1: Interconnection Circuit Breaker Information (Where Applicable)		
OC Rating:	Interrupting Rating:	Manufacturer:
Trip Speed:	Cycles:	Type Number:

Section 6.2: Protective Equipment (Complete all applicable items. Where requested a separate sheet shall be provided with the manufacturer's product information)	
6.2 (a) Provide manufacturers information for the protection package or devices	Provide manufacturers documentation for protective functions: • Under/Over Voltage • Under/Over Frequency • Anti-Islanding • Over-current
6.2 (b) Range of available settings for each protective function	Provide list of protection functions with available ranges of protection setting for tripping and shutdown, along with time delays.
6.2 (c) Proposed settings (Set point and times)	Provide list of protection functions with settings for tripping or shutdown, along with time delays. Example: High Voltage Trip 127V, Time Delay 0.1 Sec

Section 7.0: Required Documentation (Three copies of each required)	
• Information below to be submitted for all projects • All diagrams are to be neatly drawn (11" x 17" size preferred) • Free hand drawn and illegible diagrams will not be accepted by NSPI	
7.0 (a) Electrical One-Line Diagram	A single-line diagram showing the electrical relationship and descriptions of the significant electrical components such as the generator, inverters, cables and wiring, switches, meters, transformers, circuit breakers, with operation voltages and ratings
7.0 (b) Manufacturers Information and Approvals	Provide manufacturer information sheets and certification compliance reports for equipment such as, inverters, generators, solar modules, rapid shutdown devices, combiner boxes, DC disconnect switches, and DC optimizers.
7.0 (c) Equipment Labelling	Provide a detailed list of all permanently installed labels indicating, label designation, label dimensions, label background color, label letter color, label letter height, and label verbiage.
7.0 (d) Site Plan	Provide a site plan showing the physical arrangement of the major equipment, including generating equipment, transformers, switches, control panels, the customer's existing metered service and the interconnection with NSPI's distribution system, Include the civic address, references, etc. Provide Property Identification Number (PID)
7.0 (e) Protective Device Data	For all protective devices used to protect and control the interconnection, please provide proposed protective device settings, circuit breaker and fuse data and coordination curves, and a description of how the protection scheme is intended to function.
7.0 (f) Point of contact	If the interconnection and start-up process is to be coordinated through a party or individual other than the customer, provide the name, company, address, and phone number of that individual or party with whom the utility is to coordinate the interconnection

I hereby certify that I have reviewed and agree to adhere to the Interconnection Guidelines located at www.nspower.ca/netmetering and to the best of my knowledge, all the information provided in this Interconnection Request and Equipment Information Form is true and correct

Print: _____ (Customer-Generator)

Signature: _____ (Customer-Generator)

Date: _____

Send completed form to:

netmetering@nspower.ca

Nova Scotia Power
P.O. Box 910, Halifax, NS B3J 2W5
Attn: Net Metering Program Lead

Interconnection Fees by Sample Utilities

Appendix F

Utility	Interconnection Fee
Nova Scotia Power	$0: But responsible for costs incurred in delivering the net metering service beyond the standard connection costs to regular customers.
Quebec Hydro	$400
SaskPower	Interconnection Study Fee: $315. Interconnection Cost: $498.75
ENMAX (AB)	$0
BC Hydro	Simple Interconnection Cost: $0 Complex Interconnection Cost: $600 for interconnection engineering study. Other incremental cost may be added for certain systems. Synchronous Generator, Over 50kw, system upgrades, etc.
Fortis (BC)	Interconnection Cost: $100 Application Cost: $200
NWT	$0
Guelph Hydro/Alectra Utilities (ON)	Connection fee of $1,695.00 (HST included) for single phase and $2,260.00 (HST included) for three phase generator associated with the connection of the new Net Metering service.
Hydro One Brampton (ON)	Net Metering: Costs are generally 100% to the customer and estimated on a case by case basis.
London Hydro (ON)	Net Metering: $640 + HST
PowerStream Inc (ON)	Net Metering: >10kW - $1500 +HST. Additional $3000 CIA if the project is on an embedded feeder of the Everett, Holland, or Waubashene transformer stations. $600 connection fee for single phase. Price for 3-phase depends on configuration
Toronto Hydro (ON)	Net Metering: • Application fee of $500 + HST for systems under 10 kW • Application fee of $2500 + HST for systems between 10kW and 999 kW
ATCO Electric (ON)	$0

Building Permit Fees by Sample Municipalities

Appendix G

Municipality	Building Permit Fee
Halifax	$150
Town of Wolfville	$50 for the building permit plus $4.00 per $1000 of estimated value of construction.
Municipality of the County of Kings	$50
Town of New Glasgow	$25 for the building permit plus $2.50 per $1000 of estimated value of construction
Municipality of Pictou	$25 for the building permit plus $2.50 per $1000 of estimated value of construction
Calgary	Building Permit: $10.33 per $1000 construction costs ($105 min)
Colwood BC	Development Permit: $1,247 base fee + other fees based on project
Kelowna	Done on a case-by-case basis.
Vancouver	Building fees based on value of building construction:
Yellowknife	Up to $10,000: $175
Markham-Vaughn	$10,001 -$100,000 ---> $175 + $9.55 per $1000
Guelph	Approximate building/development permit fees vary:
London	$300-$600 development permit plus $122 + $8.10 per 1000 over $5000.
Toronto	Plus $1,000 P.Eng Site review and declaration.
Belleville	Done on a case-by-case basis.
Brampton	PV system serving individual dwellings: $110; if serving other buildings: $525
Whitehorse	Low-Rise Building Solar Collectors: $95

Source: HES PV, August 2021

Appendix H

Complex Vs. Simple Installations

Although many different methods of installing solar PV systems exist, they can generally be classified into two categories: simple and complex. Simple systems apply a minimal distributed load to an existing structure and parallel/flush to the slope on which they are mounted. These systems do not require modification of the base structure to bear the load imparted by the array. Complex projects incorporate many different types of mounting systems all of which rely on a properly designed foundation to support the array. These types of systems may require additional structural components to be added to properly support the load. Listed below are guidelines associated with simple and complex residential solar PV systems.

Simple Installation:

If the residential building meets the following conditions (simple) then the installation of solar should not require a building permit or have a simplified permit process. This applies to sloped roofs and low slope roofs (with rafter or truss construction).

1. The system's distributed weight is less than 5 lbs/ft2, and that the roofing is l ightweight material (cedar shakes, asphalt, metal, etc.)
2. The systems connection to the roof results in the system weight being uniformly distributed on the rafters beneath the racking, and each connection point has to bear less than 50 lbs.
3. The solar panels do not tilt or extend more than 18" above the roof.
4. Solar panels are below or flush to the roof ridge (of sloped roofs), and they do not extend beyond the roof edges (eaves).
5. The mounting structure is a product specifically designed to mount solar panels to the roof of interest.
6. There are installation instructions provided by the mount supplier, and they follow good engineering practices.
7. Set back a minimum of 24" from ridges and 18" from eaves and roof edges.

Complex Installation:

If the above conditions are not met, a building permit is required. Below are the criteria where a system should require a building permit for the installation of solar panels.

1. When there is a change to the roof structure, or if the roof needs to be reinforced due to installation of solar, a permit is required. The installation of the panels by itself does not constitute a structural change to the roof.
2. If the mounting system is ballasted on the roof or tilted and the solar panels extend more than 18" above the roof.
3. If the installation is ground, pole or tracker mounted.
4. The installation is impacted by a major obstruction.

Nova Scotia Solar-Friendly Communities Study

September 2021

Canadian Renewable Energy Association
WIND. SOLAR. STORAGE.

Association canadienne de l'énergie renouvelable
ÉOLIEN. SOLAIRE. STOCKAGE.

HES PV Locations

Victoria
3330 Tennyson Ave.
Victoria, BC, V8Z 3P3
250.483.0871

Edmonton
17815-111 Ave.
Edmonton, AB, T5S 2X3
780-489-3700

Dartmouth
47 Mosher Drive
Dartmouth, NS B3B 1E5
1-866-258-0110

Calgary
1440 Aviation Park NE #111,
Calgary, AB T2E 7E2
250-483-0871

Barrie
120 Ellis Dr Unit 8
Barrie, ON L4N 9B2
905-532-0770

Vancouver
1260 Cliveden Ave,
Delta, BC V3M 6Y1
1-866-258-0110

Toronto
550 Industrial Drive
Milton, Ontario, L9T 5A6
416-641-4900

Montréal
205 Av Avro
Pointe-Claire, QC H9R 6A9
1-866-258-0110