

BULLETIN 2021-001-EL

April 19, 2021

## SOLAR PHOTOVOLTAIC INSTALLATIONS

The intent of this bulletin is to clarify the electrical permit and inspection process for installation of the solar photovoltaic systems.

### Electrical Permit Submission

A plan review will be required for all solar photovoltaic systems except as noted below. The electrical plans and specifications are required to be submitted with the permit application, see Bulletin 2001-008-BU/EL for details. The City Electrician shall require the submittal of the **Checklist for Solar Photovoltaic System** (see **Attachment A** of this bulletin).

For an installation of a solar PV system with an aggregate generated capacity of 12 kW or less, in a single dwelling, a plan review is not required; the application review for permit is eligible for fast tracking provided that the following information is submitted with the application:

- 1) A single-line diagram. (see **Section 1** of this bulletin for requirements)
- 2) A site plan. (see **Section 1** of this bulletin for requirements)
- 3) A completed ***Checklist for Solar Photovoltaic System of Bulletin 2021-001-EL - Attachment A***.

### Electrical Inspection

Solar PV system must be verified in accordance with the **Verification of Solar Photovoltaic System of Bulletin 2021-001-EL - Attachment B** to ensure that the solar PV system is installed in conformance with the Canadian Electrical Code, Part I (2018 CE Code) and performs all of its intended functions as designed.

Upon completion of an installation of a solar PV system, the field safety representative (FSR)/holder of the permit authorizing the installation **must** notify the City Electrician of the completion and request an inspection with the completed **Verification of Solar Photovoltaic System** submitted to the City Electrician. The installation of solar PV system must not be energized until the **Verification of Solar Photovoltaic System** and installation of the solar PV system have been accepted and approved by the City Electrician.

**\*\*It should be noted that the net metering application is required to be approved by BC Hydro, if applicable\*\***

### Note

**Section 1** of this bulletin contains supplementary requirements and explanatory information for a solar PV permit (development or building permit) and the CE Code requirements. Any other installation of renewable energy systems such as wind or energy storage system or device should be discussed with the City Electrician.

(Original signed by)

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## Section 1

### **Supplementary requirements and noteworthy details.**

- 1) The following link provides information related to solar PV permits (development or building permits):  
<https://vancouver.ca/home-property-development/solar-panels.aspx>
- 2) The single-line diagram must identify and include a complete and detailed description of the following (where applicable):
  - a) Site address, project title, date, name of person/company prepared the diagram,
  - b) All the components and subsystems of the solar PV system including disconnecting means, PV rapid shutdown system and devices, PV combiners and PV recombiners,
  - c) Inverter, converter, module manufacturer and model number of the solar PV system,
  - d) Electrical specifications of the solar PV system. i.e. Rated array power, maximum DC voltage, number of phases, rated AC voltage, rated AC power and rated AC current,
  - e) Interactive point of connection with the compliance of CE Code Rule 64-112,
  - f) Service, service equipment, distribution equipment, panel boards and metering equipment,
  - g) Conductors for services, feeders, branch circuits, and photovoltaic circuits,
  - h) Grounding and bonding; including racking system (manufacturer and model number) - means of bonding to ground,
  - i) Wiring methods,
  - j) Overcurrent protection and control of electrical circuits and apparatus,
  - k) Location of electrical equipment,
  - l) Location of marking, warning signs, warning labels, warning notice and diagram as required by the CE Code, and
  - m) Differentiation between new and existing equipment by using cloud or dividing line.
- 3) The site plan may be hand drawn, scale is not required, and it must be consistent with the single-line diagram. The site plan must show:
  - a) Site address, project title, date, name of person/company that prepared the diagram,
  - b) Plan view of site with buildings, structures and surrounding streets,
  - c) Location of components and subsystems of the solar PV system including disconnecting means and initiator of PV rapid shutdown,
  - d) Location of service, service equipment, distribution equipment, panel boards and metering equipment, and
  - e) Differentiation between new and existing equipment by using cloud or dividing line.
- 4) Upon completion of an installation of a solar PV system, the FSR/holder of the permit authorizing the installation must request an inspection with the completed Verification of Solar Photovoltaic System (Attachment B) uploaded to the installation permit.
- 5) A solar PV system is usually designed and installed to reduce the consumer's utilization load as needed. It is important to note that oversizing the generating capacity of the system beyond utilization needs may not be acceptable. The net metering application **must** be approved by BC Hydro. See link to BC Hydro Net Metering Guide below:  
[https://www.bchydro.com/work-with-us/selling-clean-energy/net-metering.html?WT.mc\\_id=rd\\_netmetering%20%5bbchydro.com%5d](https://www.bchydro.com/work-with-us/selling-clean-energy/net-metering.html?WT.mc_id=rd_netmetering%20%5bbchydro.com%5d)

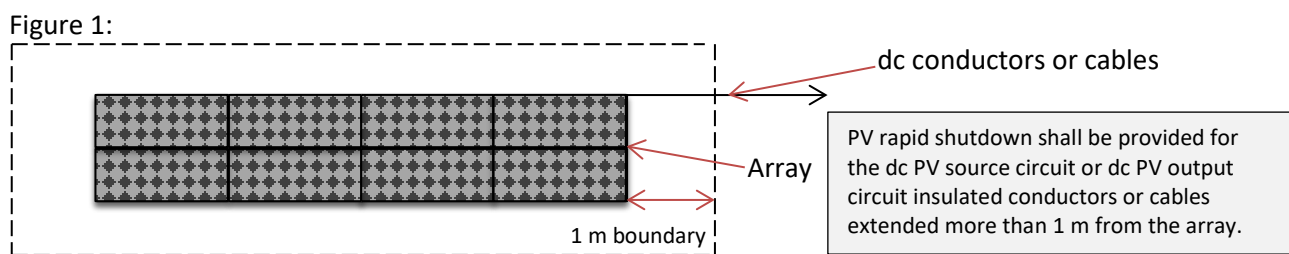
## Section 2

### Explanatory information - photovoltaic rapid shutdown and disconnecting means.

#### **Rule 64-218 - Photovoltaic rapid shutdown**

Rule 64-218 1) requires that PV rapid shutdown shall be provided for a solar PV system installed on or in buildings where the photovoltaic source circuit or photovoltaic output circuit insulated conductors or cables installed on or in buildings are more than 1 m from a photovoltaic array. Rule 64-218 3) requires PV rapid shutdown shall limit PV source circuits or PV output circuits located more than 1 m from the PV array to not more than 30 V within 30 s of rapid shutdown initiation. It should be noted that the requirements for a photovoltaic rapid shutdown system are given in CSA C22.2 No. 330. For a compliant PV rapid shutdown installation, the manufacturer's published installation instructions must be followed.

Figure 1 illustrates the 1 m PV rapid shutdown boundary from a PV array.



Note: There may be some micro-inverter installations where the PV source or output circuits are not more than 1 m from the PV array and thus are not required to meet the rapid shutdown rules.

It should be noted that removing the electric meter from the meter socket does not comply with the rapid shutdown requirements. A separate initiating device will be required.

#### **Rule 64-060 - Disconnecting means**

The provisions of Rule 64-060 mandate that a device, group of devices or other means shall be provided, whereby the conductors of a circuit can be disconnected from their source of supply.

Rule 64-060 1) requires that an equipment disconnecting means shall be provided to disconnect simultaneously all ungrounded conductors supplied from a renewable energy power supply source from all other insulated conductors in a building or other structure.

Rule 64-060 2) requires that the equipment disconnecting means referred to in Subrule 1) shall conform to Section 14, be located within sight of and within 9 m of the equipment or be integral to the equipment.

Rule 84-022 requires that a disconnecting means shall be provided to disconnect simultaneously all the electric power production sources from the supply authority system.

\*It should be noted that activating anti-islanding feature of the inverters by removing the electric meter out of the meter base does not meet the disconnecting means requirements.\*

Figure 2 illustrates how the disconnecting means are provided in accordance with Rule 64-104, for a solar PV system equipped with modules installed with interactive micro inverters or AC modules

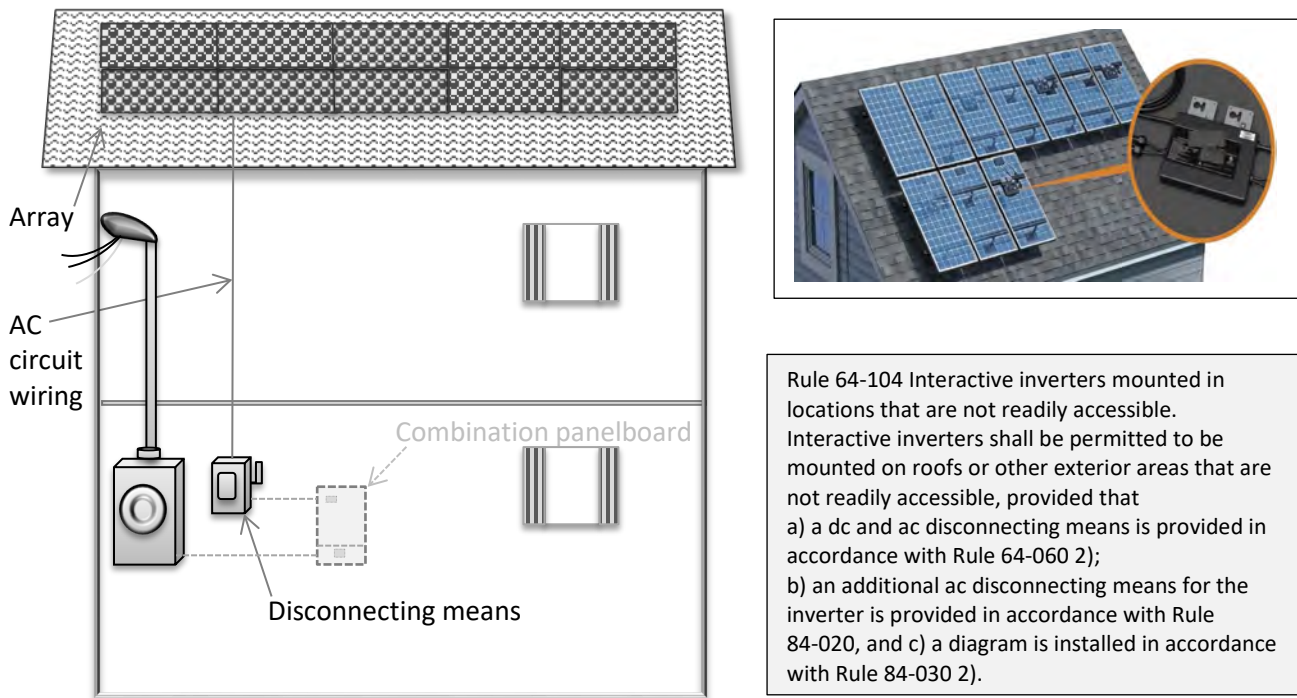
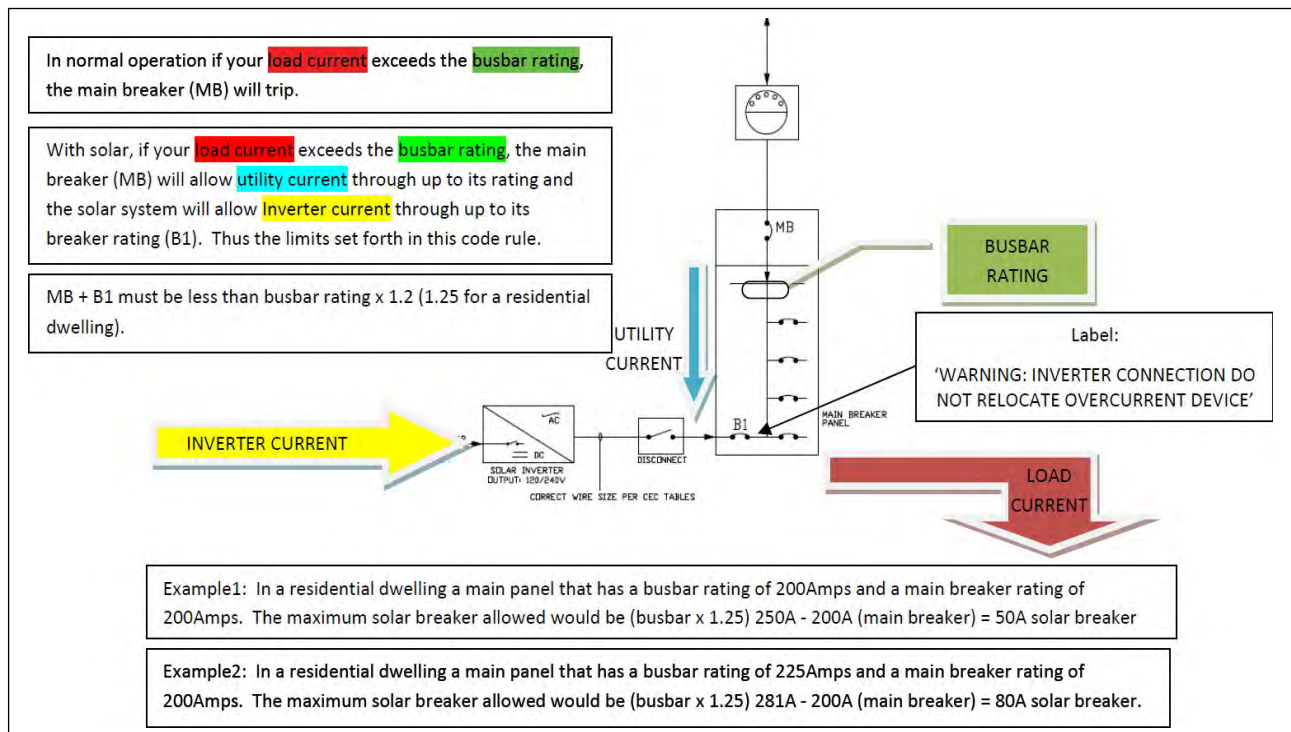


Figure 2

### Rule 64-112 - Interactive Point of Connection

Subrule 3) and 4) allows the output of an interactive inverter to be connected to the load side of the service disconnecting means provided that each source interconnection is made at a dedicated circuit breaker or fused disconnecting means. The point of connection shall be positioned at the opposite (load) end of the panel board, busbar or conductor from the input feeder location or main breaker location.



### Supplementary Notes:

- 1) Buildings equipped with solar PV systems can present a significant hazard should a fire or other incidents occur. The requirements of disconnecting means and initiator locations will allow first responders or utility personnel to quickly disconnect and de-energize the system.
- 2) The equipment disconnecting means referred to in Rule 64-060 1) must be located within sight of and within 9 m of the equipment. The utility disconnecting means referred to in Rule 84-024 must be readily accessible. The device (initiator) used to initiate PV rapid shutdown referred to in Rule 64-218 4) must be readily accessible and located as follows:
  - a) For single dwelling units, at the supply authority meter.
  - b) For other than dwelling units, there are two initiators required, at the consumer's service and one of the following; within sight and 9 m of the array or at the permanent access to the roof.
  - c) Where a disconnecting means or an initiator (where required) is installed within 9 m of the array(s) and it is impracticable to comply with the "within sight of the array(s)" requirement, the disconnecting means or initiator is permitted to be located out of sight of the array(s) provided that:
    - i. It can be demonstrated that the location specified in the foregoing Rules is clearly impracticable,
    - ii. disconnecting means or initiator is provided with a permanent marking indicating location of the array it disconnects and controls, and
    - iii. a special permission is approved by the City Electrician in accordance with Bulletin 2009-004-EL.

Note: in some cases the equipment or utility disconnecting means may also serve as the rapid shut down initiator.

All requests for special permission must be provided with supplementary information (i.e. a permanent warning sign installed in a suitable location next to the meter base to identify the location of the disconnecting means or device). Link for special permission is provided below.

<https://vancouver.ca/files/cov/2009-004-special-permission-of-the-electrical-by-law-no-5563.pdf>

- 3) Where the PV dc arc-fault circuit protection required by Rule 64-216 is not located at the module, Rule 64-210 5) requires PV source or output circuits insulated conductors and cables installed on or above a building and operating at 80 volts or greater must be provided with protection against damage from rodents by enclosed raceway or by enclosing the conductors and cables in material such as expanded metal, solid metal, and screening.  
For protection against damage from rodents by dc arc-fault protection, module-level dc arc-fault protection must be approved and listed in the manufacturer's published instruction.
- 4) No person shall install renewable energy systems including ground-mounted solar PV system susceptible to flood damage, below the flood construction level, unless such systems are protected from flood damage and accessible for servicing during a flood, to the satisfaction of the City Electrician.
- 5) Bi-facial modules should not use the STC ratings to determine the maximum voltage and current. Bi-Facial modules will have much higher values due to the back-side gain. The highest gain value should be used.

## Checklist for Solar Photovoltaic System

### Bulletin 2021-001-EL – Attachment A

(To be completed by the applicant of an electrical permit for installation of a Solar Photovoltaic System)

Address: \_\_\_\_\_ Electrical Permit No.: \_\_\_\_\_

Specific Location: \_\_\_\_\_ Development/Building Permit No.: \_\_\_\_\_

Please complete the appropriate items accordingly.

<b>Part 1. Select the type of Solar Photovoltaic System</b>	
Interactive solar PV system: Yes <input type="checkbox"/> Stand-alone solar PV system: Yes <input type="checkbox"/>	
<b>Part 2. Provide the Electrical Equipment Details</b>	
<b>Modules (AC/PV)</b>	Manufacturer and model number: _____
	Number of modules: _____
<b>Inverters</b>	Manufacturer and model number: _____
	Number of inverters: _____
<b>Converters dc-dc</b>	Manufacturer and model number: _____
	Number of converters: _____
<b>Storage batteries</b>	Manufacturer and model number: _____
<b>Racking system-means of bonding to ground</b>	Manufacturer and model number: _____
<b>Comments:</b> _____	
<b>Part 3. Provide the Solar Photovoltaic System Electrical Specification</b>	
<b>Rated array power (W):</b>	_____ (Total PV power source)
<b>Maximum DC voltage:</b>	_____
<b>Number of phases:</b>	Single phase <input type="checkbox"/> Three phase <input type="checkbox"/>
<b>Rated AC voltage (V):</b>	_____
<b>Rated AC power (W):</b>	_____ (Number of inverters X rated AC power output = Total W)
<b>Rated AC current (A):</b>	_____
<b>Comments:</b> _____	
<b>Part 4. Confirm the requirements of Bulletin 2021-001-EL</b>	
Yes <input type="checkbox"/>	A single-line diagram accompanies the permit application.
Yes <input type="checkbox"/>	A site plan accompanies the permit application.
<b>Notes:</b>	
<p>1) Upon completion of the installation of solar PV system, the FSR/permit holder must notify the City Electrician of the completion and request an inspection with the completed Verification of Solar Photovoltaic System (see Bulletin 2021-001-EL) submitted to the City Electrician. The installation of solar PV system must not be energized until the Verification of Solar Photovoltaic System and installation of solar PV system have been accepted and approved by the City Electrician.</p> <p>2) The issuance of the electrical permit does not represent and warrant that the submitted diagram and plan comply with provisions of the Electrical By-law, nor does it prevent the City Electrician from enforcing the By-law as the City Electrician sees fit. The responsibility to comply with the By-law at all times still remains with the permit holder and the owner.</p>	

FSR name/

Electrical contractor: \_\_\_\_\_ Signature: \_\_\_\_\_

Phone number: \_\_\_\_\_ Email: \_\_\_\_\_ Date: \_\_\_\_\_

## Verification of Solar Photovoltaic System

### Bulletin 2021-001-EL – Attachment B

(To be completed and uploaded to POSSE by the field safety representative)

Address: \_\_\_\_\_ Electrical Permit No.: \_\_\_\_\_

Specific Location: \_\_\_\_\_ Development/Building Permit No.: \_\_\_\_\_

Please complete the appropriate items accordingly.

<b>Part 1. Confirm the type of Solar Photovoltaic System installed.</b>		
Grid Interactive solar PV system: Yes <input type="checkbox"/> Stand-alone solar PV system: Yes <input type="checkbox"/>		
<b>Part 2. Confirm the Electrical Equipment installed for the Solar Photovoltaic System.</b>		
<b>AC modules</b>	Manufacturer and model number: _____	
	Number of modules: _____	
<b>PV modules</b>	Manufacturer and model number: _____	
	Number of modules: _____	
<b>Inverters</b>	Manufacturer and model number: _____	
	Number of inverters: _____	
<b>Converters</b> dc-dc	Manufacturer and model number: _____	
	Number of converters: _____	
<b>Storage batteries</b>	Manufacturer and model number: _____	
<b>Racking system-means of bonding to ground</b>	Manufacturer and model number: _____	
<b>Comments:</b>	_____	
	_____	
	_____	
<b>Part 3. Confirm the Electrical Specification for the Solar Photovoltaic System.</b>		
<b>Inverters</b> Power Optimizers	Rated array power (W): _____	
	Maximum DC voltage: _____	
	Number of phases: _____	
	Rated AC voltage: _____	
	Rated AC power (W): _____	
<b>Micro inverters</b>	Rated AC current: _____	
	Number of phases: _____	
	Rated AC voltage: _____	
	Rated AC power (W): _____	
	Rated AC current: _____	
<b>Inverters / Power conditioning unit</b>	Rated PV array power (W): _____	
	Maximum DC voltage: _____	
	Number of phases: _____	
	Rated AC voltage: _____	
	Rated AC power (W): _____	
<b>Other</b>	Rated AC current: _____	
	<b>Comments:</b>	_____
		_____

Part 4. Interactive point of connection - Select the appropriated checkboxes and answer the questions.			
Yes	No	N/A	Conformance with the CE Code Rule 64-112
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The connections of interactive inverter(s) or power conditioning unit(s) to the supply authority system comply with Section 84. Ref: CE Code Rule 64-112 1).
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The output of interactive inverter(s) is connected to the supply side of the service disconnecting means. Ref: CE Code Rule 64-112 2)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	For the purpose of Rule 64-112 4) a), b), c), d) and e), provisions for interconnection between the primary power supply source and the interactive inverter(s) comply with the following conditions:
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	a) each source interconnection is made at a dedicated overcurrent device,
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	b) each panelboard, busbar, or conductor supplied by the multiple sources in the interactive system is provided with:
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I. suitable warning signs adjacent to each source disconnecting means; required by Rule 14-414,
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	II. the point of connection positioned at the opposite (load) end from the input feeder location or main circuit location, where the panelboard is rated less than the sum of the ampere ratings of all overcurrent devices in source circuits supplying the panelboard,
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	III. a permanent warning label at the distribution equipment to indicate that the overcurrent device shall not be relocated.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	c) the sum of the ampere ratings of the overcurrent devices in source circuits supplying power to the busbar does not exceed more than 120% rating of the busbar.
Answer 1: _____			Question 1: What is the ampere rating of the busbar?
Answer 2: _____			Question 2: What is the sum of the ampere ratings of the overcurrent devices?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	d) <b><i>for a dwelling unit</i></b> , the sum of the ampere ratings of the overcurrent devices in source circuits supplying power to the busbar does not exceed more than 125% rating of the busbar.
Answer 3: _____			Question 3: What is the ampere rating of the busbar?
Answer 4: _____			Question 4: What is the sum of the ampere ratings of the overcurrent devices?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	e) the interconnection point is made on the line side of all ground fault protection equipment.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The interconnection point described in Rule 64-112 4) e) is made on the load side of ground fault protection equipment in accordance with Rule 64-112 5).
Part 5. Select the appropriated checkboxes.			
Yes	No	N/A	Conformance with Section 64 of the CE Code and Rule 2-024.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bipolar system has been installed in conformance with Rule 64-056.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Stand-alone system complies with Rule 64-102.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wiring methods comply with Rules 64-062, 64-210, 64-212 and 64-220.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Grounding and bonding comply with Rules 64-064, 64-068, 64-070 and 64-222.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Voltage and voltage drop of solar PV system comply with Rules 64-202 & 64-204.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ampere rating of PV source and output circuits comply with Rule 64-206.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Overcurrent protection complies with Rules 64-058 and 64-214.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Photovoltaic dc arc-fault circuit protection complies with Rule 64-216.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PV module application class use complies with Rule 64-208.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Inverters comply with Rules 64-104 and 64-106.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Disconnecting means have been installed in conformance with Rule 64-060.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PV rapid shutdown and initiator of PV rapid shutdown have been provided in conformance with Rule 64-218.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Loss of interactive system power complies with Rule 64-078.



<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Marking, warning signs and warning labels have been provided in conformance with Rules 64-072, 64-200, 84-024 and 84-030.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Warning notice and diagram have been provided in conformance with Rules 64-074 and 84-030.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All electrical equipment used in installation is approved in accordance with Rule 2-024.
<b>Part 6. Select the appropriated checkboxes.</b>			
<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Requirements of Bulletin 2021-001-EL</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A single-line diagram has been submitted with the permit.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A site plan has been submitted with the permit.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Net metering has been applied for by BC Hydro.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The Solar Photovoltaic System is ready to be energized.

Electrical contractor: \_\_\_\_\_ Electrical Engineer: \_\_\_\_\_

FSR name: \_\_\_\_\_ Company: \_\_\_\_\_

Phone number: \_\_\_\_\_ Phone number: \_\_\_\_\_

Email: \_\_\_\_\_ Email: \_\_\_\_\_

Signature: \_\_\_\_\_ Signature: \_\_\_\_\_  
(Affix Professional Stamp Here)