

Bulletin 64-5-0
Installation of solar photovoltaic systems
Rules 64-060, 64-200, 64-214, 84-020, 84-024 and 84-030

Issued May 2016
Supersedes Bulletin 50-1-2

Scope

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(1) Introduction

The intent of this bulletin is to clarify some of the solar photovoltaic installation rules.

In addition to this Bulletin, the following documents provide additional information on the installation of solar photovoltaic systems:

- ESA SPEC-004 “Electrical Guidelines for Inverter-Based Micro Generation Facilities (10 kW and smaller)”
- ESA SPEC-005 “ Process Guideline for the Installation of Parallel Generating Systems greater than 10 kW
- Bulletin 6-7-* Hot splitters/tapping existing services
- Bulletin 64-2-* Grounding and Bonding of Solar Photovoltaic Systems
- Bulletin 64-3-* Voltage rating of a photovoltaic source circuit
- Bulletin 64-1-* Connection of utility-interactive inverters on the load side of service disconnecting means
- Bulletin 84-1-* Interconnection of Electric Power Production Sources

(2) Disconnecting means

(a) Disconnecting means for solar photovoltaic source circuits

Question 1

Does Rule 64-060(1) require disconnecting means for each photovoltaic source circuit (panel or modules connected in series)?

Answer 1

No.

Having said that, Rule 64-060(7) requires means to disable and isolate PV output circuits greater than 48 V. According to Appendix B Note, an opaque covering is an acceptable means of disabling the array.

Servicing the equipment on the photovoltaic side of disconnecting means, such as overcurrent devices or modules, may require disabling all or portions of the array, since PV modules or panels are always energized when exposed to any light source.

(b) Disconnecting means for overcurrent protection devices

Question 2

Does the Code require disconnecting means for overcurrent devices, that may be required by Rule 64-214?

Answer 2

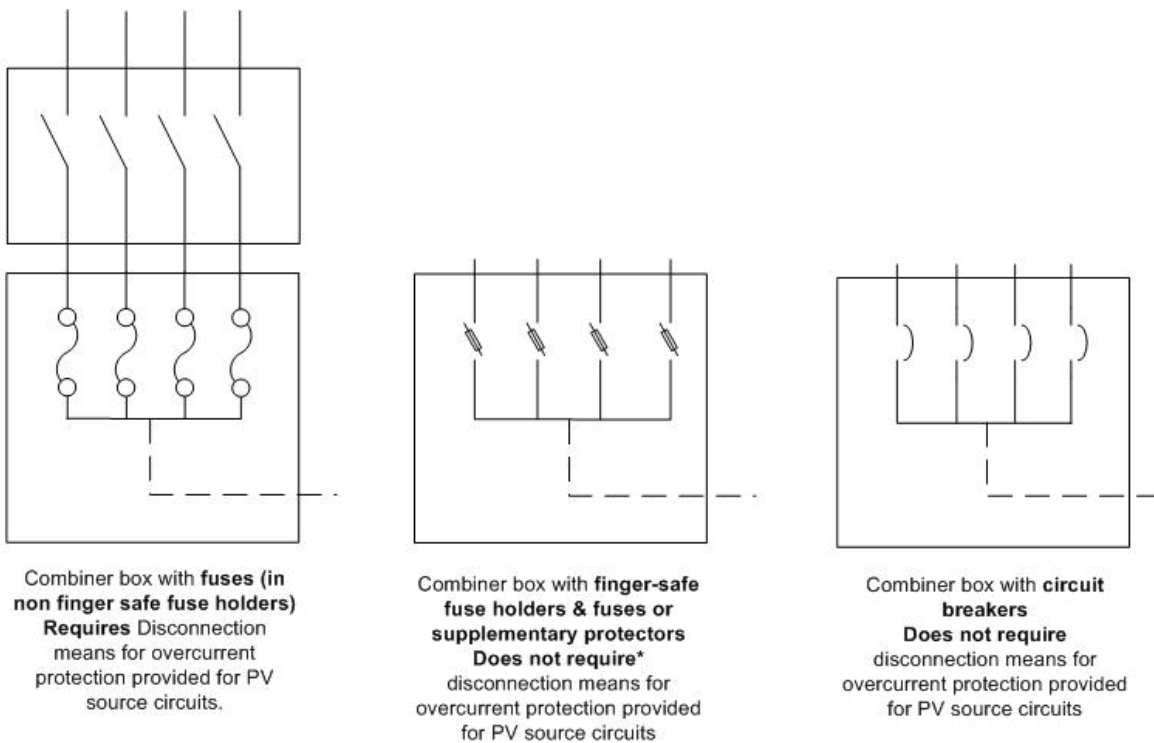
Based on Section 14 and depending on the type of overcurrent protection used, the disconnecting means may or may not be required. It should also be noted that disconnecting means may not be rated as load break devices and should not be operated without first disabling the current source. See Diagram B1:

- Fuses (in non finger safe fuse holders): **Disconnecting means is required**
- Circuit breakers: **Disconnecting means is not required**
- Finger-safe fuse holders & fuses OR Supplementary protectors: **Disconnecting means is not required***

(*) Note:

Not rated to be opened under load.

Diagram B1 – Requirements for disconnecting means



(*) Not rated to be opened under load. Several means to do so are either by disabling all PV modules, that are connected to that combiner box, or having the DG disconnect in the “open” position, so no current flow.

Question 3

Where disconnecting means is required for fuse holders and fuses (not designed to be finger safe), and is not integral with the combiner box in which fuses are located, what is meant by “adjacent to” for these types of installations?

Answer 3

If the disconnecting means is not integral with the fuses, then it shall be installed within sight **and** within 9 m from the fuse holder.

A warning sign is required to indicate that all switches must be opened to de-energize from all sources before replacing fuses.

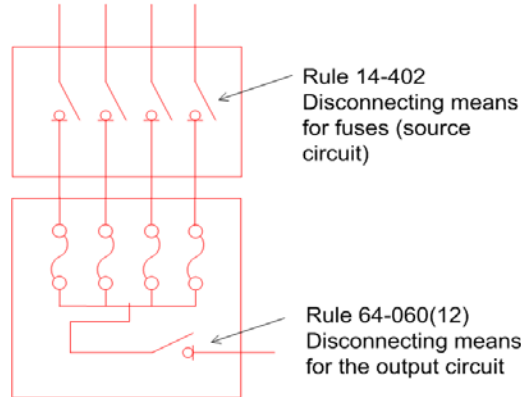
Question 4

When fuses are used as PV source circuit overcurrent protection, does a disconnecting switch for the output circuit satisfy the requirements for disconnecting means for fuses?

Answer 4

No, Rule 14-402 requires circuits protected by fuses to be equipped with disconnecting means in order to safely replace fuses.

Diagram B2 – Disconnecting means for fuses used for PV source circuit overcurrent protection



(c) Disconnecting means for overcurrent protection devices

As per Rule 64-060(12), a disconnecting means for the combiner box is required for the PV output circuit and shall be:

- rated to interrupt the load;
- be integral with the combiner box; or
- installed within 2 m of the PV combiner.

If the combiner box is equipped with fuses, a disconnecting means is required to be interlocked with the door. *The enforcement of the interlocking requirement will not be enforced until further notice,*

Note:

Rule 64-060(12) is not applicable to re-combiners.

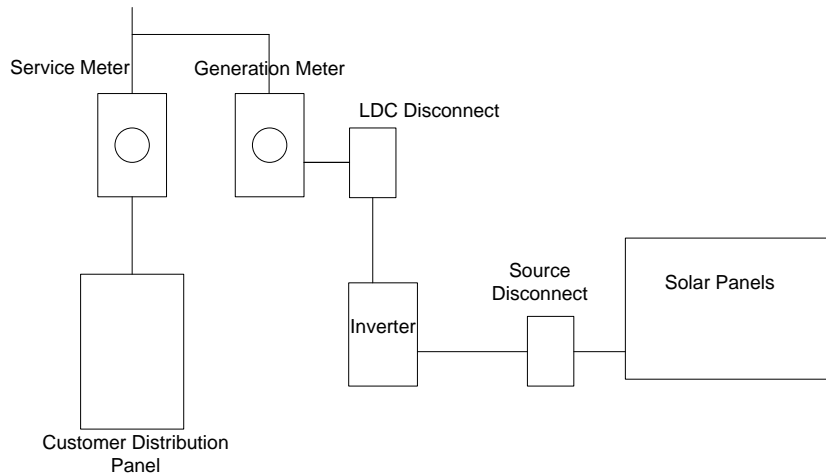
(3) Single-line diagram and labels

(a) Single-line diagram of the interconnected renewable system

Question 5

Does Diagram B3 meet the requirements of Rule 84-030(2) for the single-line diagram of the interconnected system that is located at the supply authority disconnect switch?

Diagram B3 – Typical single-line diagram of the interconnected system with parallel meter connection



Answer 5

Yes, this meets the minimum single-line diagram requirements of Rule 84-030(2).

Note:

The system ratings required by Rule 64-200 are not required to be displayed at the supply authority disconnect or on the single-line diagram. The label required by Rule 64-200 shall be posted at the generator (Source) disconnecting means.

(b) Labels

Question 6

What Codes or Standards provide requirements for labels, e.g. “DG SOURCE DISCONNECT”, “UTILITYINTERCONNECTED”, “DG SYSTEM DISCONNECT – WARNING – TWO POWER SOURCES”? Does the code require specific wording?

Answer 6

Rules 2-100 and 84-024 require the labels. The Rules do not specify the specific wording. The wording provided in ESA SPEC-004 can be used as an example.

The following markings are applicable CSA Part 2 Standard requirements and can be used as guidance:

- CSA Standard C22.2 No. 257 defines “Distributed generation (DG)” as an electric generation facility connected to a distribution system through the point of common coupling. In Annex B of Standard C22.2 No. 257 that is informative, it shows similar labels as in ESA SPEC-004, i.e. “**DG - source disconnect means**”.
- CSA Standard C22.2 No. 107.1, Clause 15.4.1.1 requires “When the unit complies with Clause 15, it shall be marked: **UTILITY - INTERCONNECTED**, or the equivalent”, and Clause 15.4.1.3 specifies; “A utility-interconnected inverter shall be marked: **WARNING - POWER FED FROM MORE THAN ONE SOURCE**, or the equivalent.”

Question 7

What is considered acceptable for exterior, weatherproof labels required by Section 84? Does the code specify letter size?

Answer 7

The Code does not provide specific requirements; the labels need to be able to withstand the elements, be permanent and legible, for example: lamacoid, engraved metal plate, or equivalent. Additionally, the label has to satisfy the local supply authority requirements.

(4) Electricity meters

(a) Neutral connection for electricity meters

Question 8

For a parallel metering connection, where the generation meter is on the supply side of the service disconnecting means, do all 4-jaw revenue meters require a neutral conductor to be terminated in the meter base?

Answer 8

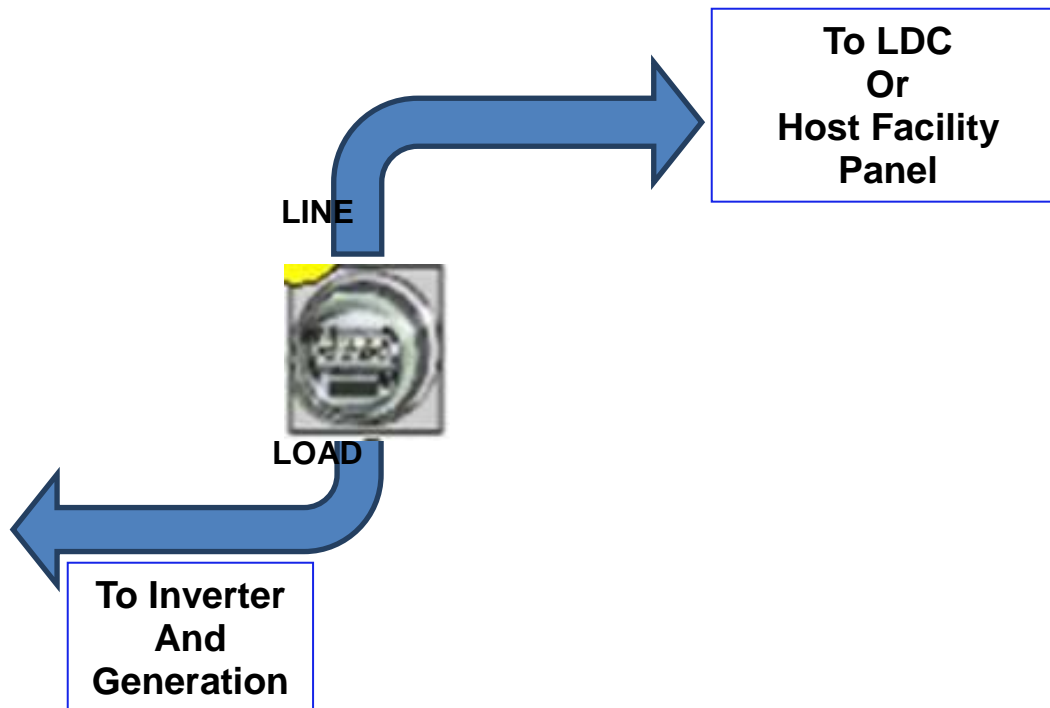
No. According to Rule 10-624(4), the grounded conductor on the supply side of the service disconnecting means is permitted to be used as a bonding conductor for the revenue meter device. In this case, the grounded conductor is required to be bonded to the meter mounting device. However, when the grounded conductor is not used as a bonding conductor for the revenue meter device, the grounded conductor can be run through the meter base without being terminated and a separate bonding conductor shall be provided between the service and the meter.

(b) Generator metering connection

Direction

The requirement in ESA SPEC-004 is to always have the Line side of the metering cabinet connected to the utility and the Load side connected to the customer, to ensure consistency and safety, as per Diagram B4.

Diagram B4 – Generation meter connection



Rationale

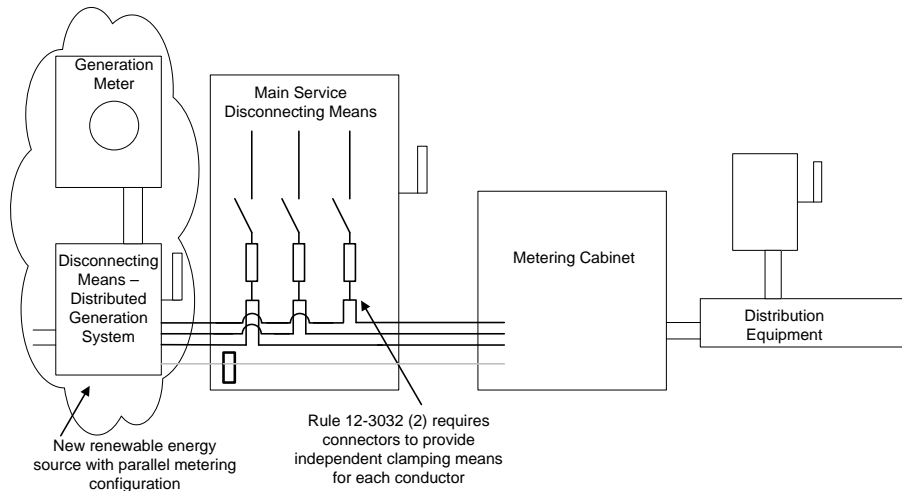
When pulling a meter, the standard practice is that the Load side of the metering cabinet will be de-energized and caution is taken around the Line side, as it may be energized. The ESA guideline is consistent with the Independent Electricity System Operator (IESO) "microFIT Contract" which requires bi-directional metering for the generator facility.

(c) Tapping to the load side of the service box for a parallel metering connection

Question 9

In installations where the existing customer load meter is downstream of the main service disconnect, does the Code permit tapping to the load side lugs of the service disconnect for a FIT or microFIT installation with a parallel metering configuration, as per Diagram B5?

Diagram B5 – Tapping to the to the load side lugs of the service disconnect



Answer 9

Yes. According to Bulletin 6-7-*, a maximum of one tap is permitted per service box. Therefore, the generator meter in a parallel configuration is allowed to be connected to the load side lugs of the service disconnect and be terminated in accordance with Bulletin 6-7-*.

(5) AC modules and micro-inverters

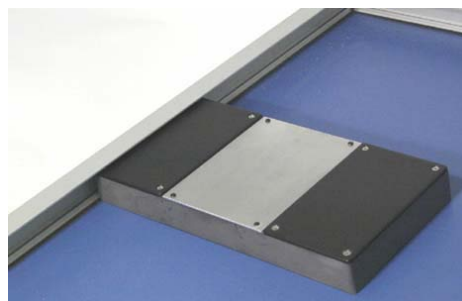
Rule 64-002 defines an ac module as “a complete, environmentally protected assembly of interconnected solar cells, inverter, and other components designed to generate ac power from sunlight”.

AC modules are designed to generate ac power when exposed to sunlight and do not have accessible, field installed dc wiring (as shown in the Photo B1).

(a) Disconnecting means

For ac modules where the inverter is an integral part of the generator (as shown on Photo B1), and the combined unit is approved, there is no requirement for a disconnecting means for the integral inverter. If, however, any other electric power production source is interconnected with an ac module, the disconnecting means, in accordance with Rule 84-020, is required for all production sources.

Photo B1 – AC module where the inverter is an integral part of the generator



For micro-inverters, inverters plugged into the photovoltaic panels (as shown in Photo B2), no additional disconnect switch is required.

Photo B2 – Micro-inverter



(b) Overcurrent protection

The output circuits of ac modules shall have overcurrent protection according to Rule 64-214 requirements.

(c) Marking of photovoltaic circuit

Question 10

Does the OESC require marking of a PV system with ac modules, when interconnecting to the supply authority?

Answer 10

Yes. Although requirements of Rule 64-200 for marking of the photovoltaic output circuit at the generator disconnecting means are not applicable to ac modules, according to Rule 2-100, PV installations utilizing ac modules connected to the supply authority shall be marked to identify the PV system rating and suitability for the particular installation.

Question 11

What is the required marking for a PV system with ac modules?

Answer 11

According to Rule 2-100 and the intent of Rule 64-200, the required marking for PV installations utilizing ac modules connected to the supply authority are:

- rated ac output current
- nominal operating ac voltage

Question 12

Where is the marking for a PV system with ac modules required to be located?

Answer 12

The required marking for PV installations utilizing ac modules connected to the supply authority shall be located at the supply authority disconnect; or be included in the single-line diagram required by Rule 84-030(2).