Bulletin 64-6-1
PV rapid shutdown
Rules 64-200 and 64-218

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Scope

(1) Background
(2) PV rapid shutdown initiator
(3) Marking requirements
(4) Micro-inverters and roof mounted “string” inverters

(1) Background

Fire service representatives are concerned about the inherent shock hazard that most PV power systems present to first responders. To address their concerns, Rule 64-218 provides requirements for the rapid shutdown process for PV systems installed on or in buildings. For ground-mounted PV systems, wherethe PV Source circuits enter a building that only houses PV system equipment, the rapid-shutdown requirements do not apply.

Based on the intent of Rule 64-218, rapid shutdown process can be defined as a process that:
- de-energizes PV source or output conductors that are more than 1m. in length on or inside a building, and
- de-energized conductors to not more than 30 V within 30 s of initiation.

If a combiner is close (not more than 1 m) to a PV array/module, Rule 64-218 does not require a PV module level shutdown. PV conductors within a PV array and up to a combiner box located within 1 m are permitted to remain energized.

It is important to understand that Rule 64-218 does not provide **“how to”** design the rapid shutdown process. The Rule specifies the objective and the end result of the rapid shutdown process includes:
- circuits required to be de-energized
- acceptable voltage; and
- time to achieve that voltage.

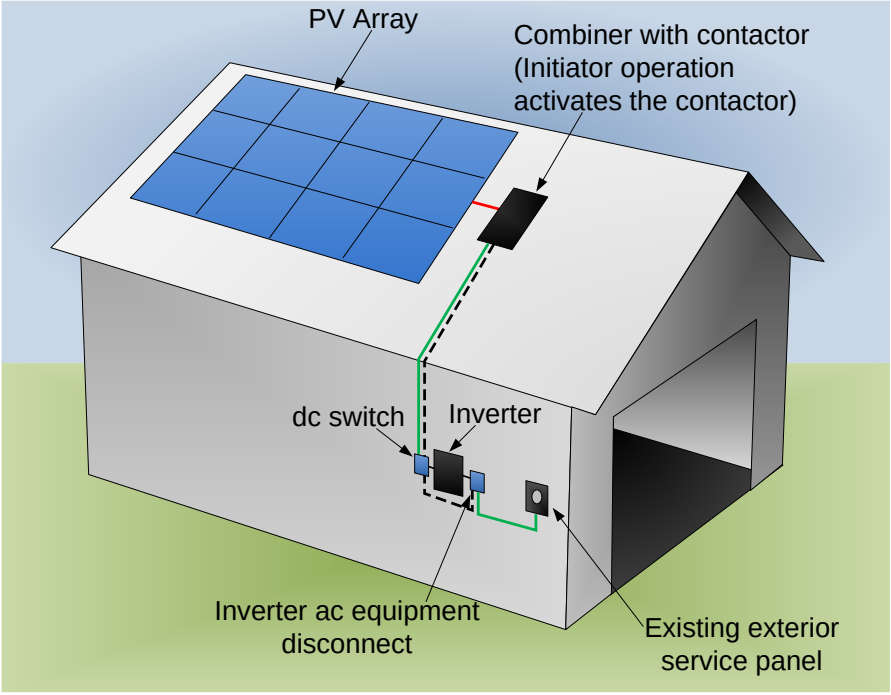
(2) PV rapid shutdown initiator

There shall be a device included in the PV rapid shutdown process that initiates the process. Considering that the intent of the Rule is that emergency responders can shut down the PV system, should an emergency situation occur, the rapid shutdown initiator is required to be a manual device. When a manually activated rapid shutdown device is provided, there is nothing that prevents other systems, such as an ancillary device from a fire alarm system, to also be able to shut down the system. The initiator may or may not be required to be a load breaking device, based on the design. If the initiator is part of a control circuit that activates a rapid shutdown and is not interrupting any load, it is not required to be a load breaking disconnecting means. Only when the initiator activates the rapid shut down by opening a PV source or output circuit is it required to be a load breaking disconnecting means. Rule 64-218 requires a device to initiate photovoltaic rapid shutdown to be readily accessible and located at the supply authority meter location. For other than single dwelling units, at the consumer service or meter and at a permanent access to a building roof where the array(s) is installed; or within sight and within 9 m of the array(s). For stand alone systems, the initiating device shall be located at the permanent access to the building roof where the array(s) is installed or within site and within 9 m.

Rule 64-218 does not specify that a rapid shutdown device is required to be an emergency shut-off switch used for only that purpose. Based on a rapid shutdown process design, PV ac or dc disconnecting means may also be used as a rapid shutdown initiator, as shown in Diagram B2. The examples of devices that may be used as an initiator are:
- Utility disconnect switch
- “DG” disconnect switch

- Rapid-shutdown switch

Diagram B2 – "DG" disconnect switch or Utility disconnect switch may be used as an initiator



(3) Marking requirements

Based on the Rules 64-200 2), 3) and 64-218 6), a marking shall be installed at the supply authority meter location and at the consumer service equipment to identify that the PV system is equipped with rapid shutdown. The marking shall be capital letters with a minimum height of 9.5 mm, in white on a red background:

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

Similar to PV system marking requirements, the rapid shutdown initiator is required to be labeled in a conspicuous, legible, and permanent manner, as required by Rule 2-100. Since the initiator is to be used by emergency responders, the initiator shall be appropriately identified. The marking requirements specified in Rule 64-200 3) shall apply. So, any device that serves as a rapid shutdown initiator is required to be marked as follows (or equivalent):

PHOTOVOLTAIC RAPID SHUTDOWN DISCONNECT

Note
If the PV Rapid Shutdown disconnect is the DG Source Disconnect, only 1 label is required.

(4) Micro-inverters and roof mounted “string” inverters

PV installations with micro-inverters and ac modules may inherently comply with rapid-shutdown requirements. Loss of ac power immediately de-energizes all PV system circuits outside the array. Only circuits internal to modules and between modules and micro-inverters or ac modules remain energized.

Another case would be where an interactive inverter (that operates only in grid-dependant mode) with an integral combiner box, sometimes referenced as a “string” inverter, is located within 1m of a PV array/module. Loss of ac power will immediately de-energize PV system conductors outside the 1 m envelope.

Marking, in accordance with Rule 64-200 2) and 3), to identify that the PV system is equipped with rapid shutdown and identification of the Utility disconnect switch, when used as the rapid shutdown initiator, is required as discussed above in Topic (3).