

Series 5 – Rapid Shutdown
Issue 1 – 2016 CEC – Photovoltaic System Requirements

Objective: *This document provides guidance in applying the 2016 California Electrical Code (CEC) where a new Photovoltaic(PV) system is added to a premises having an existing PV system that was permitted and installed in accordance with a previously adopted code. Proper understanding of terms used in the code is essential for consistency.*

The term PV System, formerly designated a Solar Photovoltaic System, has been used and defined in Article 690 since 1984. In the 2014 National Electrical Code (NEC) this definition was relocated from Section 690.2 to Article 100 in order to comply with the rules of the NEC Style Manual. Generally, definitions for terms used in two or more articles must be contained in Article 100.

Multiple Systems

One or more PV systems are allowed to be installed on or in buildings. This has been the case since the inception of Article 690 and does not conflict with the long-established definition of a PV system:

Photovoltaic (PV) System. The total components and sub-system that, in combination, convert solar energy into electric energy suitable for connection to a utilization load.

The designation of what constitutes an individual system is based on system design considerations, utility interconnection requirements, or both.

Point of Connection

Each PV system is allowed to be connected at any distribution equipment on the premises in accordance with Section 705.12. In residential settings it is common to have one system installed on the primary dwelling unit, and a separate system installed on an accessory structure such as a detached garage. The interactive inverter output of the first system may be terminated at an overcurrent protection device installed in the main service panelboard, with the second system connecting at a remote subpanel located in the garage. This configuration is fully compliant, and the specific requirements for such an installation are laid out in Article 705.

Another example might be an existing residential ground-mount system where a rooftop system is being added to the premises. The code does not require the ground mounted system to be combined with the rooftop system at a single point of connection.

There has been some misinterpretation of the details found in Section 705.12, and as such the code making panel responsible for this language (CMP4) has acknowledged the confusion and updated Section 690.4 in the 2017 NEC accordingly. Looking ahead to future codes is a valuable way to understand the intent of current and past language:

690.4(D) Multiple PV Systems. Multiple PV systems shall be permitted to be installed in or on a single building or structure. Where the PV systems are remotely located from each other, a directory in accordance with 705.10 shall be provided at each PV system disconnecting means.

Rapid Shutdown

The rapid shutdown requirements of Section 690.12 apply to specific conductors of all PV systems on or in buildings permitted and installed per the 2016 CEC. These new requirements would not apply to systems permitted and installed in compliance with earlier adopted versions of the NEC model code. Safely retrofitting existing systems may be impractical or impossible, and this maintenance requirement is beyond the scope of the CEC.

89.101.9 Effective Date of this Code. Only those standards approved by the California Building Standards Commission that are effective at the time an application for building permit is submitted shall apply to the plans and specifications for, and to the construction performed under, that permit. For the effective dates of the provisions contained in this code, see the History Note page of this code.

System Modifications

When a permit is granted for the modification, alteration, or expansion of an existing PV system the adopted code at the time the permit is applied for will apply. This means an older system may need to be updated to comply with current CEC requirements as determined by the Authority Having Jurisdiction (AHJ).

However, the installation of a new PV system on the same premises would not trigger the application of the 2016 CEC if no modifications are being made to the existing system. They are and will remain two separate systems. In addition, the interactive inverter output(s) of each system are not required to be combined or aggregated, which would effectively force a modification of the existing system.

In non-PV electrical installations, additions to existing premises wiring systems are quite common. In these situations the addition does not trigger the retroactive enforcement of the most current code. Exceptions to this general rule are explicitly called out in the CEC. See 210.12(B), which addresses arc-fault protection in dwelling unit branch circuits, for example.

Summary

- The definition of a PV system has not changed in the 2016 CEC
- One or more PV systems are allowed on the same premises
- Individual PV systems may be connected at any distribution equipment on the premises
- Only the codes adopted at the time of application for a permit apply

- The modification, alteration, or expansion of an existing system may trigger the application of requirements of the 2016 CEC
- Individual system outputs are not required to be combined, forcing the modification of an existing system that would otherwise remain unchanged.