

2017 NEC Changes for Renewable Energy Systems – Session two

© 2017 by Christopher LaForge



Christopher LaForge

IREC Certified Master Trainer

NABCEP Certified Photovoltaic Installation
Professional

30 years Operating Great Northern Solar

26 years Training with MREA and other
organizations



PV Installation
Professional

Emeritus

In accordance with the Department of Labor and Industry's statute 326.0981, Subd. 11,

“This educational offering is recognized by the Minnesota Department of Labor and Industry as satisfying **1.5 hours** of credit toward **Building Officials and Residential Contractors code/energy** continuing education requirements.”

For additional continuing education approvals, please see your credit tracking card.

690.56 (C)

Buildings with Rapid Shutdown

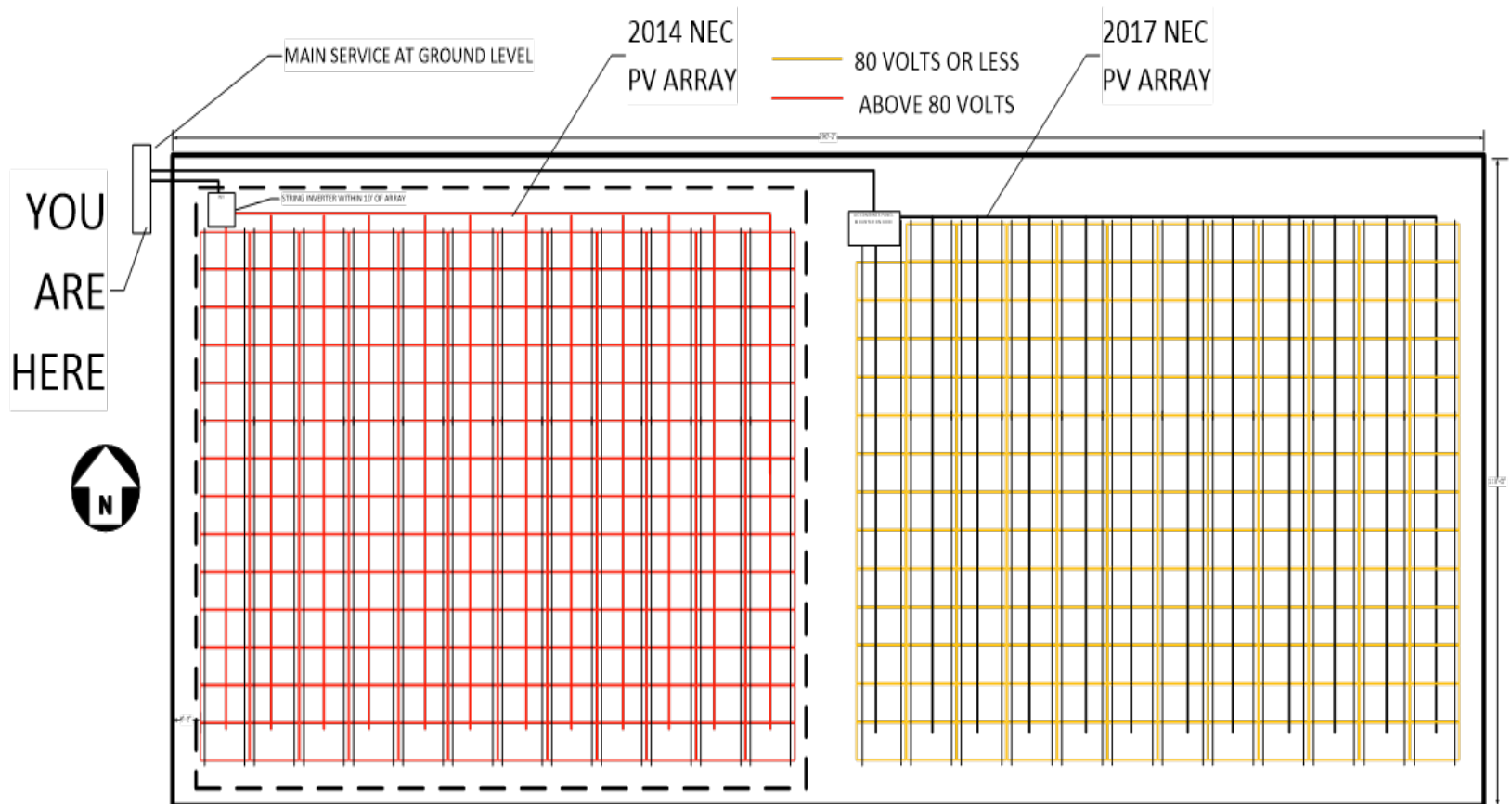
For buildings with both types of

PV systems

Signage next slide

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

AREAS WITHIN DOTTED LINES REMAIN ENERGIZED IN SUNLIGHT
WHEN RAPID SHUTDOWN SWITCH IS IN "OFF" POSITION



690.56 (C) Buildings with Rapid Shutdown

A rapid shutdown switch shall have a label located on or no more than 3 ft. from the switch that includes the following wording:

**RAPID SHUTDOWN SWITCH
FOR SOLAR PV
SYSTEM**

2017 NEC Rapid Shutdown Options

1. String inverter located at the edge of the array with dc-to-dc converters or shutoff switching devices at each module.
2. Micro-inverters that segment each module (1-4 PV modules per inverter)
3. Building-Integrated PV array with no exposed metal or wiring and installed more than 8' from grounded metal

SECTION 2017 NEC CHANGE

- **690.13 PV System Disconnecting Means**

- Clarified that there are only two types of disconnects in PV systems:

- (1) The PV System Disconnecting Means [690.13] and

- (2) The disconnects for equipment [690.15] conductors on the dc side of the PV system.

690.15

- 690.15 Disconnection of Equipment
 - Removed all of 690.16, 690.17, and 690.18 and placed the necessary requirements in 690.13 and 690.15.
- Introduce “Isolating Devices” to 690.

Disconnects must disconnect both positive and negative.

SECTION 2017 NEC CHANGE

- 690.31 Wiring Methods Reorganized and revised 690.31 to include all wiring methods, including ungrounded systems, into a single set of requirements.
- 690.31(B)(1) Identification - No white wire allowed on the dc side of a PV system for anything except rare solidly grounded PV systems.

690.31(C)(1) Single- Conductor Cable – Type USE-2 and PV Wire are permitted for grounded and ungrounded PV Systems

This allows for retro-fitting legacy systems with non-isolated (transformerless) inverters when replacement is necessary – such as during the Hartley Nature Center retro-fit project...

690.31 (D)

- (D) Multiconductor Cable.
- Jacketed multiconductor cable assemblies listed and identified for the application shall be permitted in outdoor locations. The cable shall be secured at intervals not exceeding 1.8 m (6 ft.)

690.41 and 690.42 System Grounding and Point of System Grounding

- Concept of functional grounded PV systems introduced to 690. Most PV systems installed now and in the last 15 years are functionally grounded. All PV systems require ground fault protection unless solidly grounded (rare).

690.43 Equipment Grounding

- Simplified and reorganized for clarity.

690.47

Grounding Electrode System

- Completely reorganized and simplified. Structures supporting PV systems must have a grounding electrode system.
- Equipment grounding conductor must be connected to the local grounding electrode system.
- Additional array electrodes are optional

690.53

Marking DC PV Power Source

- Simplified by removing “Rated maximum power-point current and Rated maximum power-point voltage” from the list on the sign.

Part VII

Connection to Other Sources

- Replaced with a simple reference to Article 705.

Part VIII

Storage Batteries

- Replaced with a reference to new Article 706. The remaining element is the requirements for Self- Regulated PV Charge Control.

Parts IX and X

(Over 1000V and EV Charging)

- Removed as they are adequately covered elsewhere in 690 and the rest of the NEC.

Article 705 Major Changes

705.2 Microgrid System

- New Microgrid definition and
- New Part IV, Microgrid Systems.

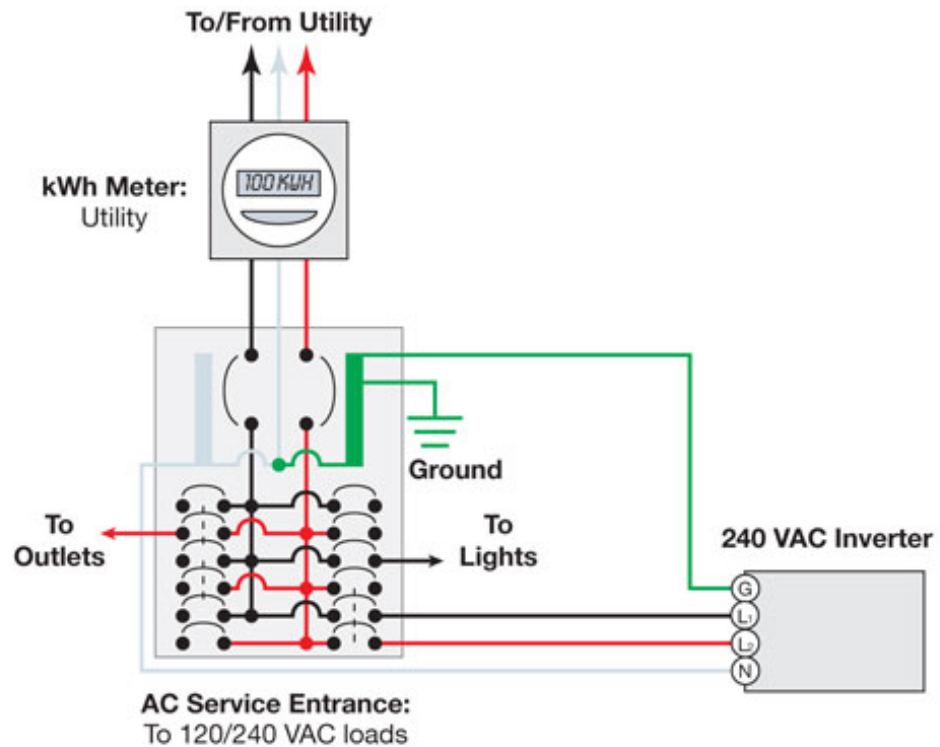
705.12 Point of Connection

- Simplified whole section to cover just supply-side and load-side interconnections of electric power sources.

705.12(B) Load Side

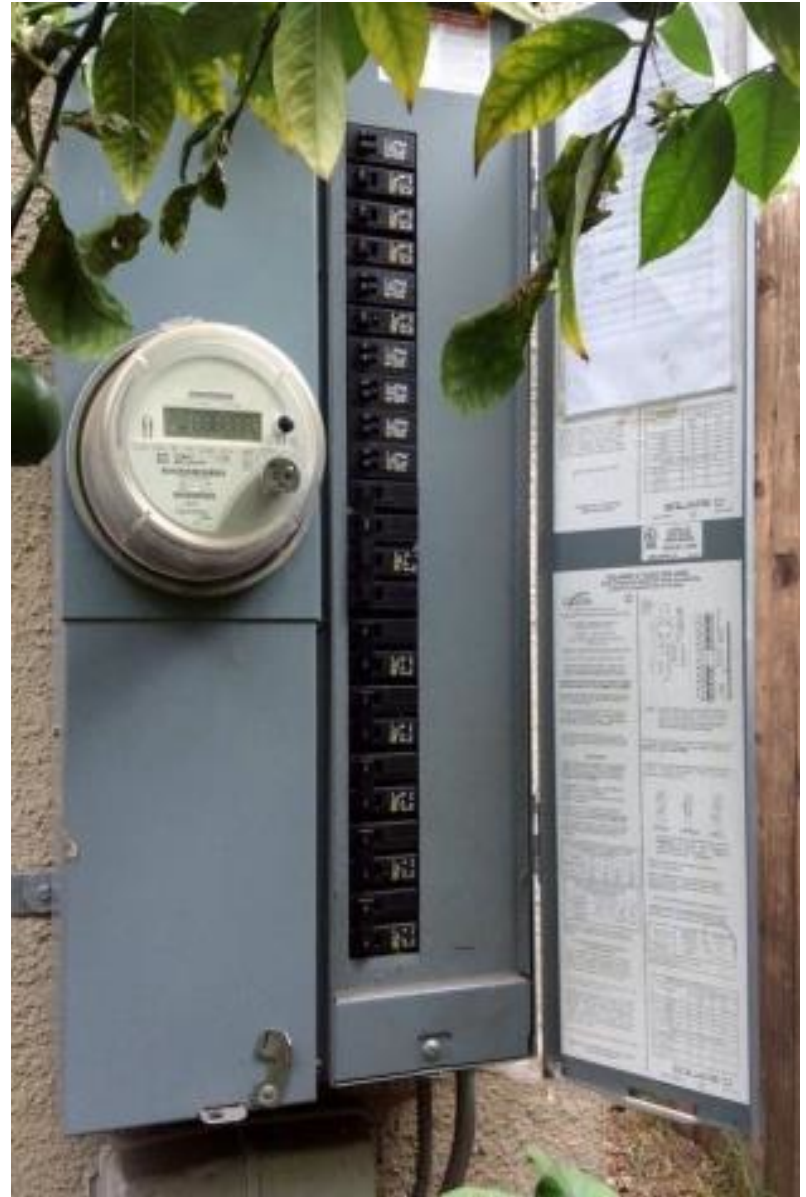
- Allows for interconnection of more than one inverter on load side.

Load-Side Connection



705.12(B)(2)(3)(d)

- Allows center-fed panels in dwellings to apply the 120% rule with power source connection at either end of the panelboard.



705.12(B)(2)(3)(d)

- A connection at either end, but not both ends, of a center-fed panelboard in dwellings shall be permitted where the sum of 125 percent of the power source(s) output circuit current and the rating of the overcurrent device protecting the buss-bar does not exceed 120 percent of the current rating of the buss-bar

Old 705.12(D)(6)

- Requirement for arc-fault detection on small ac circuits is removed.



New 705.23

Interactive System

Disconnecting Means

- New section to match the changes in Article 690 related to PV System Disconnecting Means.



Questions?

Thank you for your participation in
interest in Clean Renewable energy...

Christopher LaForge



PV Installation
Professional

Emeritus