

ALTERNATIVE POWER SYSTEMS

Photovoltaic
Wind
Generators



Photovoltaic Systems





- ❑ Photovoltaics (PV) is a solar energy technology that uses the unique properties of semiconductors to directly convey solar radiation into electricity.
- ❑ Photovoltaics is an environmentally friendly technology that causes no noise or pollution and can provide potential economic savings over time.
- ❑ Currently, the most significant disadvantage of PV systems is the high initial cost compared to prices competing power-generating technologies

(2) PV systems common at dwellings are: AC module Systems with Micro Inverters, and DC Systems consisting of DC modules and a DC to AC Inverter. Each have specific NEC requirements.

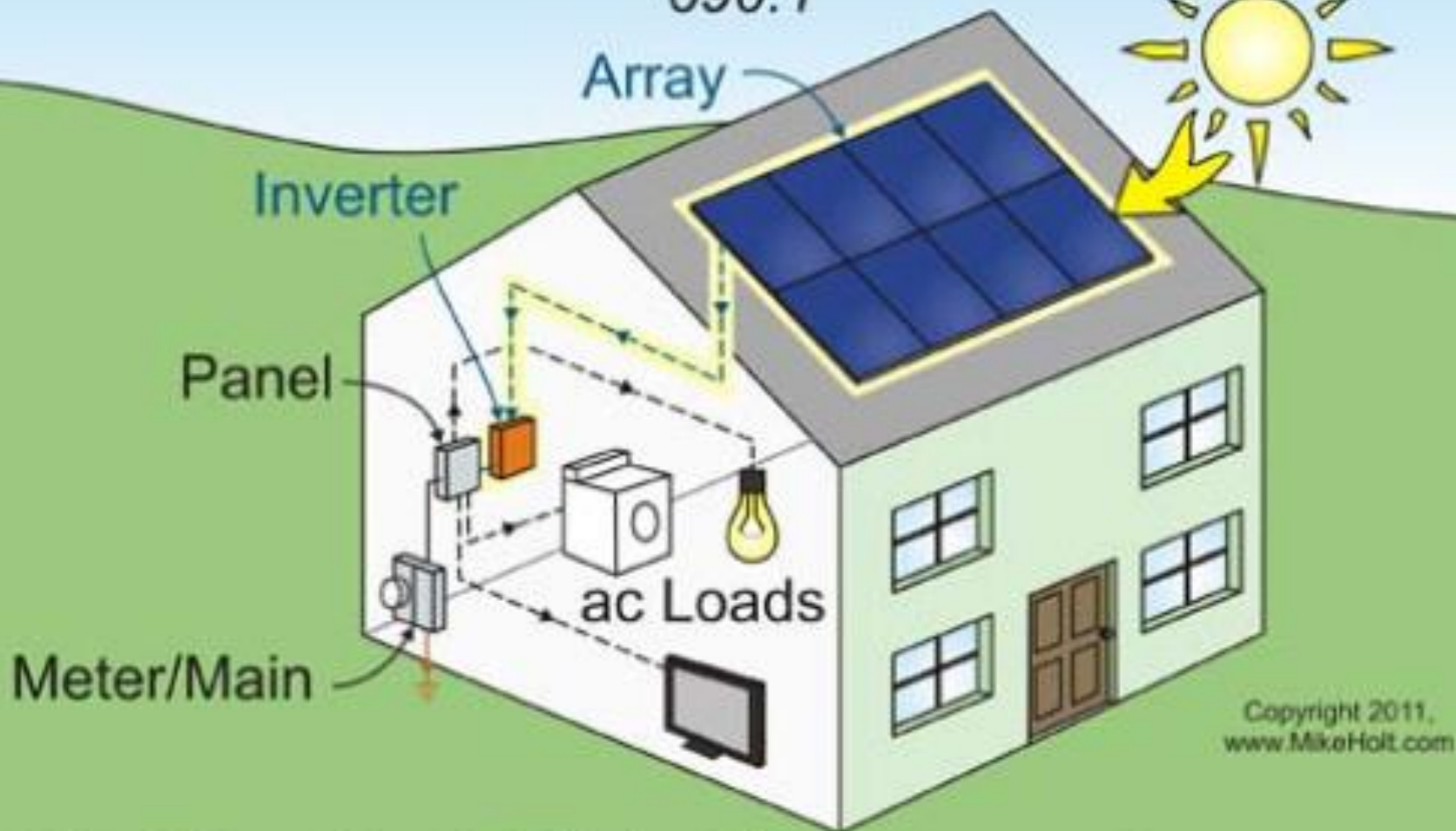


Electrical Integration

- ▣ PV Systems are subject to all of the same general requirements as most electrical systems found in the NEC, such as overcurrent protection and grounding. However PV systems are also subject to additional requirements found in NEC Article 690. Article 690 detail the sizing, specifications, and installation methods required to complete a safe, reliable, and easily maintained PV electrical system. Article 705 has additional requirements for PV systems Interconnected to the primary source of power (Utility Power).

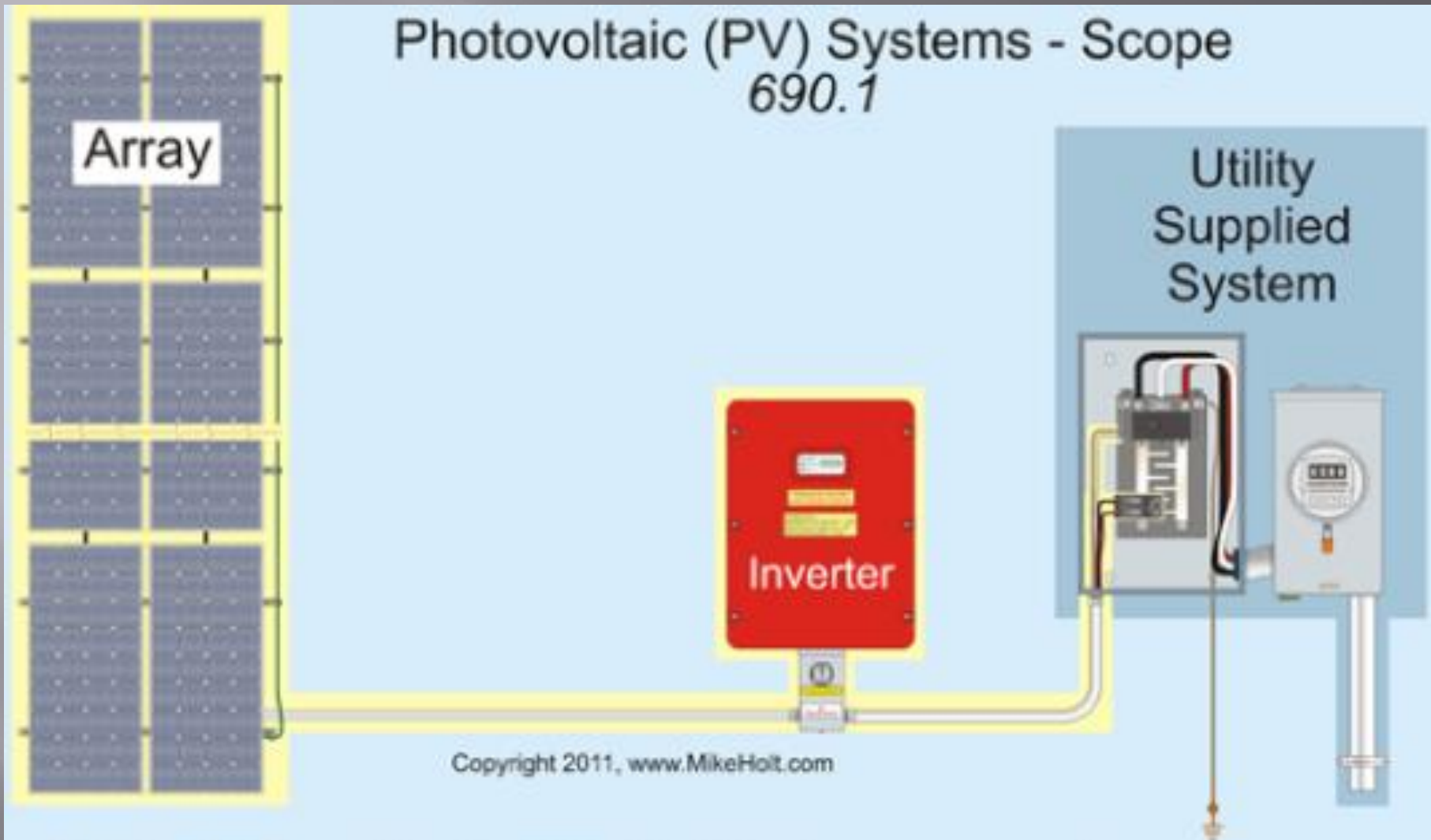


Photovoltaic (PV) Systems - Scope 690.1



Article 690 applies to PV electrical energy systems, array circuit(s), inverter(s), and charge controller(s) for such systems which may be interactive with other electrical power sources or stand-alone, with or without energy storage.

Photovoltaic (PV) Systems - Scope 690.1

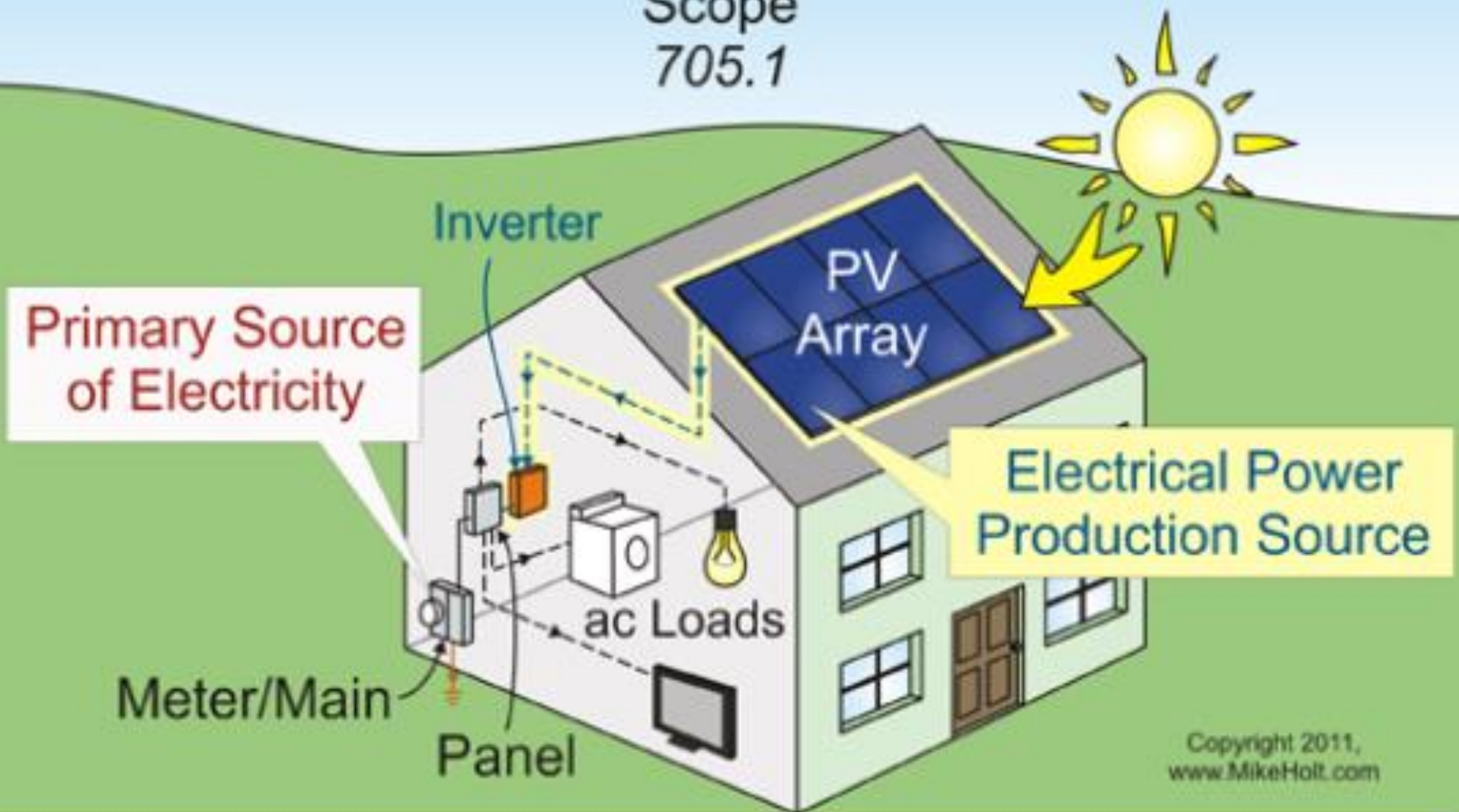


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Interconnected Electric Power Production Sources

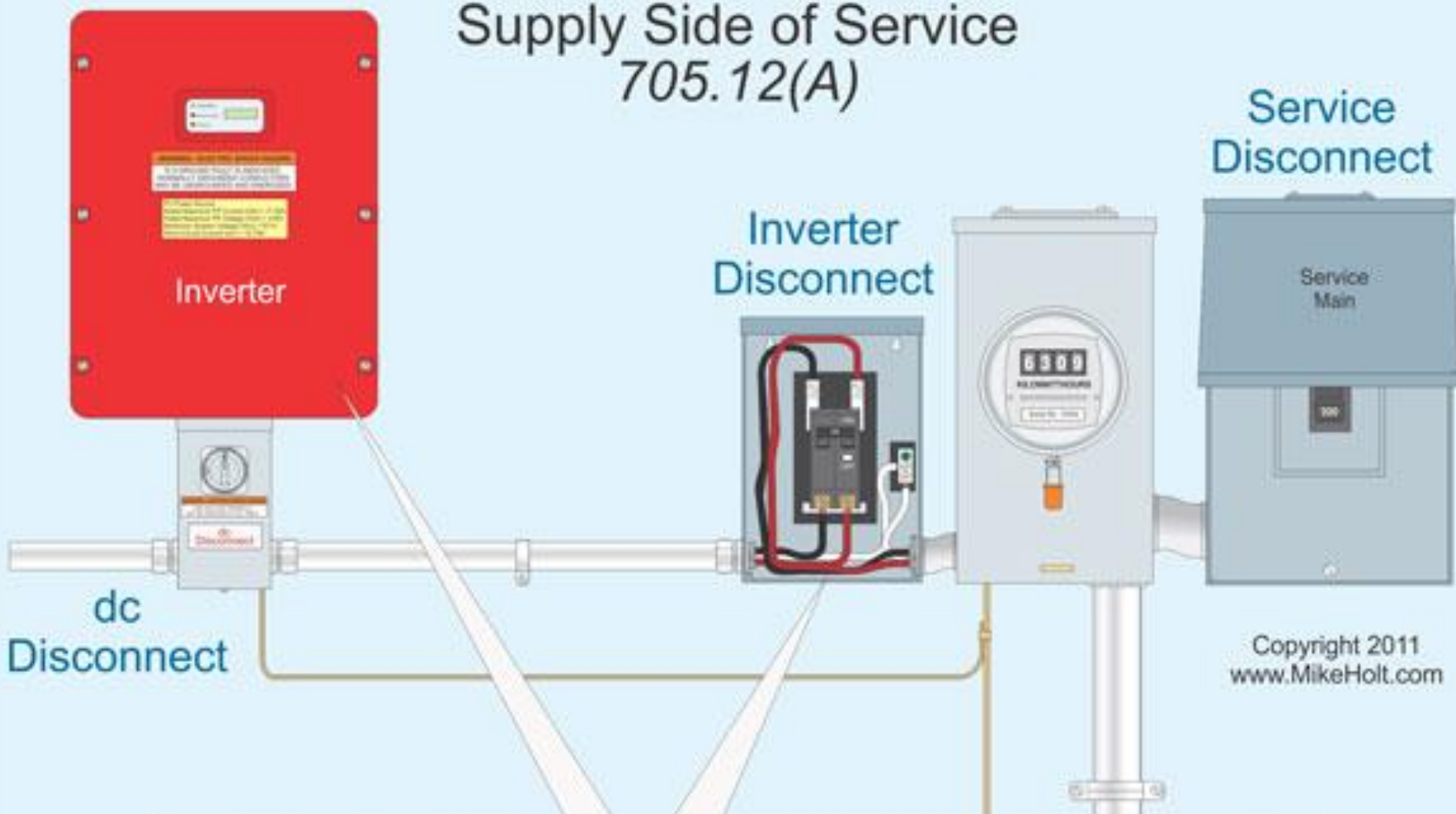
Scope
705.1



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Article 705 covers the installation of electric power production sources (photovoltaic, wind, micro-hydro generators, etc) operating in parallel with a primary source(s) of electricity.

Point of Connection Supply Side of Service 705.12(A)



Service
Disconnect

Inverter

Inverter
Disconnect

Service
Main

dc
Disconnect

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The output of a utility-interactive inverter can be connected to the supply side of the service disconnect as permitted by 230.82(6).

▣ Ten Things You Have to Know Installing and Inspecting PV Systems



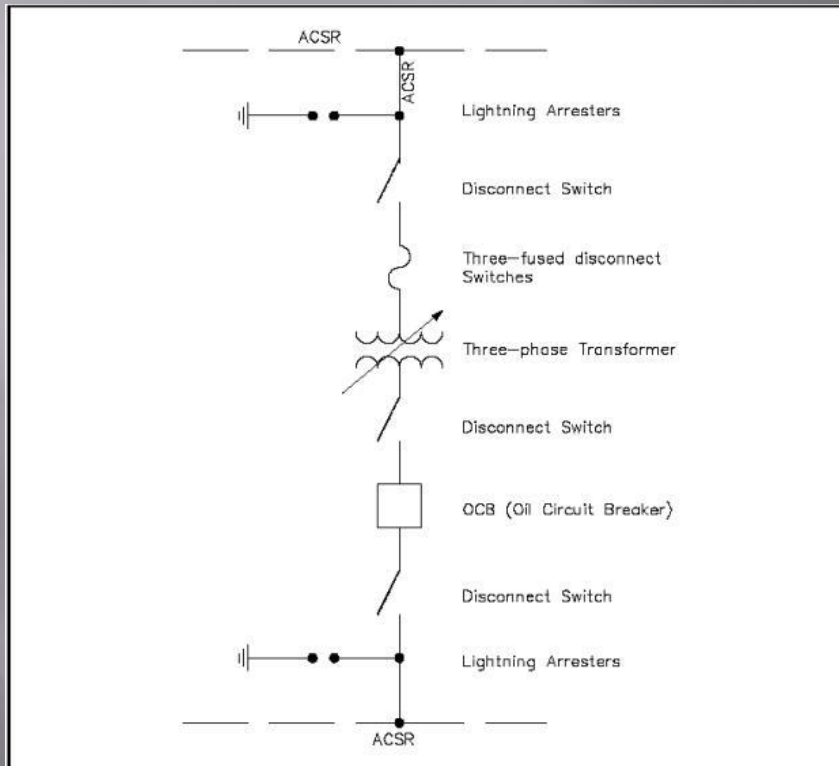
#1 Consult with your Utility

- ▣ Utilities and Co-Ops In Wisconsin have unique requirements for Utility-Interactive Applications, (Systems that are connected to the Utility Grid)
- ▣ Requirements Include but not limited to:
 - ▣ Utility Plan Review
 - ▣ Additional Disconnect Requirements (PSC 119)
 - ▣ Additional Metering Requirements
 - ▣ On Site Inspection by Utility Prior to energizing.



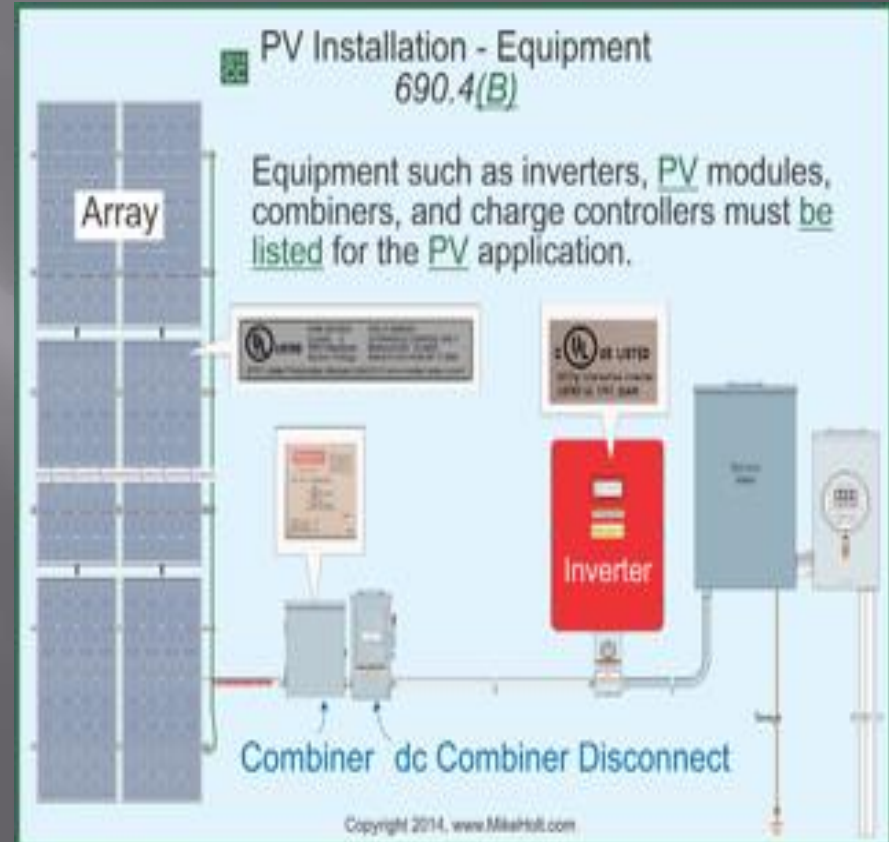
#2 Request a One Line Diagram

- ▣ The Diagram should include the Array, Inverter, Inverter Input and Output Circuit, Disconnect Switch, Wiring methods, Correction factors, Overcurrent Protection, and System Voltages. The diagram shall be requested and reviewed prior to inspection.



#3 Check for Listing of PV Equipment

- ▣ NEC 690.4(D)
- ▣ Inverters, photovoltaic panels, modules, combiners, and controllers for use in photovoltaic power systems shall be identified and listed for the (PV) application



#4 Identification and grouping of PV Circuits

- ▣ NEC 690.4 & 690.31(E)(4)
- ▣ PV Source and Output Circuits shall not be contained in the same raceway, tray or box with non-PV system wiring, unless the conductors of the different system are separated by a partition.
- ▣ NEC 690.4(B)(1)-(4)
- ▣ PV source and output circuits, Inverter circuits, and conductors of multiple PV systems shall be identified at all points of termination, connection and splices.



Mixing Conductors of Different Systems

690.4(B)

2011
CC

dc Conductors

ac Conductors

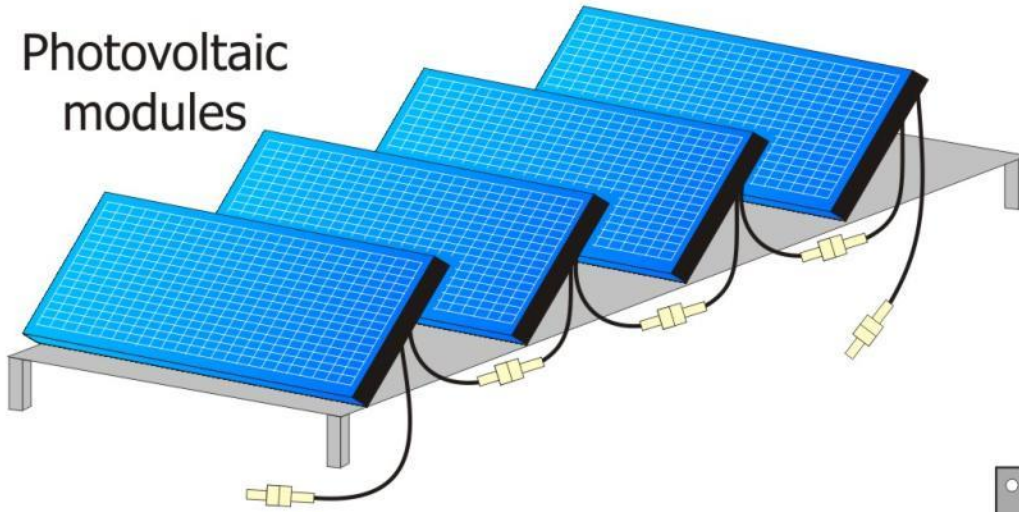
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PV system conductors, (dc/ac) are permitted in the same raceways, outlet and junction boxes, or similar fittings, but must be entirely independent of non-PV system wiring.

690.4(B) Conductors of Different Systems



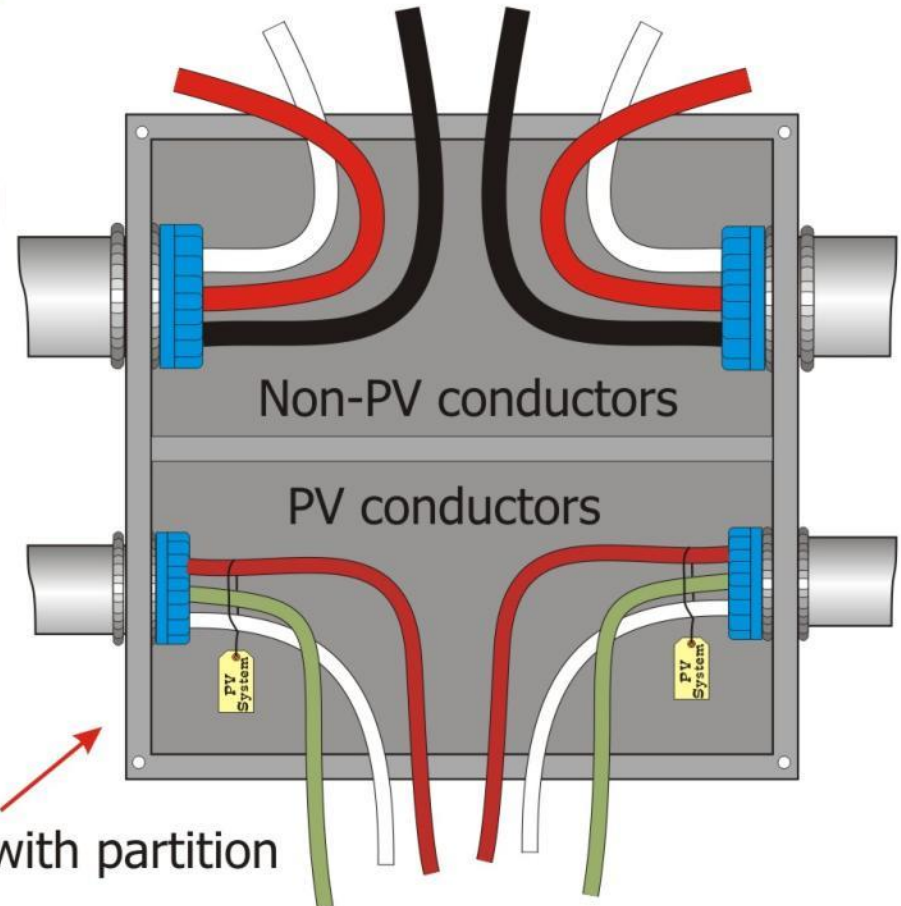
Photovoltaic modules



New requirements for separation and marking requirements for photovoltaic (PV) circuits installed in a building or structure were added at 690.4(B)

PV system conductors not to be mixed with non-PV conductors unless:

- Separated by a partition
- Identified and grouped
- Identified by color coding, marking tape, tagging
- Identified at all points of termination, connection, and splices



Junction box with partition

Installation - Multiple Systems 690.4(B)(3)

Conductors of each system must be identified at each termination, connection, and splice point.



Circuits Inside Buildings/Structures Marking or Labeling 690.31(E)(3)

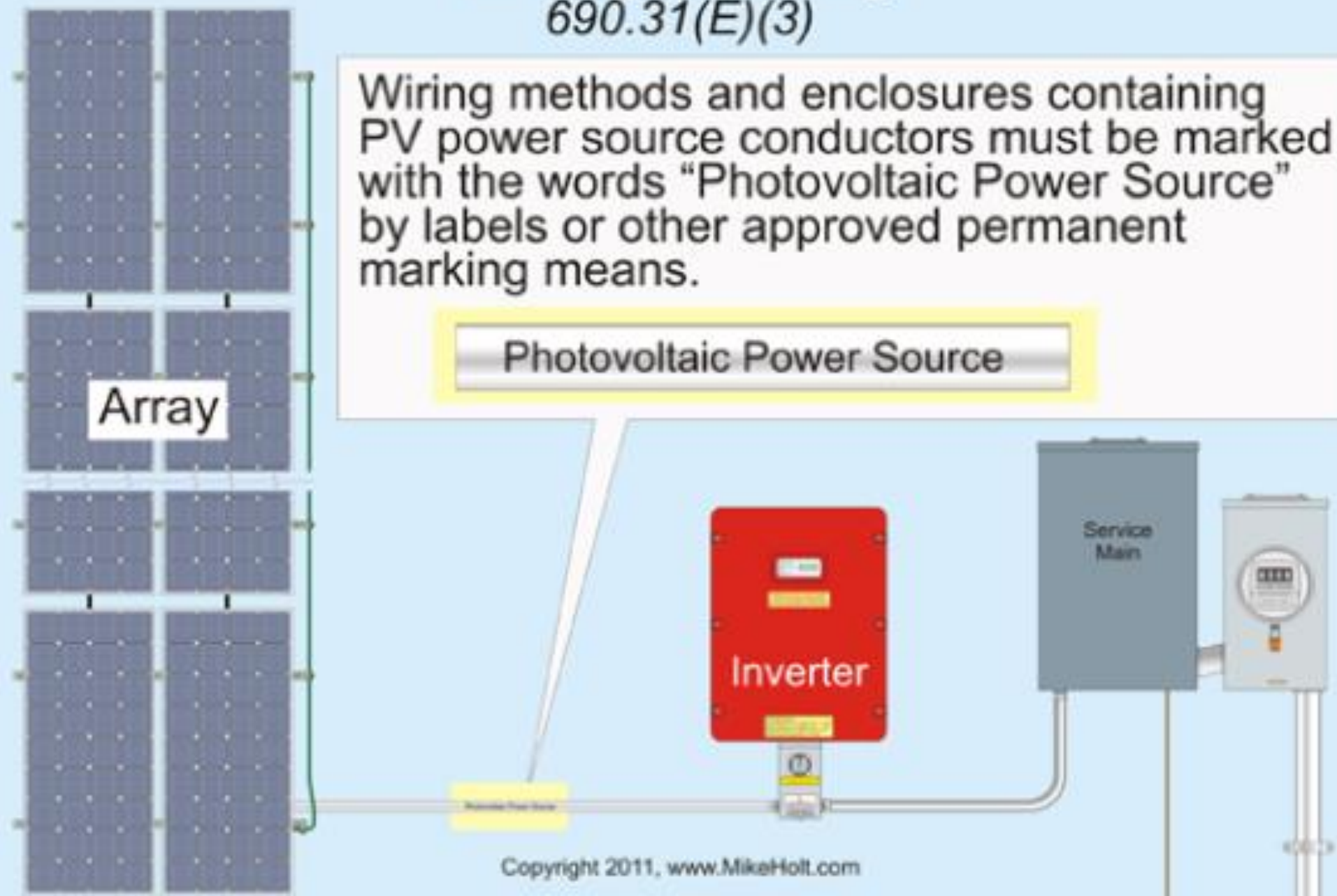
Wiring methods and enclosures containing PV power source conductors must be marked with the words "Photovoltaic Power Source" by labels or other approved permanent marking means.

Photovoltaic Power Source

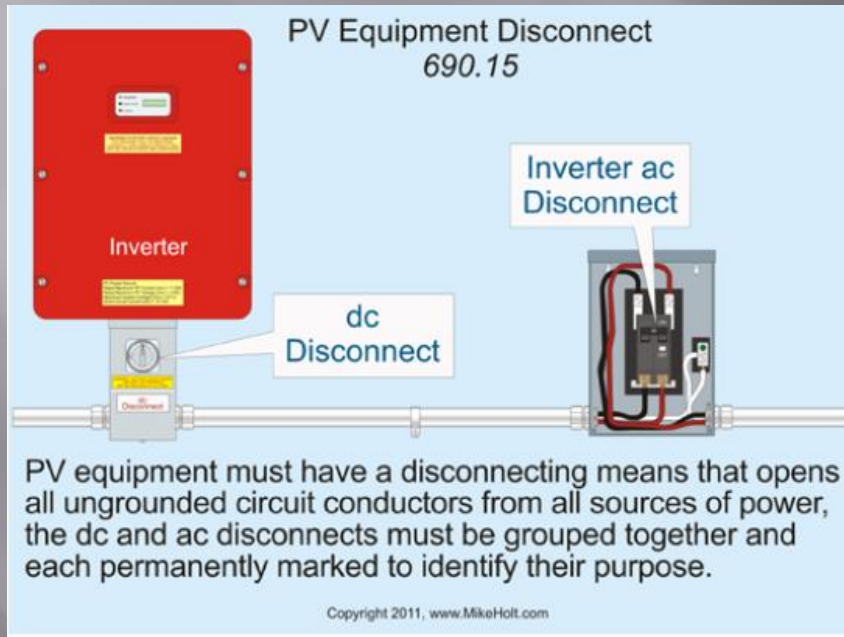
Array

Inverter

Service
Main



#5 PV Disconnecting Means



PV Equipment Disconnect 690.15

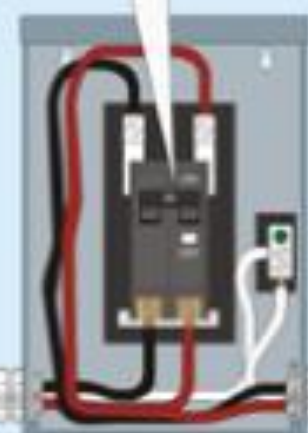


Inverter



dc
Disconnect

Inverter ac
Disconnect



PV equipment must have a disconnecting means that opens all ungrounded circuit conductors from all sources of power, the dc and ac disconnects must be grouped together and each permanently marked to identify their purpose.

#5 Disconnecting Means Location (DC Disconnect)

- ▣ NEC 690.14(C)(1)
- ▣ The photovoltaic disconnecting means (DC Disconnect) shall be installed at a readily accessible location either on the outside of a building or structure or inside nearest the point of entrance of the system conductors.
- ▣ Art. 100 Definition of Readily Accessible:
Capable of being reached quickly for operation, renewal, or inspections without requiring to climb over or remove obstacles or to resort to portable ladders, and so forth.



Violation? Yes. Disconnect is Located on Roof. Not readily accessible



Article 100 - Definitions

Accessible, Readily (Readily Accessible).

Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.



#5 Remote DC Disconnect Exception

- ▣ NEC 690.14(C)(1) Exception allows PV installations to have a (DC) disconnecting means located remote from the point of entry of the system conductors if the installation complies with NEC 690.31(E)
- ▣ Installing PV wiring per NEC 690.31(E) is useful for PV Arrays mounted on rooftops of dwellings , structures and where conductors must enter a building or structure in distance.
- ▣ NEC 690.31(E) Lists specific requirements for wiring methods remote from the point of entry.



#6 Wiring Methods

- ▣ Any conductors and wiring methods allowed by NEC Chapter 2 “Wiring and Protection” and Chapter 3 “Wiring Methods and Materials” may be used with PV systems, in addition to any wiring equipment specifically identified for use in PV systems in Article 690.
- ▣ Part IV of article 690 covers the applications and conditions of use for conductors used in PV systems, and special equipment and practices allowed.



#6 Wiring Methods

- ▣ NEC 690.31(E) DC Source and Output Circuits Inside a Building shall be contained in Metal Raceways, Type MC cable that complies with NEC 250.118(10), or metal enclosures from the point of penetration of the surface of the building or structure to the first readily accessible disconnecting means.
- ▣ No NM Romex or PVC Conduit allowed inside the building.
- ▣ NEC 690.31(E)(1) Beneath Roofs. Wiring methods shall not be installed within (10") of the roof decking except where directly below the roof surface covered by PV modules and associated equipment.



690.4(F) Circuit Routing *(Solar Photovoltaic Systems)*

- ▣ New requirements were added for visibility and roof marking requirements on certain PV circuits
- ▣ Firefighting community has expressed concern about the safety of ventilating roofs where PV circuits are present
- ▣ Routing PV circuits along the building structural members will lower probability that the structural members will be compromised by the firefighting process during a fire
- ▣ When PV module system circuits are integrated into the roof, PV associated circuits are to be clearly marked on the surface of the roof as a visual aid for firefighters and other maintenance personnel





#6 Wiring Methods

- ▣ NEC 690.31(E)(2) Flexible wiring methods. Where (FMC) smaller than $\frac{3}{4}$ " and Type MC cable smaller than 1" in diameter containing PV circuit conductors are installed across ceilings or floor joists, the cables shall be protected by guard strips that are at least as high as the cable. Where run exposed, other than within 6' of their connection to equipment, these wiring methods shall closely follow the building surface or protected from physical damage by an approved means.



#7 Ampacity and Overcurrent Protection

- ▣ Example 1: Ampacity and Overcurrent Protection For PV Source and Output Circuits
NEC 690.8(A)(1)&(2) & 690.8(B)(1)
* The PV Source Circuit consists of the circuit conductors between the PV modules and the terminals of the combiner or inverter dc input terminals if no combiner is used



Example #1 PV Source Circuits

PV Source Circuit - OCPD 690.9(B)



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$$\begin{aligned} \text{OCPD} &= (\text{Module } I_{sc} \times 1.25)^* \times 1.25 \\ \text{OCPD} &= (8.90A \times 1.25)^* \times 1.25 \\ \text{OCPD} &= 11.13A^* \times 1.25 \\ \text{OCPD} &= 13.91A \\ \text{OCPD} &= \mathbf{15A [240.6(A)]} \\ &^*[690.8(A)(1)] \end{aligned}$$

Fuse Holder



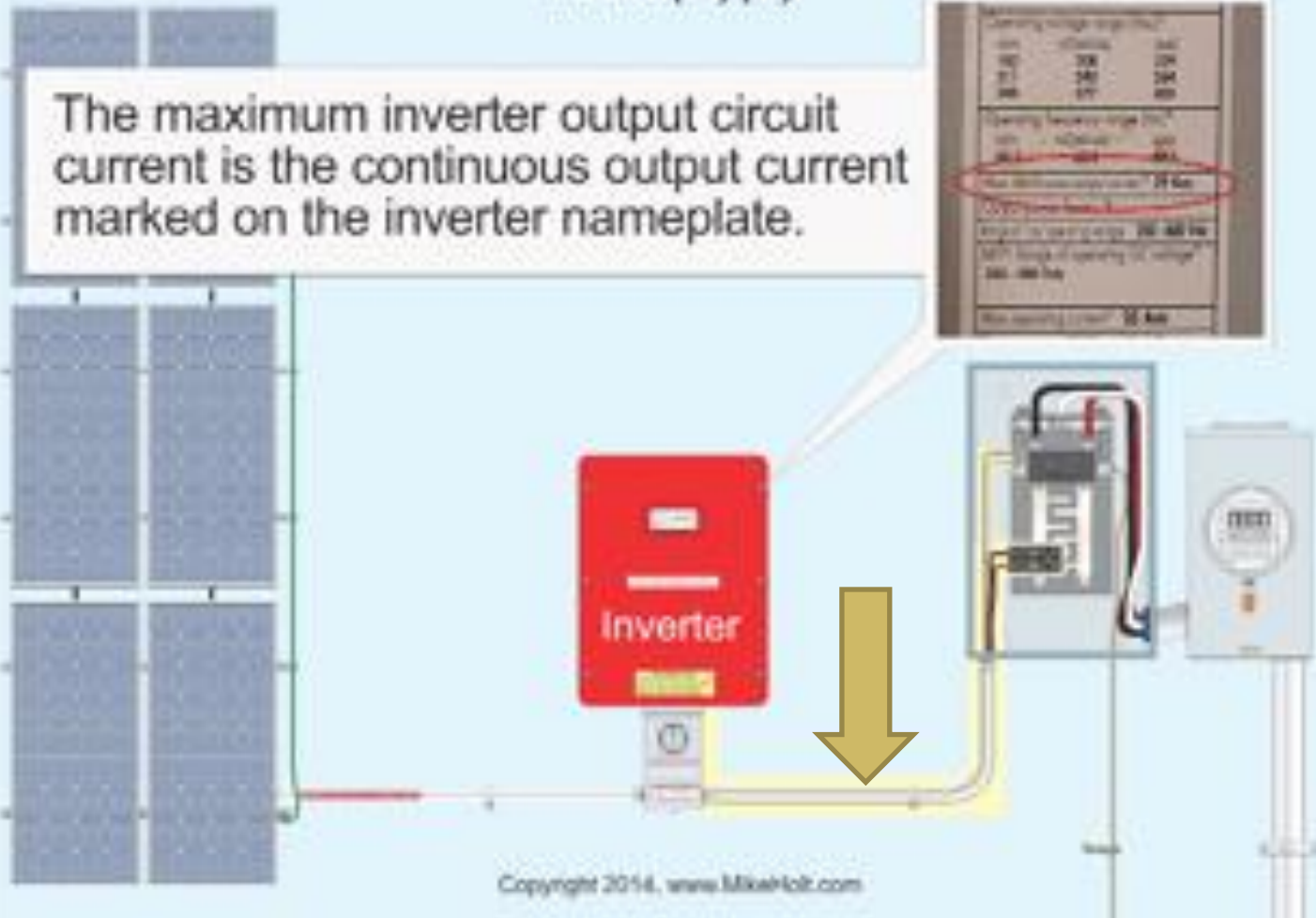
Example #2 Inverter Output Circuit

Maximum Inverter Output Current
690.8(A)(3)

The maximum inverter output circuit current is the continuous output current marked on the inverter nameplate.



Operating Voltage Range (V)		
min	nom	max
100	200	250
21	240	254
240	277	300
Operating Frequency Range (Hz)		
min	nom	max
50	60	60
50	60	60
50	60	60
Output Voltage Range (V)		
min	nom	max
200	240	254
200	240	254
200	240	254
Output Current (A)		
min	nom	max
0	29.6	30
0	29.6	30
0	29.6	30



Example #2 Inverter Output Circuit

- ▣ Example-Inverter Output Circuit: What size OCPD is required for an Inverter output Circuit having a maximum Inverter continuous ac output nameplate current rating of 22A?
- ▣ $OCPD = \text{Inverter ac Output Current Rating} \times 125\%$
- ▣ $OCPD = 22A \times 1.25$
- ▣ $OCPD = 27.5A$
- ▣ $OCPD = 30A$ Circuit Breaker NEC 240.6(A) & NEC 690.8(A)(3)

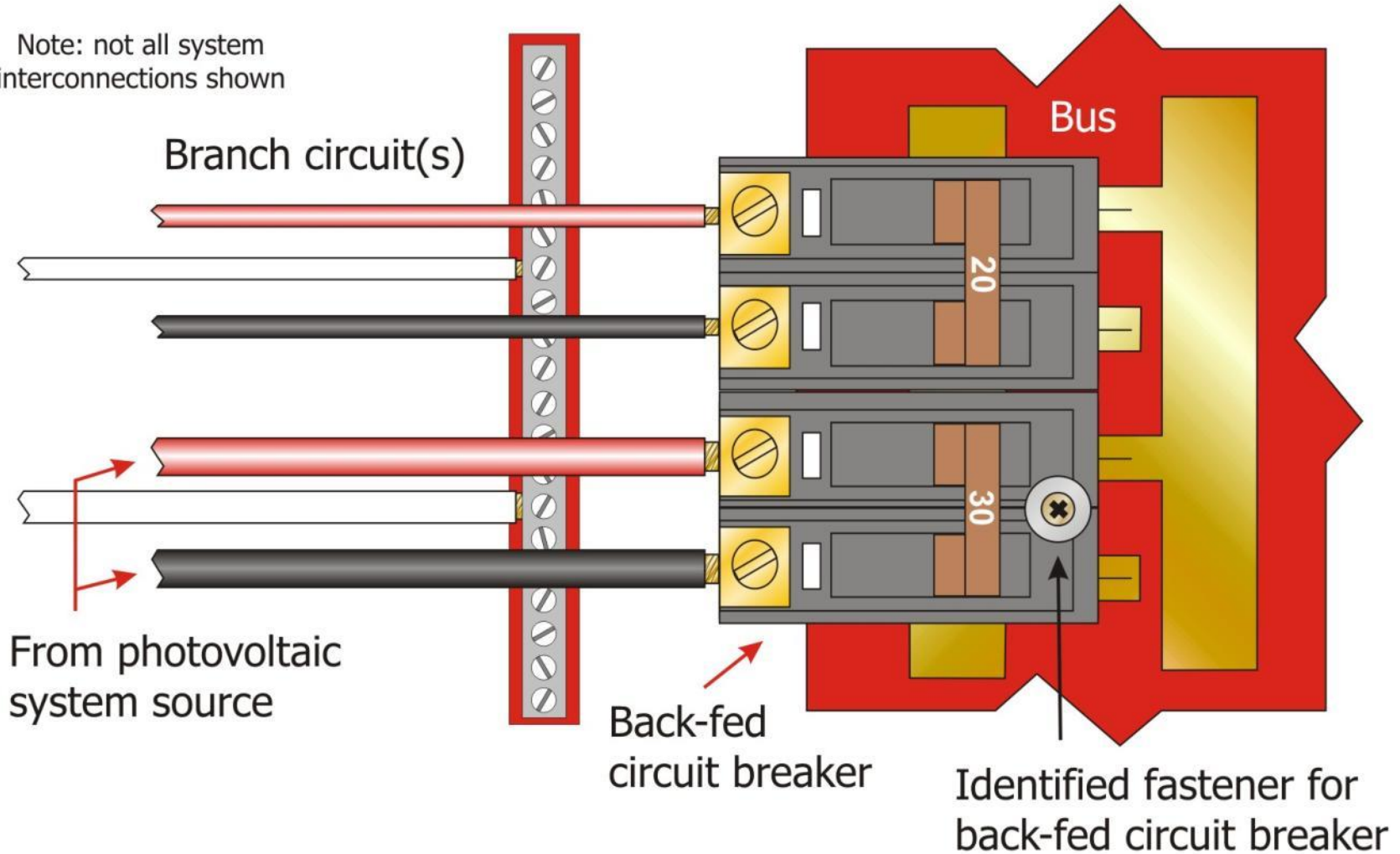


690.10(E) Back-Fed Circuit Breakers (PV Systems)



Plug-in-type overcurrent protection devices for stand-alone PV systems that are back-fed and used to terminate field-installed ungrounded supply conductors are **required to be secured in place by an "additional fastener" that requires other than a pull to release the device from the mounting means on the panel**

Note: not all system interconnections shown



#8 Conductor Sizing

- ▣ PV Circuit Conductors must be sized to carry not less than 125% of NEC 690.8(A) current before the application of any required ampacity correction requirements found in NEC Article 310.



#8 Conductor Sizing

- Example 1- PV Source Circuit (DC) Wiring:
What Size Conductor is required for a PV Array String having a short circuit current rating of 18Amps; assuming all terminals are rated 75 degree C?
- Conductor Ampacity= $(18 \times 1.25)^* \times 1.25$
- Conductor Ampacity= $(22.5A)^* \times 1.25$
- Conductor Ampacity= 28.125
- Conductor Ampacity= 10AWG rated 35A at 75 degree C. Table 310.15(B)(16)
- * 690.8(A)(1)



#8 Conductor Sizing

- ▣ Example 2- Inverter Output Circuit (AC Wiring): What size 75 degree C rated conductor is required for the Inverter Output Circuit if the Maximum continuous nameplate ac rating of the Inverter is 24A?
- ▣ Conductor Ampacity: Inverter Nameplate Rating \times 1.25
- ▣ Conductor Ampacity = $24A \times 1.25$
- ▣ Conductor Ampacity = 30Amps
- ▣ Conductor Ampacity = 10 AWG rated 35A at 75 degree C. NEC 310.15(B)(16) & NEC 690.8(A)(3)

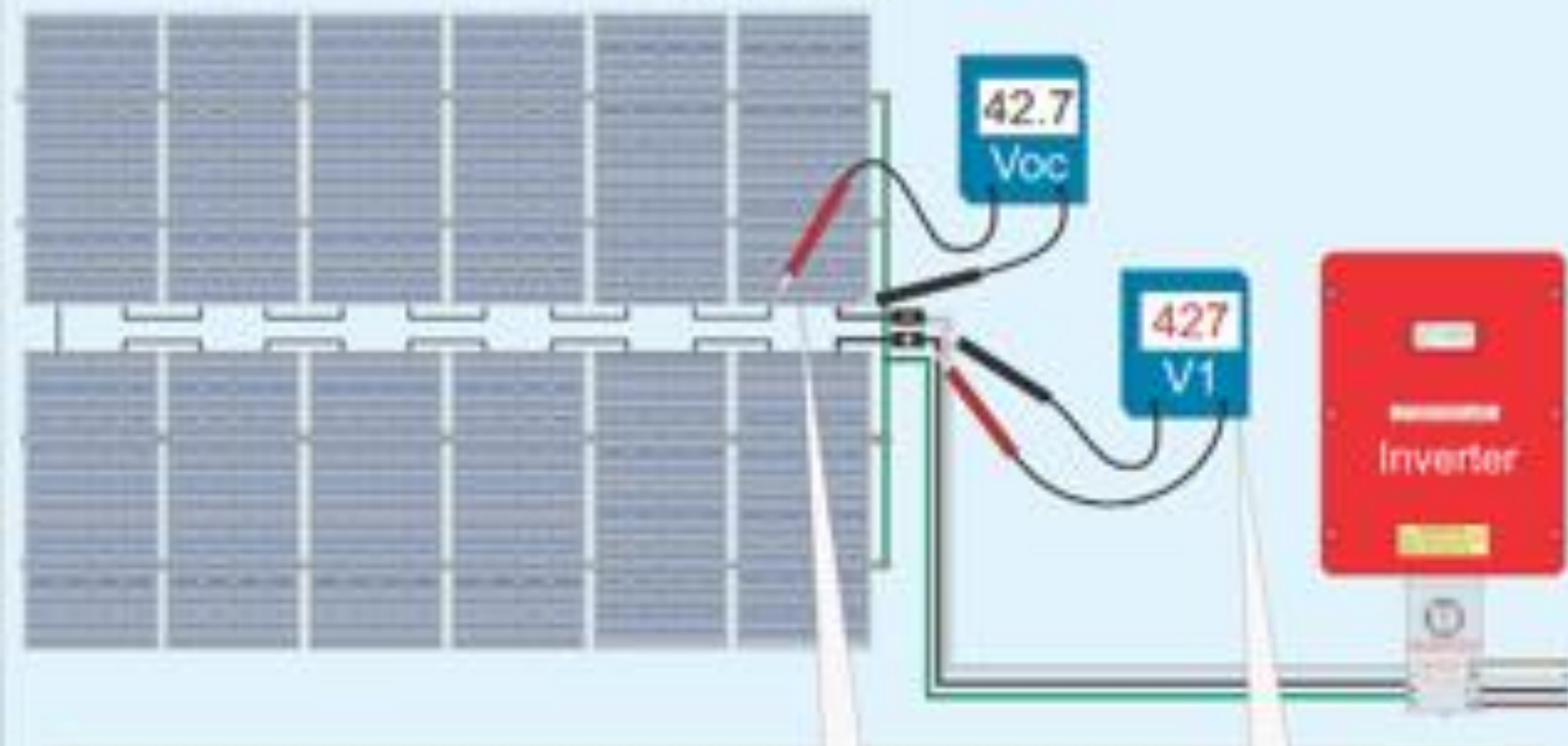


#9 System Voltages

- ▣ NEC 690.7.
- ▣ Maximum PV System Voltage is equal to the sum of the rated open-circuit voltage (VOC) of the series-connected PV modules as correct for the lowest expected ambient temperature.
- ▣ The Open-Circuit Temperature coefficients are generally supplied in the instructions for the PV modules and can be used to determine maximum system voltage.
- ▣ If the Open-Circuit Temperature coefficients are not supplied by the manufacture Table 690.7 Shall be used to determine PV System Voltage
- ▣ For one-and-two family dwellings, the maximum PV system voltage is limited to 600V. NEC 690.7(C)



Maximum System Voltage 690.7(A)



Maximum system voltage is equal to the sum of the rated Voc of the series-connected PV modules, corrected for the lowest-expected ambient temperature.

#10 Grounding and Bonding PV systems

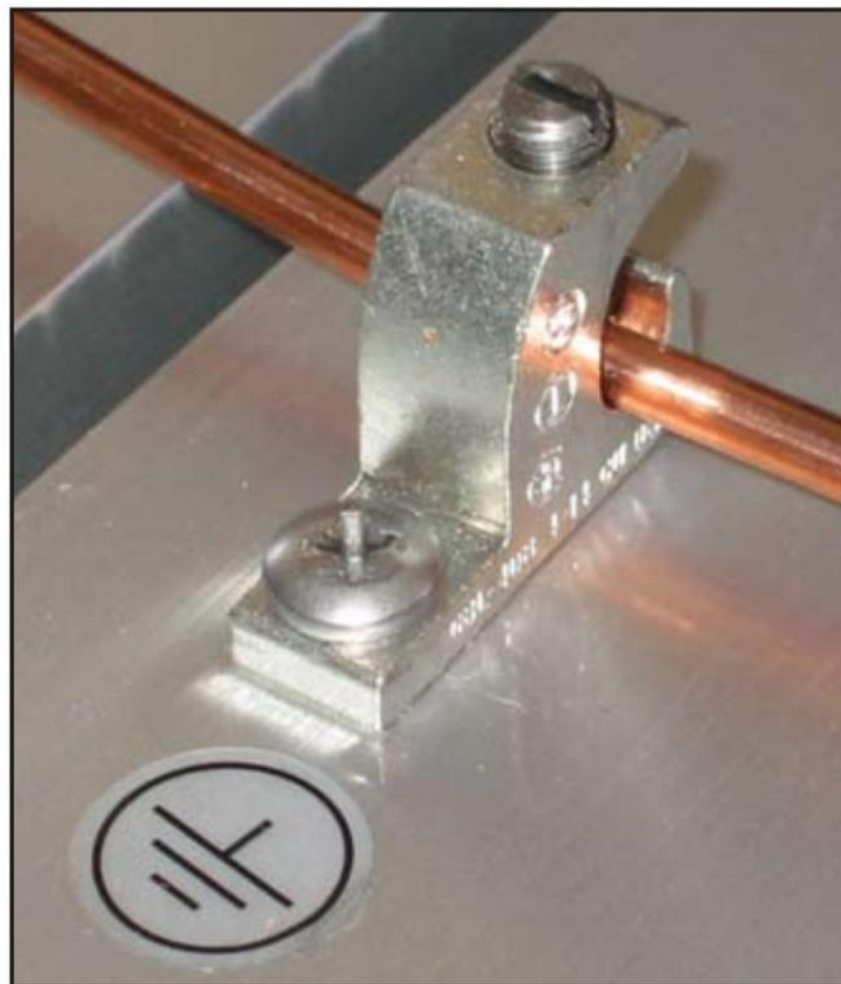
- ▣ The equipment grounding requirements for PV systems have been rearranged and revised for clarity and usability in the 2011 NEC
- ▣ Bonding and grounding is required for all exposed non-current-carrying metal parts of module frames, electrical equipment, and conductor enclosures of a solar photovoltaic (PV) system (*typically achieved through the EGC system*)
- ▣ Typically, module frame of a PV system is an aluminum frame, making a durable connection with an EGC or bonding jumper difficult
- ▣ Revisions will allow grounding devices that have been developed too quickly and effectively ground the frames of PV modules

690.43 Equipment Grounding (PV Systems)



Equipment grounding conductors and devices shall comply with (A) through (F)

- (A) Equipment Grounding Required
- (B) Equipment Grounding Conductor Required
- (C) Structure as Equipment Grounding Conductor
- (D) PV Mounting Systems and Devices
- (E) Adjacent Modules
- (F) All Conductors Together



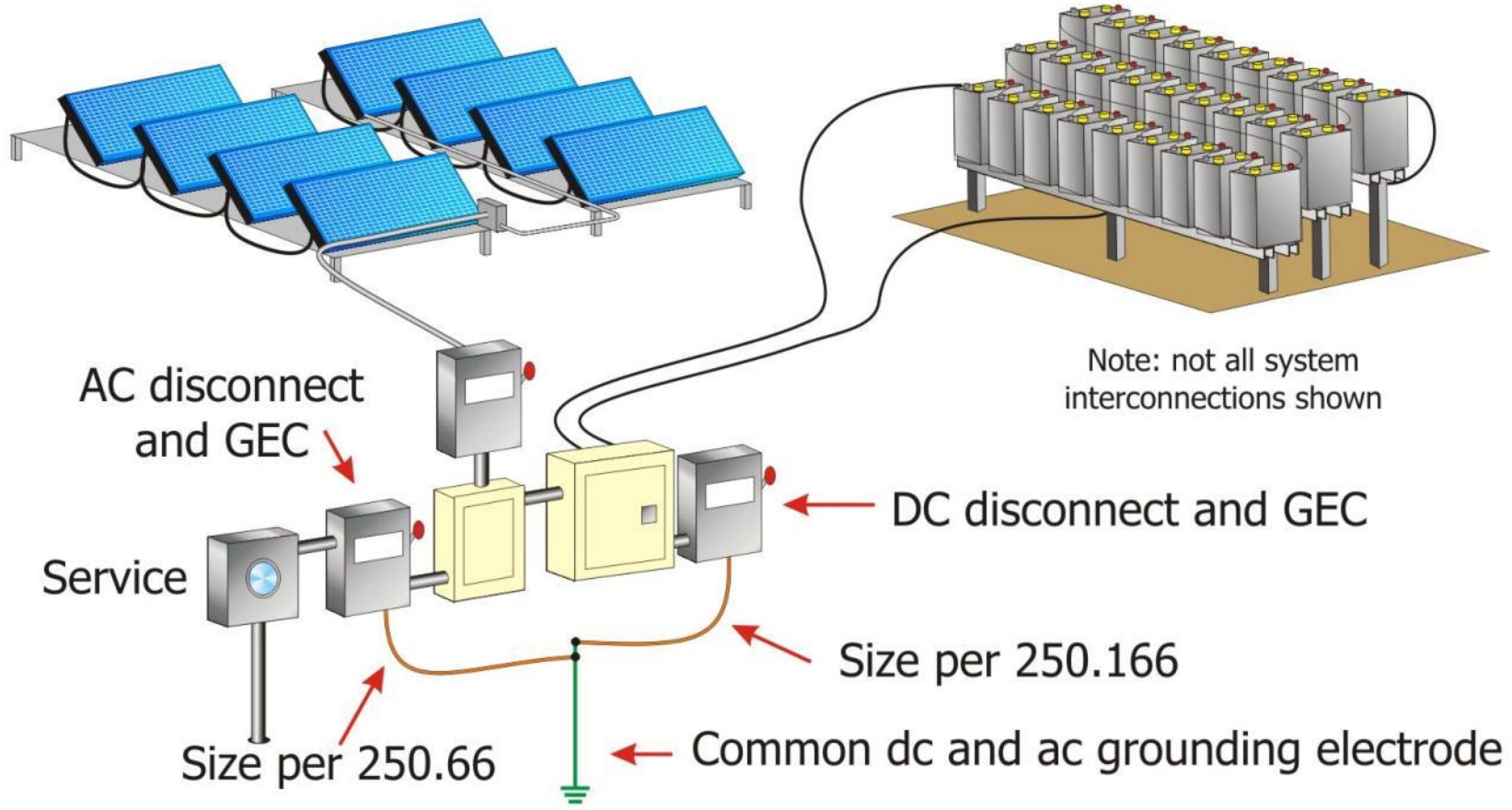
The equipment grounding requirements for PV systems have also been rearranged and revised for clarity and usability

#10 Grounding/Bonding Of PV Systems

Grounding Electrode System

- ▣ NEC 690.47(A) If installing a ac PV System, a grounding electrode shall be provided in accordance with 250.50 through 250.60. The grounding electrode shall be installed in accordance with 250.64
- ▣ If installing a dc system, a grounding electrode shall be provided in accordance with 250.166 for grounded PV systems. The grounding electrode shall be installed in accordance with 250.64.

690.47(C) Systems with Alternating Current and Direct-Current Grounding Requirements

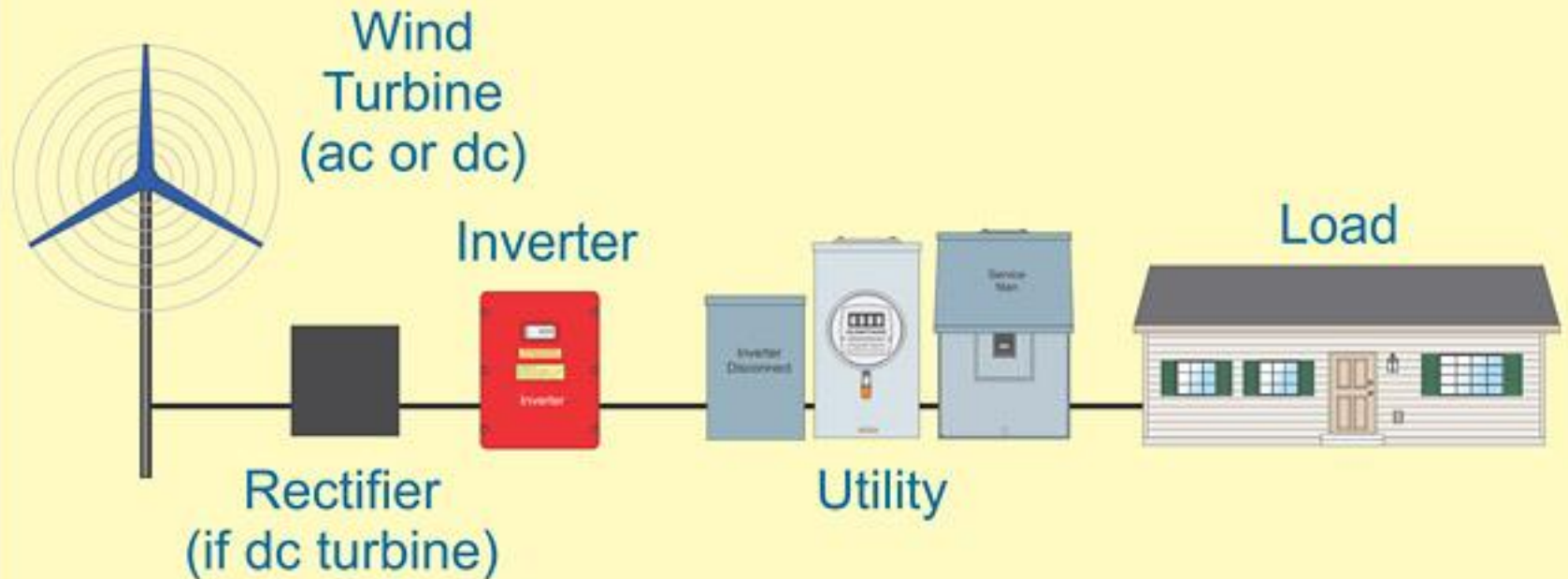


Grounding electrode system requirements for PV systems with both ac and dc grounding electrode systems have been revised

If both ac and dc systems are installed, they must be bonded together or utilize of a common electrode system



Small Wind Electric System 694.1



Example of Small Wind System - Interactive System

Article 694 applies to small wind (turbine) electric systems that consist of one or more wind generators having a rated power up to and including 100 kW

Article 694 Small Wind Electric Systems



Part I - General

Part II - Circuit Requirements

Part III - Disconnecting Means

Part IV - Wiring Methods

Part V - Grounding

Part VI - Marking

Part VII - Connection to Other Sources

Part VIII - Storage Batteries

Part IX - Systems Over 600 Volts

A new article was added covering requirement for small wind electric systems



Why a new Article?

Turbine Fires,
Uniform
Installations &
Enforcement



- ▣ The format for Article 694 is modeled after the PV code's Article 690. Section I (694.1 through 694.7) establishes the scope of the article and provides definitions for terms specific to small wind systems. It also states that 694 requirements apply anytime they differ from the rest of the code – except for 705, when a small wind system is operated in parallel with primary sources of electricity; and 500 through 516, when a system is installed in a hazardous location.



- ▣ Section I specifies that small wind systems shall be installed by qualified persons.
- ▣ Section I also requires surge protection between the wind turbine system and the loads served, and allows standard plug-in receptacles on the wind turbine branch or feeder circuit for maintenance or data acquisition. (This is not allowed for in PV systems under Article 690.)



Art. 694.7(D)

Surge Protection Devices (SPD)



Surge Protection Devices (SPD)

- SPD's must be installed between the wind system and the premises electrical system.
- Permitted to be Type 2 or 3



Art. 694.7(E) Receptacles



A receptacle shall be permitted to be supplied by a wind system branch circuit for maintenance or data acquisition use.

- All 125-volt, singlephase, 15 & 20 amp receptacles installed for maintenance of the wind turbine shall have GFCI protection.

▣ Section II (694.10 to 694.18) covers circuit requirements. It defines how to calculate voltage and current for small wind systems and how to derate conductors.



Art. 694.10 Maximum Voltage



(A) Wind Turbine Output Circuits

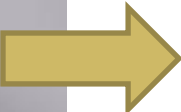
- Wind turbines connected to one and two-family dwellings are limited to a maximum of 600 volts.

Art. 694.12(A)(1)

Circuit Sizing – Turbine Output

BERGEY EXCEL 5 SPECIFICATIONS

PERFORMANCE



START-UP WIND SPEED.....	5 mph (2.2 m/s)
CUT-IN WIND SPEED.....	4.5 mph (2 m/s)
RATED WIND SPEED.....	25 mph (11 m/s)
AWEA RATED POWER (at 11 m/s or 25 mph)	5.2 kW
AWEA ANNUAL ENERGY (at 5 m/s average)	9,700 kWh
CUT-OUT WIND SPEED.....	none
FURLING WIND SPEED.....	31-45 mph (14-20 m/s)
MAXIMUM DESIGN WIND SPEED.....	134 mph (60m/s)
PEAK POWER.....	6.2 kW
ROTOR SPEED.....	0-400 RPM

MECHANICAL

TYPE.....	3-Blade Upwind, Horizontal-Axis
ROTOR DIAMETER.....	20 ft (6.2m)
WEIGHT.....	772 lbs (350 kgs)
GEARBOX	none
BLADE PITCH CONTROL.....	none
OVERSPEED PROTECTION.....	AUTOFURL®
TEMPERATURE RANGE.....	-40 to 140 deg. F (-40 to 60deg. C)

ELECTRICAL

OUTPUT FORM.....	240VAC, 1-Phase, 60Hz or 220VAC, 1-Phase, 50Hz
GENERATOR	Permanent Magnet Alternator
POWER PROCESSOR	Powersync II Inverter

Turbine Output Circuit Currents shall be based on the circuit current of the wind turbine operating at maximum output power.

- $6200 \text{ W} / 240 \text{ V} = 25.8 \text{ A}$

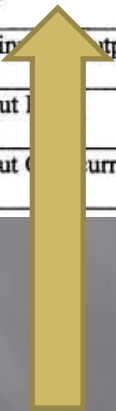
Art. 694.12(B)(1) Continuous Current



Small wind turbine electric system currents shall be considered to be continuous.

Art. 694.12(B)(2) Continuous Current

Current (AC)	V Configuration Respectively)	/ 208 V Configuration Respectively)
Operating Voltage Range (AC)	244-304 Vac for 277 Vac configuration 211-264 Vac for 240 Vac configuration 183-228 Vac for 208 Vac configuration	244-304 Vac for 277 Vac configuration 211-264 Vac for 240 Vac configuration 183-228 Vac for 208 Vac configuration
Operating Frequency Range (HZ)	59.3-60.5 Hz	59.3-60.5 Hz
Nominal Output Voltage (AC)	277 Vac / 240 Vac / 208 Vac	277 Vac / 240 Vac / 208 Vac
Normal Output Frequency	60 Hz	60 Hz
Continuous Output Current (AC)	24 A / 28 A / 30 A	24 A / 28 A / 30 A
Maximum Continuous Output Power (AC)	@ 50°C ambient: 6000 W	@ 50°C ambient: 6000 W
Maximum Output Current	32 A	32 A
Maximum Output Current Protection	30 A / 35 A / 40 A	30 A / 35 A / 40 A



Conductors and OCPD shall be sized to carry not less than 125% of the maximum current (continuous)

Art. 694.12(B)

Continuous Current Example

- ▣ Conductors and OCPD shall be sized to carry not less than 125% of the maximum current (continuous)
- ▣ $28 \text{ amps} \times 125\% = 35 \text{ amps @ } 240 \text{ volts}$
- ▣ Table 310.15(B)(16) $75^\circ \text{ C} = \#10 \text{ Cu}$
- ▣ 240.6-35 amp OCPD Required
- ▣ Check manufacturer's installation requirements
- ▣ 240.4(B) & (C) permitted for round-up rule
- ▣ If OCPD rated for continuous operation at 100% is permitted at 100%
- ▣ – 30 amp OCPD, #10 Cu Permitted Per 694.12(B)(2)(ex)

Art. 694.15(A)

Overcurrent Protection

Turbine output circuits, inverter output circuits, and storage battery circuit conductors and equipment shall be protected in accordance with Article 240.

▣ Section III (694.20 to 694.28) relates to disconnecting issues.



Means shall be provided to disconnect all current-carrying conductors of a wind source from all other conductors in a building.

Art. 694.22(A)

Disconnecting Means -Additional

- ▣ Not required to be SUSE rated
- ▣ • Located where readily accessible
- ▣ • Externally operable
- ▣ • Plainly indicate open or closed
- ▣ • Interrupting rating sufficient for voltage and current
- ▣ • Where capable of being energized in the open position, must have warning signs



Art. 694.22(C)(1)

Location for Disconnecting Means

- ▣ Readily accessible location
- ▣ – On or adjacent to the turbine tower
- ▣ – On the outside of a building or structure
- ▣ – Or inside, at the point of entrance of the wind conductors
- ▣ Not required at the nacelle or tower
- ▣ Not permitted in bathrooms

- ▣ Section IV (694.30) covers wiring methods. It requires that flexible cords comply with Article 400 and be identified as hard service cord, listed for outdoor use and water-resistant.
- ▣ DC output circuits in a building must be in metal raceways, from the point of penetration at the building's surface to the first readily accessible disconnecting means.



Art. 694.30 Wiring Methods



(A) Where accessible, over 30 volts, shall be in raceways (C) DC output inside building must be in metal raceway

Art. 694.30(B)

Flexible Cords and Cables

Flexible cords, Art. 400, listed for location

- Hard Service cord or portable power cable
- Extra-hard usage
- Listed for outdoor use
- Water resistant
- Sunlight resistant where exposed
- See 110.14 for flexible fine-stranded cable terminations



- ▣ Section V (694.40) addresses grounding.

Grounding Electrodes and Grounding Electrode Conductors

- A wind turbine tower shall be connected to a grounding electrode system.
- Where installed in close proximity to galvanized foundation or tower anchor components, galvanized grounding electrodes shall be used. (See Info Note NEC 694.40(C)(1))



Foundation Rebar – Ufer ground Permitted to be used NEC 690.40(C)(1)





NEC 690.40(A) Equipment Grounding

- ▣ All Exposed non current carrying metal parts of the tower, turbine nacelles, other equipment and conductor enclosures shall be connected to an equipment grounding conductor in accordance with NEC 250.134 or 136(A)
- ▣ Note: Metallic turbine blades and tails that have no source of electrical energization shall not be required to be connected to equipment grounding conductors

NEC 694.40(B) Guy Wires

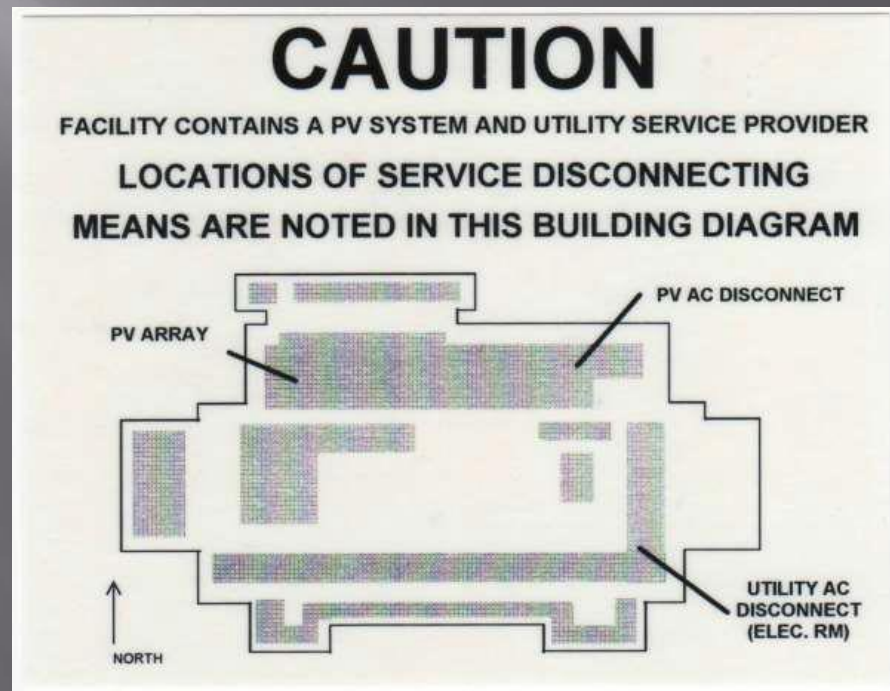
Not required to be attached to equipment grounding conductor.



Section VI (694.50 through 694.56) prescribes signage that is required for various system configurations. It covers grid-interactive systems and stand-alone systems.

All points of interconnection shall be marked at an accessible location with the rated ac output current and the nominal operating ac voltage.

WIND ELECTRIC



- ▣ Section VII (694.60 to 694.68) pertains to connecting the system to other sources of electricity. This section requires that inverters used in grid-tied systems be listed and identified as utility-interactive, and that these systems comply with article 705



Art. 705 Interconnected Electric Power Production Sources

Covers installation of one or more electric power production sources operating in parallel with a primary source of electricity



- ▣ Section VIII (694.70 to 694.75) covers storage batteries, referencing Article 480 for general battery requirements.



- ▣ Section IX (694.80 and 694.85) is for systems greater than 600 volts. While there are few, if any, systems in excess of 600 V and no battery systems over 600 V, serious efforts are made to not have the code limit future developments.



New Technology



New Technology

Offshore
Available up to 7.0 MW
capacity

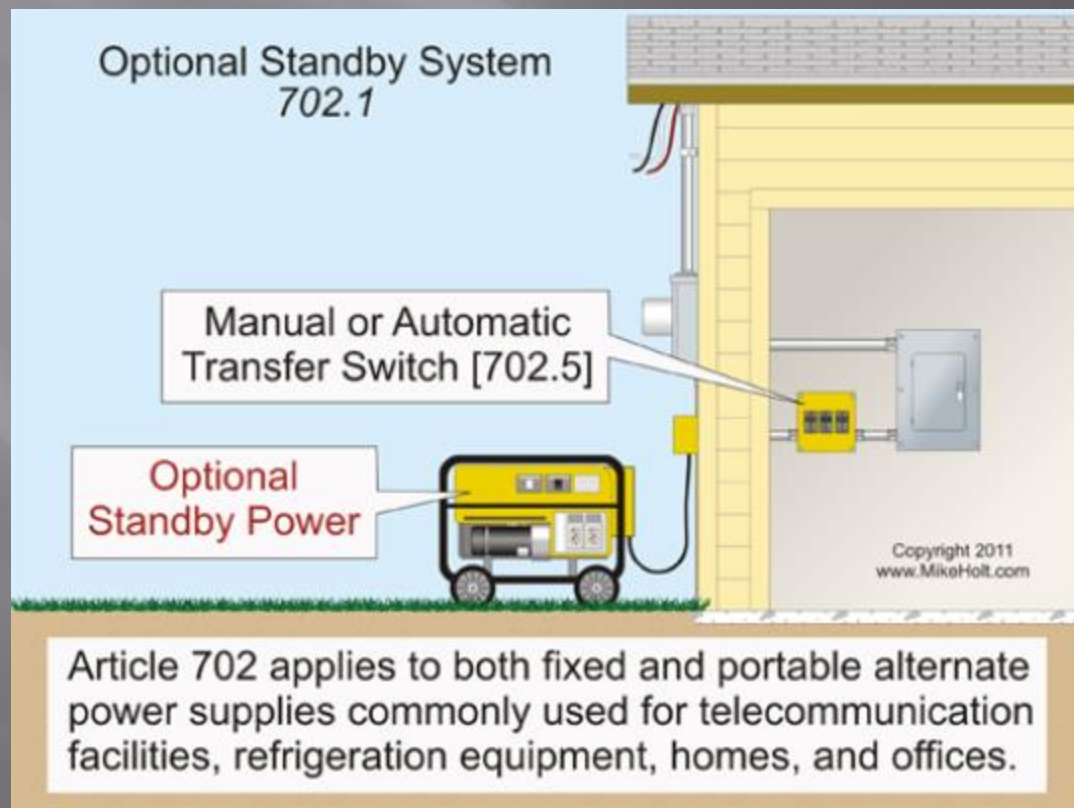


Things You Have to Know Inspecting and Installing Generators



#1 What codes apply? Generators at Dwellings

Must Be Installed In Accordance With NEC 702, & 445 and Chapters 1-4 of the NEC



#2 Verify & Calculate Loads

Standby System Capacity - Automatic Transfer Equipment 702.4(B)(2)(a)



The optional standby power source must have adequate capacity to supply the full load transferred.

Standby System Capacity
702.4(B)

Optional
Standby Power

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For existing facilities, the optional standby source can be sized to the maximum demand data available for 1 year, or the average power demand of a 15-minute period over a minimum of 30 days [220.87].

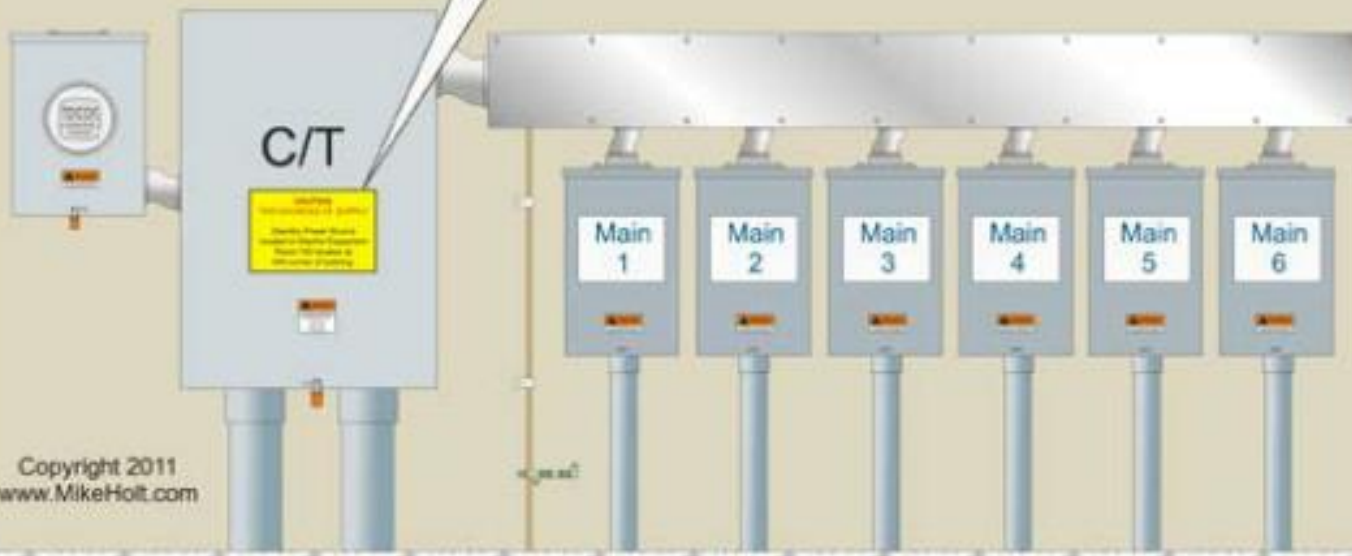
#3 Labeling Requirements

Signs for Optional Standby Sources 702.7(A)

CAUTION
TWO SOURCES OF SUPPLY

Standby Power Source
Located in Electric Equipment
Room 100 Located at
NW Corner of Building.

A sign must be placed at the service-entrance equipment indicating the type and location of on-site optional standby power sources.



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#3 Labeling Requirements

- ▣ NEC 312.8(3)
- ▣ If branch circuits feed through an enclosure to the generator branch circuit enclosure a warning label must be applied to the enclosure that identifies the closest disconnecting means for any feed through conductors



#4 Disconnecting Means

Outdoor Generator Sets - Generator Disconnect 702.12

Generator Feeder Disconnect
Not Required on Building

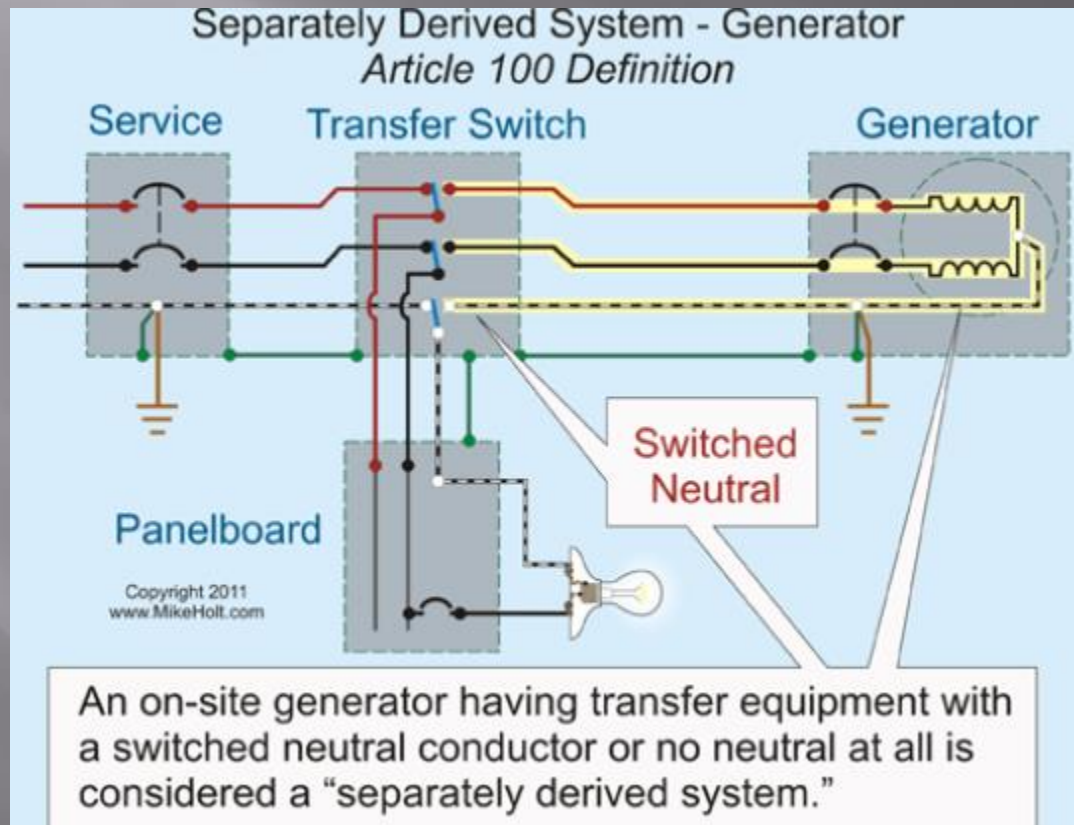
Outdoor Generator
Disconnect

Maximum
50 ft

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A disconnect isn't required on or at the building or structure if the generator disconnect is readily accessible and within sight of the building.

#5 Is the Generator a Separately Derived System?



#5 Is the Generator a Separately Derived System?

