

# Solar PV Safety for the Fire Service

Presented by

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and

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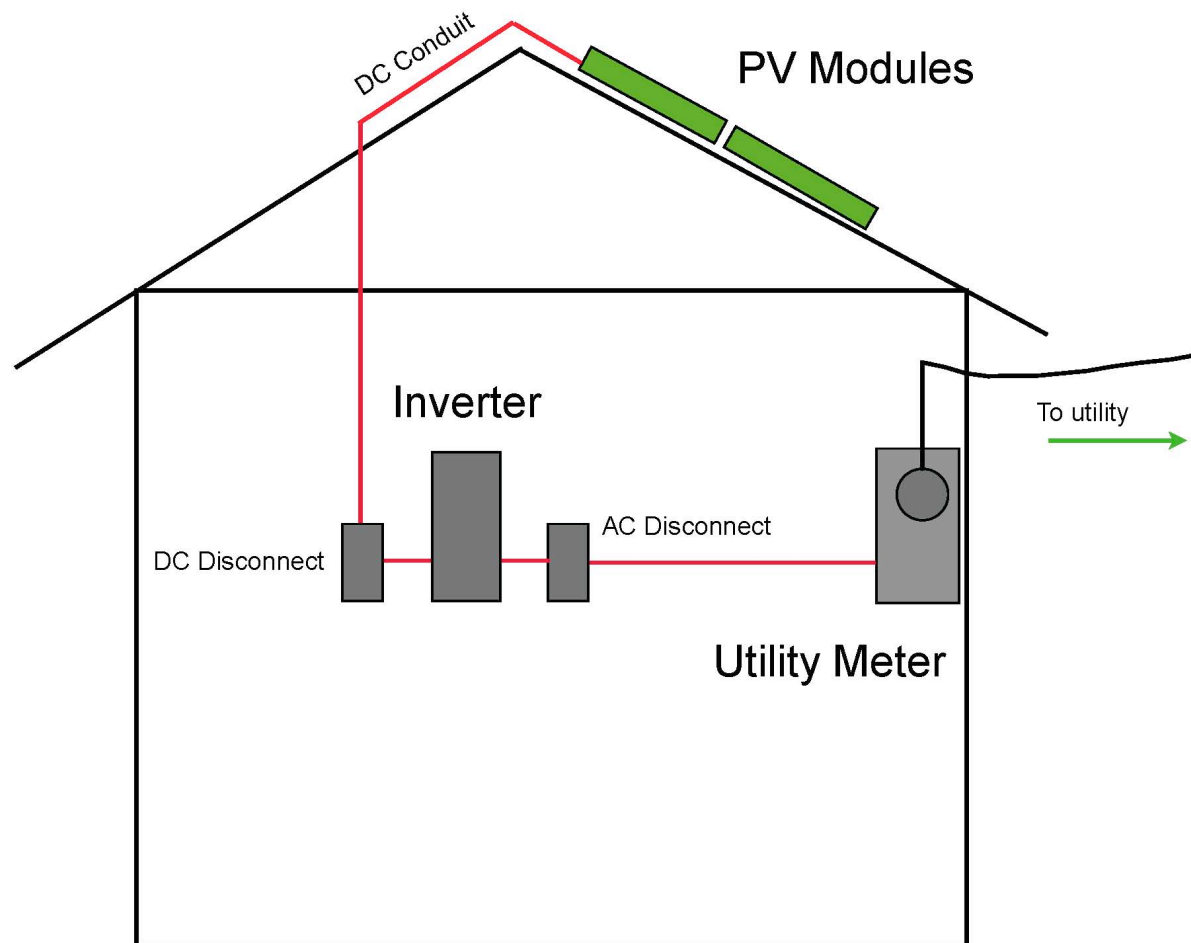


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# Overview of Presentation

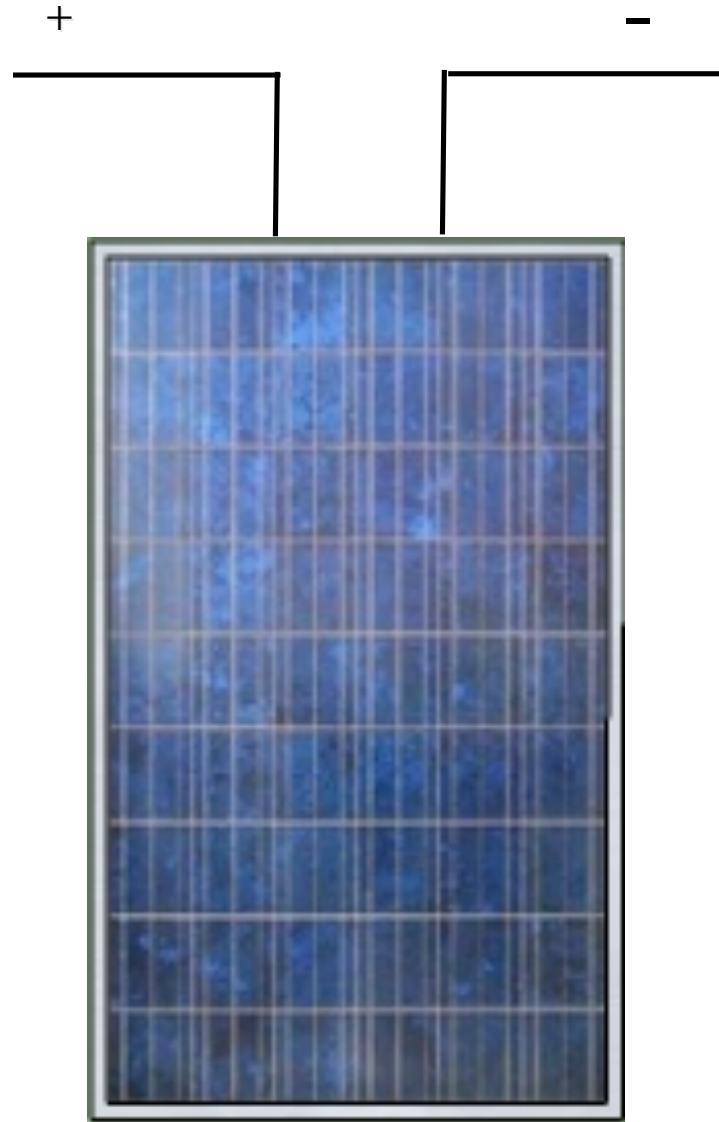
- Terminology of PV Systems.
- Brief history of the Fire Service experience with PV system installations
- Review of California Solar Photovoltaic Installation Guideline
- What Firefighters Need to Know About Working Around PV Systems
- Training Availability

# Simple Grid-Tied PV System



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# Module



40 VDC  
8 Amps



# Inverters - Residential



Photo courtesy of Independent Energy Systems



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# History of Fire Service Experience

- 10 years ago, fire officials in Northern California suggested a variety of very stringent regulations for PV systems. Largely ignored and the issues went away (for a period of time)
- CalSEIA (California Solar Industries Association) and SMUD (Sacramento Municipal Utilities District) developed training materials for fire fighters in 2006, which raised awareness among fire districts.
- LA Fire Department began strictly enforcing a document that was developed in 1999. They also added new requirements to the document.



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# The LA PV Installation Guidelines

- The LA Guidelines began to be more strictly enforced in the spring of 2007 after the fire department updated the document.
- Previous guidelines were only used for commercial PV systems—now being applied to residential.
- Main concerns related to language referring to:
  - 1) 4' perimeter around arrays
  - 2) 50'x50' maximum array sizes
  - 3) Reference to quick-release mounting hardware

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# How the State Guideline Process Started

- Many installation permits began being held up due to concerns over compliance with LA guidelines.
- Solar industry began voicing concerns to CalSEIA and the state fire marshal about delays.
- State Fire Marshal convened first meeting on August 17, 2007—approximately 20 participants—roughly half fire officials and half solar representatives.



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# Primary Concerns of Stakeholders in the Process

- Fire Fighters
  - Clear walkways on rooftops
  - Access and area on rooftops for purpose of venting.
  - Methods to protect firefighters from energized conductors
  - Warning signs to notify of dangers.
- Solar Industry
  - Clearly defined process for permitting
  - Building department review of basic compliance
  - Minimize impact of requirements on installation

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# Education Process for Both Sides

- Fire Fighters
  - Residential, small commercial, and large commercial all have differing issues and differing needs for access.
  - Very difficult to prevent shock if fire fighters directly contact PV circuits during daylight hours.
  - Disconnects do not necessarily deenergize PV conductors—used primarily for maintenance.
- Solar Industry
  - Why fire departments ventilate buildings
  - Importance of roof access
  - Hazards of fire fighting

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# Summary of Fire Marshal Guidelines (3/10/08 DRAFT)

- Marking
- Access on Rooftops
- Location of DC Conductors

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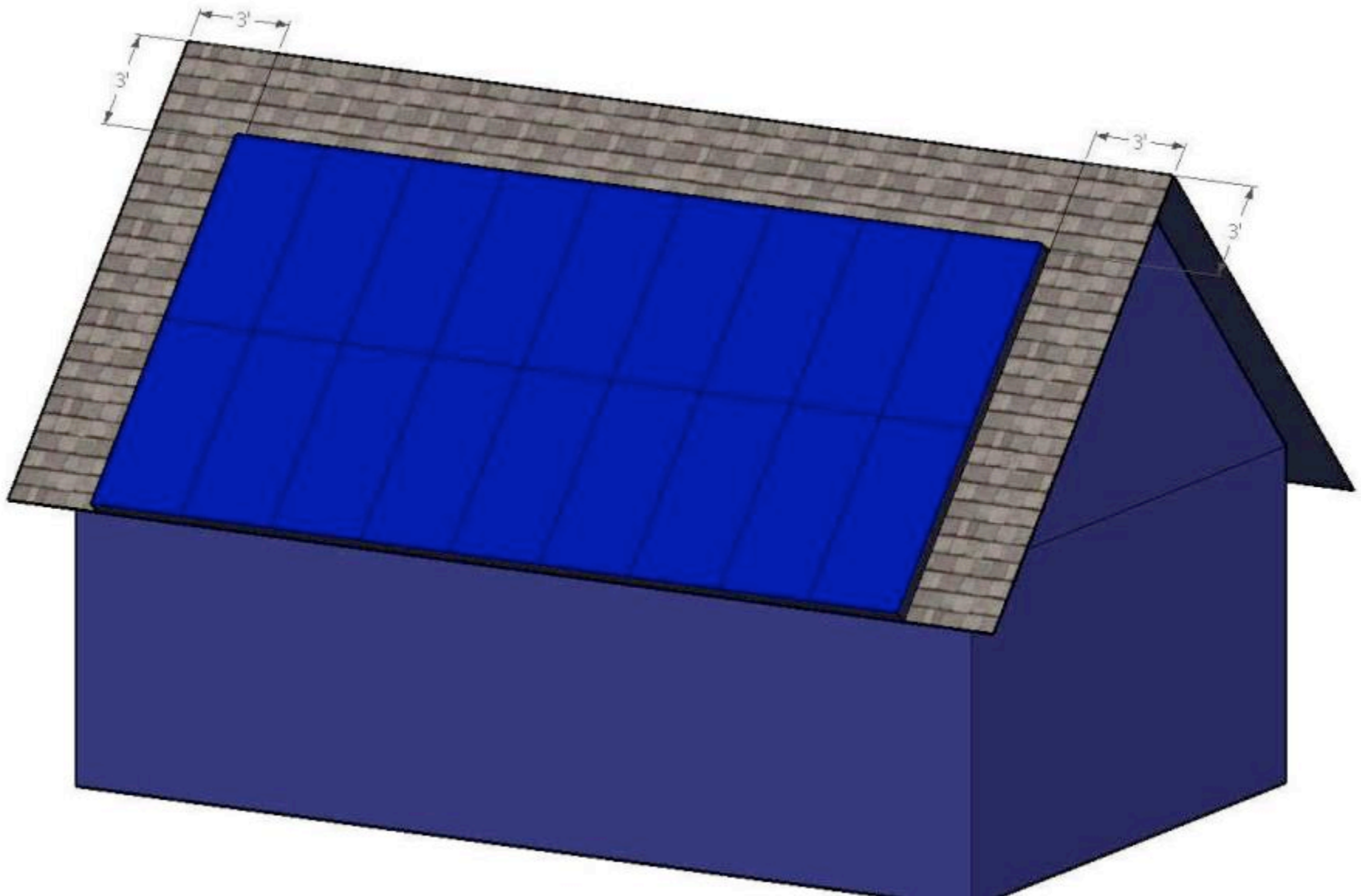
## Summary of Fire Marshal Guidelines—Residential

- 3' space along edge of load bearing exterior wall, 3' from ridge and 1.5' on either side of a hip or valley.
- Single ridge need two 3' pathways on array faces.
- No rooftop disconnect requirement.
- Each roof face treated independently.
- PV array and wiring is off limits to fire fighters.



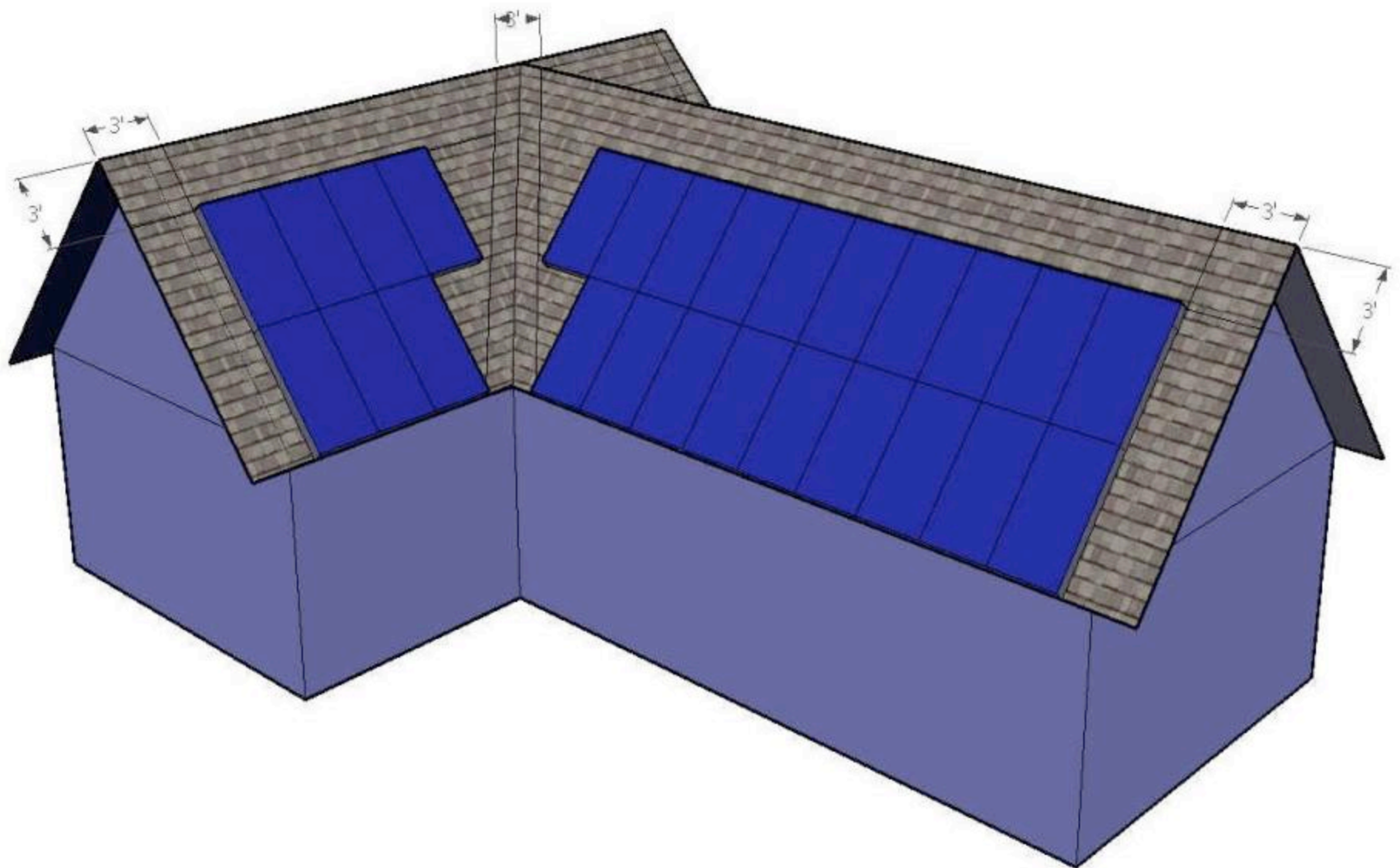
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# Full Gable



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# Cross Gable with Valley



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## Summary of Fire Marshal Guidelines—Commercial

- Commercial flat roof with no roof dimension more than 250 feet—4' space around perimeter wall.
- Commercial flat roof with a roof dimension more than 250 feet—6' space around perimeter wall.
- No rooftop disconnect requirement for fire fighters.

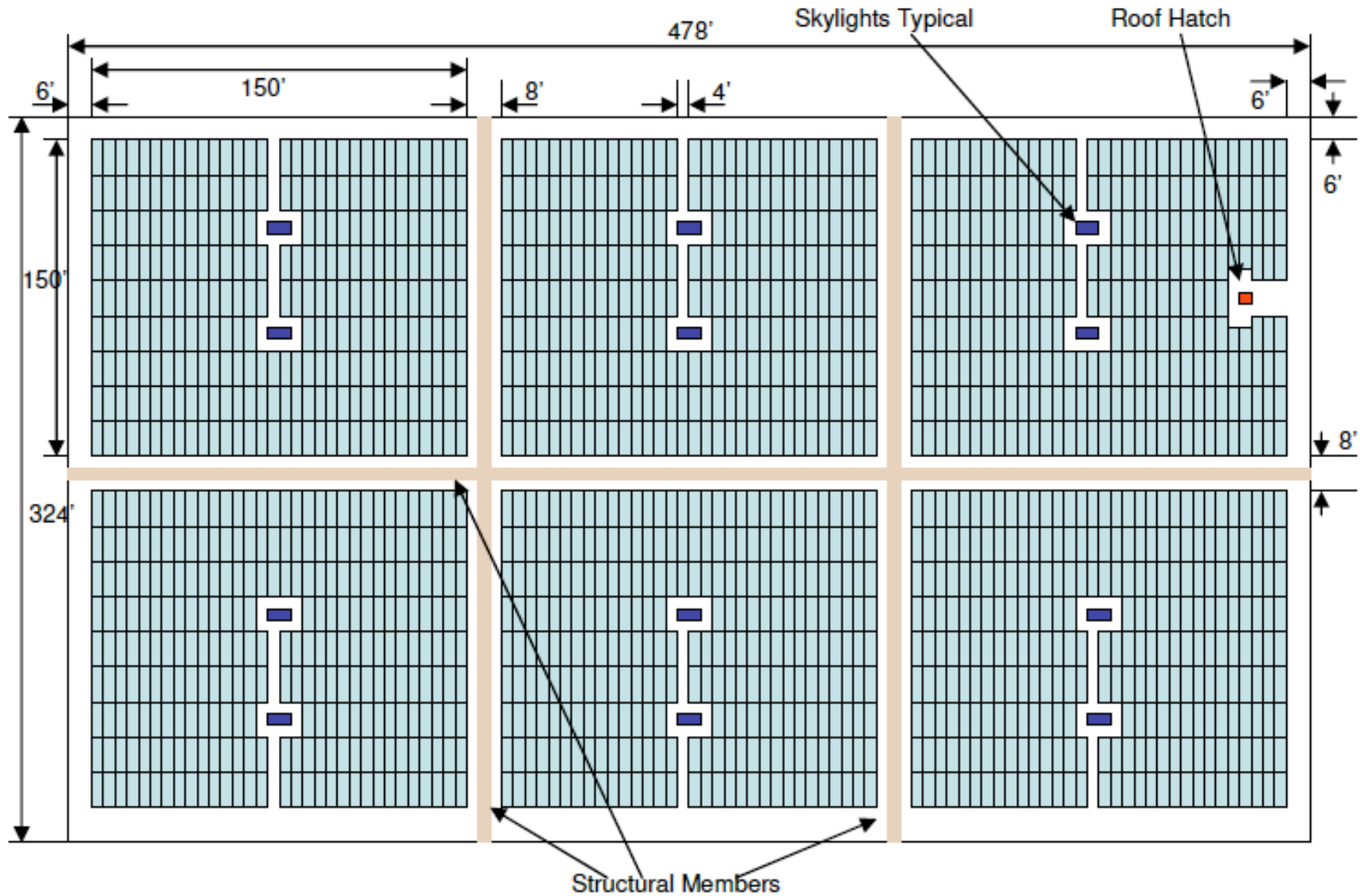
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## Summary of Fire Marshal Guidelines—Commercial (cont.)

- Minimum 4' pathway on center access of building in both directions. A 4' access to skylights, roof hatches, and fire standpipes shall be provided to the perimeter wall.
- Commercial rooftop arrays shall be no greater than 150 by 150 feet in distance in either axis.
- Array off limits to fire fighters.



# Commercial > 250'



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# Current Code Activities

- California's guidelines are reasonable for suburban departments that routinely fight fires from rooftops regardless of regional location.
- Both the IFC and UFC (NFPA 1) are currently considering adopting language similar to the California document for the upcoming editions of these codes.
- The solar industry and the fire fighting community need to work together to establish construction codes and standard operating procedures for firefighters.



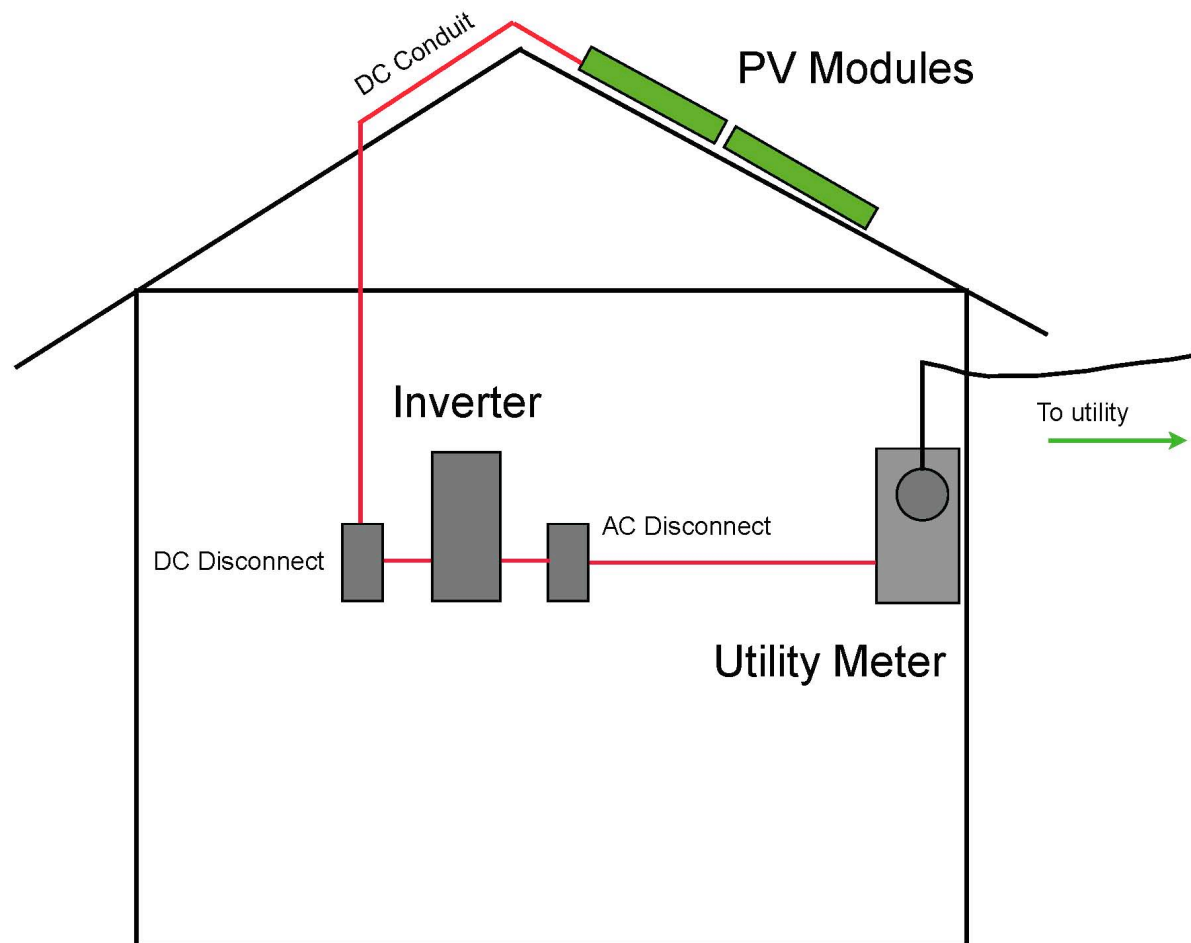
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# Basic hazard info for Firefighters

- Electrical Shock
- Trips and Slips
- Dead Load

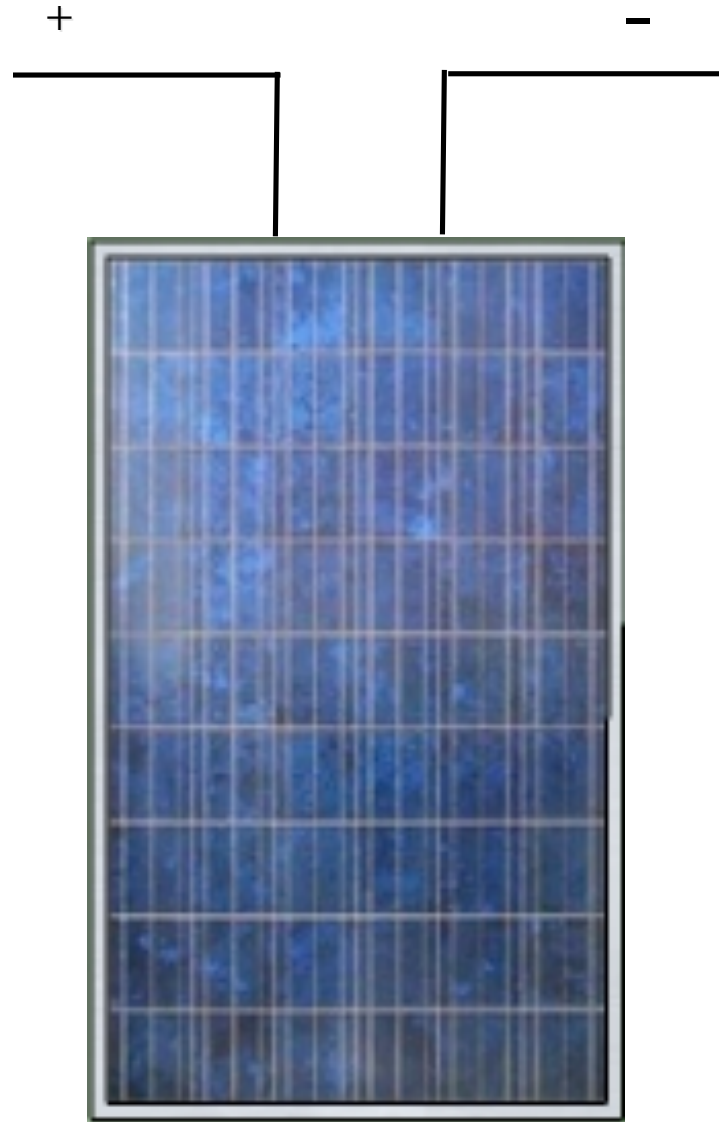


# Simple Grid-Tied PV System



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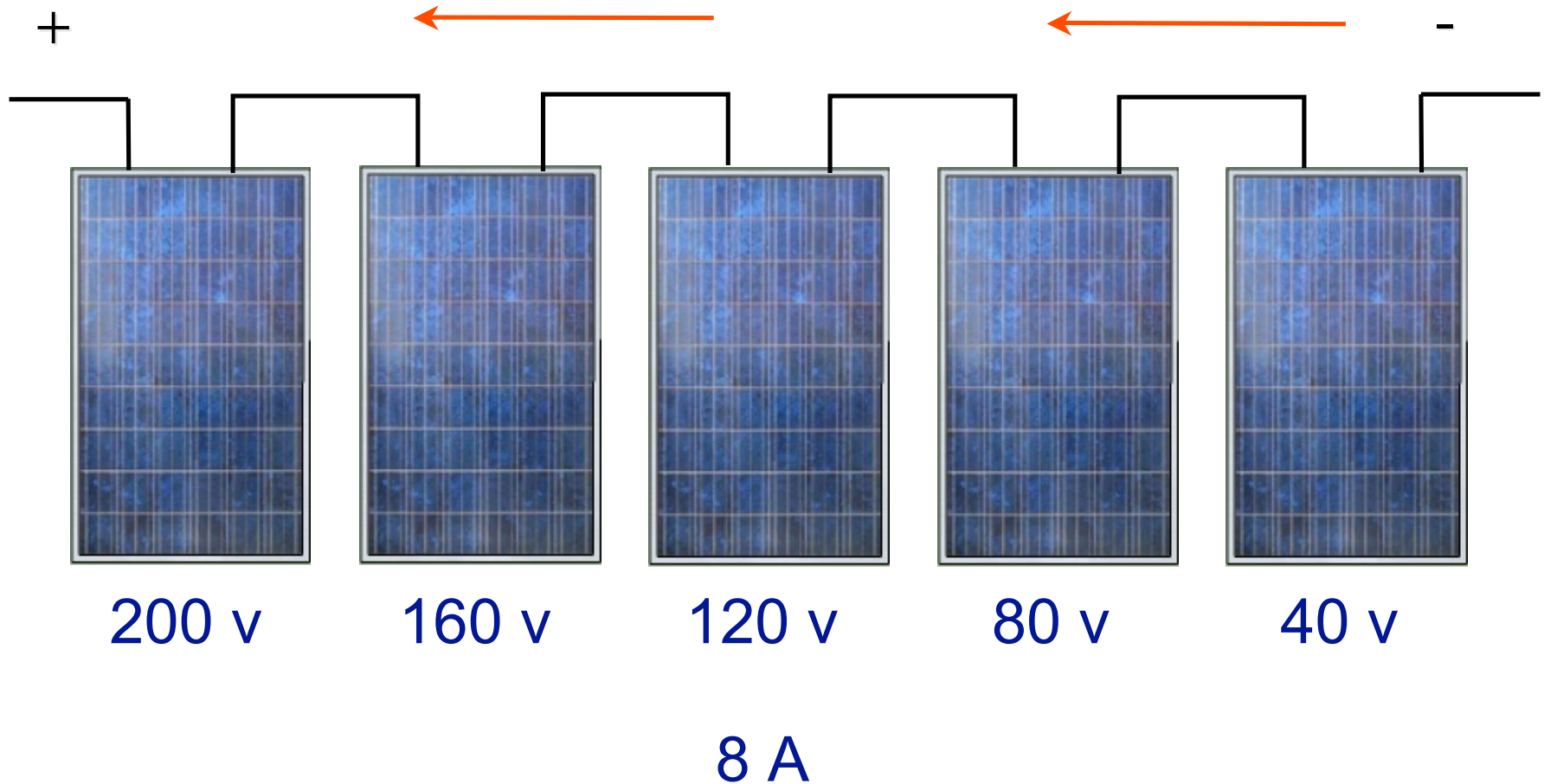
# Module



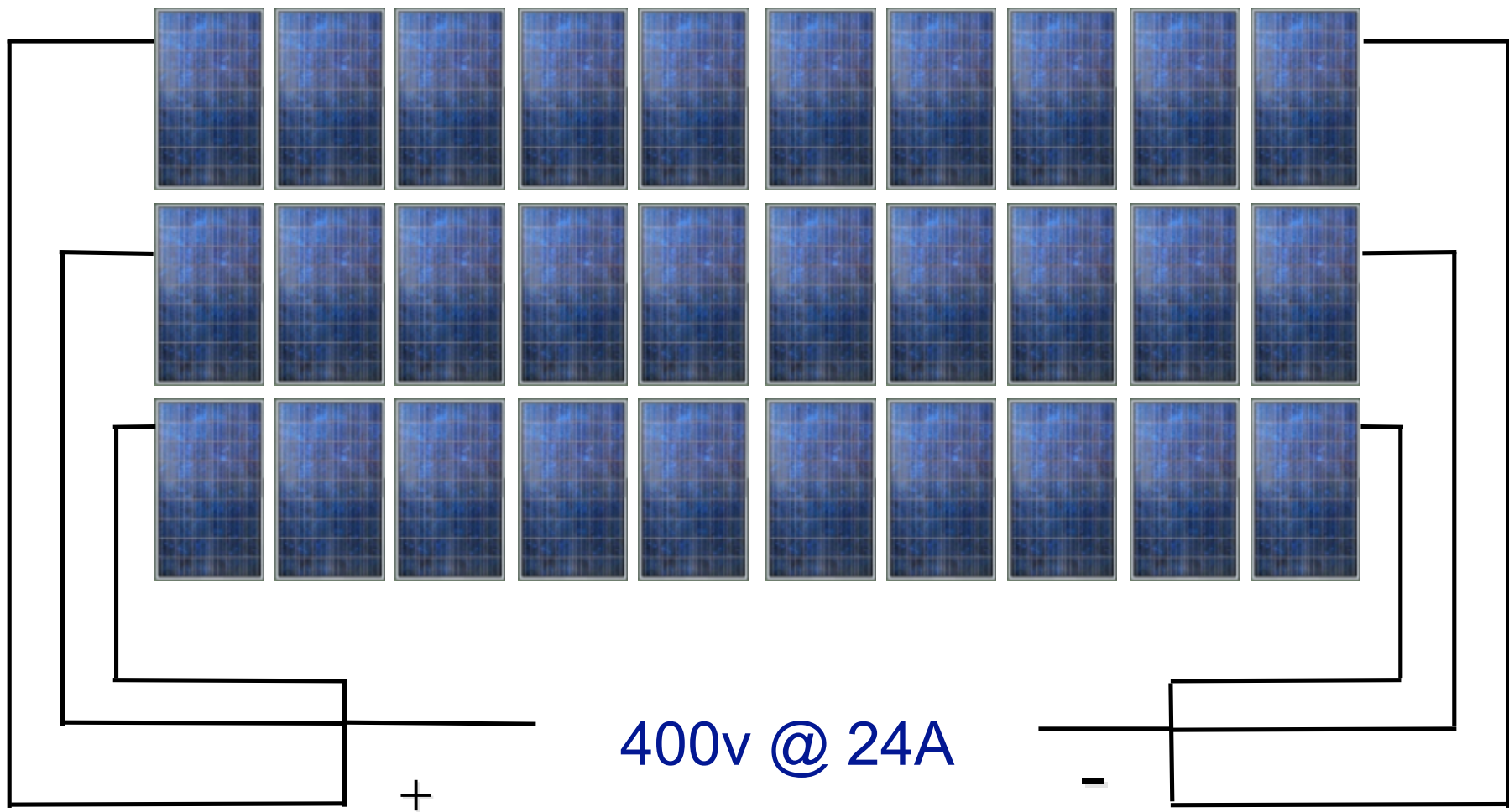
40 VDC  
8 Amps



# String



# Array



# Framed, BIPV, Flexible



Photo by M. Paiss



Photo courtesy of Sharp



Photo courtesy of Uni-Solar

Solar America Board for Codes and Standards





# Inverters - Residential



Photo courtesy of Independent Energy Systems



Locations  
will vary



Photo by M. Paiss

Disconnects  
will vary



Photo courtesy of Independent Energy Systems



# Microinverter



Photo courtesy of E.Oakes



# Commercial



Photo courtesy of J. Perry



Photo courtesy of H. Barikmo

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# Key Points

- Identify & communicate the **PRESENCE** of a PV system.
  - Key components of a PV system:
    - Array, Inverter, Conduit, Labeling.
- Safely operate around a PV system
  - Isolate power to degree possible
  - Stay away from damaged system
- Request Solar Contractor to secure system

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# Next Steps with Fire Officials

- Educate officials about 2011 NEC updates.
- Provide basic PV operational-level training so they better understand the technology and hazards.
- Develop “white paper” recommendations for implementation of guidelines.
- Work with developments of NFPA 1 and the IFC F-30 documents to help see that regulations are properly implemented.