Solar PV Safety for the Fire Service

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Overview of Presentation

- Terminology of PV Systems.
- Brief history of the Fire Service experience with PV system installations.
- What Firefighters Need to Know About Working Around PV Systems.
- Training Availability.
Simple Grid-Tied PV System
Module

40 VDC
8 Amps
Inverters - Residential
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.
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
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.
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
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
Summary of Fire Marshal Guidelines (3/10/08 DRAFT)

• Marking
• Access on Rooftops
• Location of DC Conductors
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.
Full Gable
Cross Gable with Valley
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.
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’
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.
Basic hazard info for Firefighters

- Electrical Shock
- Trips and Slips
- Dead Load
Simple Grid-Tied PV System
Module

40 VDC
8 Amps
String

200 v → 160 v → 120 v → 80 v → 40 v

8 A
Framed, BIPV, Flexible
Inverters - Residential
Disconnects will vary.

Locations will vary.

Photo courtesy of Independent Energy Systems.

Photo by M. Paiss.
Microinverter

Photo courtesy of E.Oakes
Commercial
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
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.