Code Division / First Responder Guide to First Responder Safe Solar (FRSS)

Purpose

Save Lives. Turning the DC disconnect OFF de-energizes all high voltage DC cables connected to the DC disconnect. FRSS installations may be identified by a dial voltage indicator marked FRSS located near the DC disconnect.

Background

Non FRSS solar panels unconditionally energize their cables whenever light is present. Current National Electric Code has accommodated this limitation in solar technology. As a consequence solar installations conforming to existing NEC remain energized and may expose first responders to lethal voltages even after all required disconnects have been set to OFF. A damaged installation may remain energized extending the risk to demolition workers and secondary fire ignition.

FRSS eliminates the exception to standard electrical safety behavior for solar power installations.

Under FRSS, the terminals of a solar panel must remain in a safe state regardless of illumination when not connected to an inverter. Solar panels incorporating FRSS turn off when disconnected as is expected and required of all other electrical equipment.

On Site First Responder Procedure

1. ***LOOK FOR THE FRSS INDICATOR.*** The presence of a voltage indicator marked FRSS at the DC disconnect means that the solar array may be a First Responder Safe Solar type. **IF AN FRSS INDICATOR IS NOT PRESENT, CONSIDER ALL DC CABLES LIVE REGARDLESS OF THE POSITION OF THE DC DISCONNECT.**
2. ***FRSS INDICATOR SHOULD SHOW RED.*** Note the position of the FRSS indicator before operating the DC disconnect. If the solar array is lit and operating normally, the FRSS indicator should be deflected right, into the red zone. If the FRSS indicator is in the green zone with the DC disconnect ON, the cables within the solar array may have already been damaged by an active fire and the roof structure may have been compromised.
3. ***TURN OFF DC DISSCONNECT.*** Observe that the FRSS indicator moves to the left into the green zone. This indicates that the FRSS feature has successfully de-energized the high voltage DC cables.
4. ***FRSS INDICATOR SHOULD SHOW GREEN.*** After the indicator has moved from red to green, the first responder may utilize any fire attack strategy at their discretion. This includes tactical approaches that require cutting the DC cables, removing solar panels or destroying solar panels.

Cutting cables or into Solar Panels in FRSS mode

Any DC cable may be cut after setting the DC disconnect to OFF and verifying that the FRSS indicator moves from red to green. This includes the cables to the solar panels themselves. Unsafe voltages are removed from the DC cables a fraction of a second after the DC disconnect is set to OFF.

In some cases, roof ventilation is improved by deliberately cutting through a solar panel operating in FRSS mode. When practical, cut through the long axis to minimize voltage exposure from the resulting pieces.

Keep in mind that FRSS removes voltage from the cables going to, from and between the solar panels. Each solar panel contains only its own energy with the DC disconnect OFF. Each solar panel isolates itself from every other in the array.

Cutting into a solar panel may result in limited voltage and power from that individual solar panel being exposed.

To minimize any voltage exposure at the edges of burnt, broken or cut solar panels, place solar panel debris face down.

Standard

Less than 0.5 Seconds after turning the DC disconnect OFF, the DC cable voltage between any two points in the array shall be actively driven to below UL60950-1 Safety Extra-Low Voltage (SELV) limits when the solar array is lit.

On Site Implementation

No additional equipment is required for a solar panel incorporating First Responder Safe Solar to function. For FRSS identification and conformation, it is recommended that a dial voltage indicator be positioned near the DC disconnect. The indicator and FRSS markings are located behind a window within a weatherproof enclosure. The indicator deflects right into a red zone when dc voltage is present and falls to the left into a green zone when voltage is not present.