

# Solar Energy Installations & Employee Safety





# Electric Utility Safety & Solar Installations



OBJECTIVE

HAZARDS

INJURIES

PPE

REMINDERS & FACTS

SUMMARY



*“We are here to make a choice between the quick and the dead”  
Bernard Baruch, U.N. Atomic Energy Commission, 1946*

## **Objective**

To identify and mitigate potential hazards while working around Solar Installations at the customer site

To use this information to develop a standard operating guideline for your organization



# RECOGNIZED UTILITY WORKER HAZARDS

## **Lineworker & Contractor Hazards**

Inhalation Hazards (First Response)

Electrical Shock & Burns

Potential for Backfeed

Falls from Roof Operations (Sky  
Lights & Unprotected Edges)

## **Important Facts and Reminders**

Blocking Sunlight

Electrical Fires in Equipment

Personal Protective Grounding

# INHALATION HAZARDS

## Inhalation Hazards



During a fire or explosion the PV frame can quickly degrade exposing hazardous chemicals to direct flame and become dissipated in the smoke plume



# INHALATION HAZARDS

## Inhalation Hazards Due to Cells/Components

**Boron-** No health effects to humans or the environment

**Cadmium Telluride-** A known carcinogen, the primary route of exposure is inhalation

**Gallium Arsenide-** The health effects have not been studied, it is considered highly toxic and carcinogenic

**Phosphorus-** The fumes from compounds are considered highly toxic. NIOSH recommended exposure limit to phosphorus is 5 mg/m<sup>3</sup>. A lethal dose of phosphorus is 50 milligrams

# INHALATION HAZARDS

## Inhalation Hazards for Primary Troublemakers

Recommended Practice:

- Wait for qualified first responder to give “all clear” signal
- Remain upwind of “at-risk” fires



# ELECTRICAL HAZARDS

## Electric Hazards

NIOSH reports reveal the number of lineworkers who are killed and injured annually in electrical incidents

Electricity can cause a variety of effects, ranging from a slight tingling sensation, from involuntary muscle reaction to burns and death!





# ELECTRICAL HAZARDS

## Electric Hazards

The physiological effects produced by electricity flowing through the body include:

**Perception** – (1 mA) tingling sensation

**Startle Reaction** – (5 mA) involuntary muscle reaction

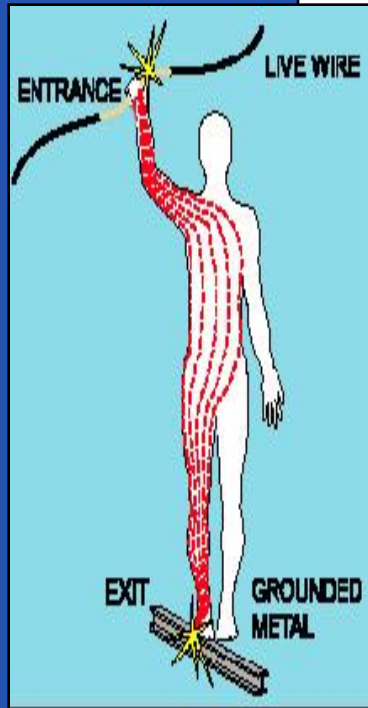
**Muscle Tetanization** – (6 to 30 mA) painful shock

**Respiratory Arrest** – (.5 to 1.50 Amps) stop breathing

**Ventricular Fibrillation** – (1 to 4.3 Amps) heart stops

# ELECTRICAL HAZARDS

## Electric Hazards



Variables in human resistance to electricity:

Amount of current flowing through the body

Path of current through the body

Length of time the body is in the current

Other Factors: **Body size and shape, Area of contact, Pressure of contact, Moisture of contacts, Clothing & jewelry, Type of skin**

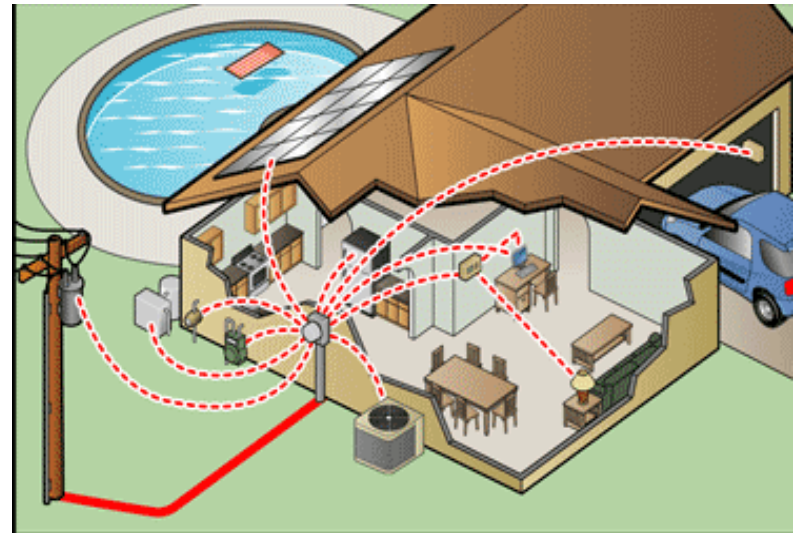
# ELECTRICAL HAZARDS

## Electric Burns

Burns that can occur in electrical accidents include electrical, arc, and thermal

With electrical burns, tissue damage occurs because the body is unable to dissipate the heat from the current flow

A lineworker should never pull the electrical meter as a means of shutting-down power to a building!



# ELECTRICAL HAZARDS

## Personal Protective Equipment

Lineworkers should follow the minimum standards in CCRT8 Section 2940.6\*, Tools and Protective Equipment or 29 CFR 1910.269\*\* (6)(iii) Apparel

- \* This would exclude: Clothing that, when exposed to flames or electric arcs, could increase the extent of injury that would be sustained by the employee
- \*\* Boots
- \* Gloves  
Hard Hats  
Eye Protection

Note: Jewelry such as; watches, rings, and necklaces are all a good conductor of electricity and should not be worn around electrical components



# ELECTRICAL HAZARDS

## Tool Reminders

When working in proximity to electrical circuits, use insulated hand tools

To check for electricity flowing between two contacts an AC/DC meter should be employed

Typically, high voltage detectors can only detect alternating current and would not detect current in PV wiring or battery conductors



### NET ENERGY METERING SERVICE

A Generating Facility under contract with SCE is connected to the load side of this meter. **The meter may run both forward and backwards.** Be sure the load side clips are dead if the meter is removed.

DO NOT REMOVE  
THIS TAG



# IMPORTANT FACTS

You cannot block all the sunlight on the array with foam or a material cover



FD supplied foam will not block out all the sunlight and will slide off the array

Cover will significantly reduce sunlight to the array but electricity can still be generated through the cover material

# IMPORTANT REMINDERS

Use Class C extinguishing agents- CO2 or dry chemical if a PV system shorts and starts a fire

Should the array become engulfed in a roof fire, call 911 immediately (beyond insipient stage)

Be aware that biting and stinging insects could inhabit the module frame and junction boxes

Use correct personal protective grounding techniques\* to protect from accidentally energized HV lines

\* May enlist high/low voltage working methods following all approved processes/procedures





## SUMMARY



Photovoltaic technology is around you every day and it is here to stay!

Your fundamental understanding of photovoltaic systems will improve your confidence in working with and around solar technology safely.

The photovoltaic industry is counting on the electric utility industry to operate safely and effectively around photovoltaic systems.