

TIBURON FIRE PROTECTION DISTRICT



Developed by: Marin County Fire
Prevention Officers

Approved by: *[Signature]*
Richard Pearce, Fire Chief

Fire Protection Standard 523

Solar Photovoltaic (PV) Systems

Date: 8-21-2017

Revision: 8-21-2017

Page: 1 of 8

The Tiburon Fire Protection District has developed this Standard, for the installation of Alternative Energy Systems to ensure public and firefighter safety.

General

Traditional firefighting techniques such as roof venting, water extinguishment and fire overhaul will have to be modified to ensure safety. Roofs containing solar arrays will be most difficult for firefighters to vent. Delayed roof venting may increase the time factor in fire containment, resulting in a greater extent of fire damage throughout. Additional roof loading by PV systems may also cause the roof integrity to be compromised sooner during fire conditions. Conventional water extinguishment on roofs with solar PV systems may not be an option for firefighters if the integrity of any portion of the solar array is threatened, as the risk of accidental electrocution is greatly increased. Fire overhaul will also be a challenge for firefighters, as broken panels or compromised solar conduit will remain energized during daylight hours or when illuminated by lights.

In addition, the challenge for firefighters to shut down all power sources to the structure will increase with the installation of energy storage systems, battery arrays, and/or home backup generators. Homes and structures are capable of being powered by a maximum of a quadruple power source. With these systems being installed throughout the property and/or structure, the means of disconnecting power to the structure may be in locations that a far more distant than the main electrical service panel and gas service meter, where power and fuel sources have only been disconnected in the past.

The importance of dedicated disconnects, signage and labels, and testing of alternative energy systems can help eliminate some of the potential challenges and hazards that emergency personnel could face in an emergency.

REQUIREMENTS FOR THE INSTALLATION OF ALTERNATIVE ENERGY SYSTEMS

1. Individual solar arrays shall not exceed 100 feet in length without a 5-foot separation between arrays.
2. Energy storage systems stored within enclosed rooms shall be mounted a minimum of 24 inches above the finished floor. Batteries contained within cabinets shall be posted with a permanent placard.
3. Energy storage

REQUIREMENTS FOR DEDICATED DISCONNECTS

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Page: 2 of 8

1. An approved and readily accessible independent and clearly labeled single exterior disconnect shall be located prior to any load/service panel and installed as close as possible to the main service panel or as approved by the fire code official. Integrated equipment toggle, rocker, or electronic switches shall not be utilized as an independent disconnects. The A/C disconnect shall be accessible to emergency personnel from the exterior without the use of ladders or other special equipment.

Exception: Enphase or similar technology for solar equipment that de-energizes the system at the roof panels upon loss of A/C reference leaving no energized electrical potential inside the structure when the main breaker is tripped.

2. The dedicated disconnect accessible to emergency personnel shall have the capability to power down all energy storage systems available on site when more than one battery is installed.
3. Energy storage systems, such as batteries, installed in an attached garage, basement, or interior room shall be equipped with a fire sprinkler system or a heat detector that is hardwired to an interior smoke alarm. The dedicated alarm can be interconnected to the existing alarms near the sleeping area or have loud annunciation from the installation location. The alarm sound shall be at a minimum of 70 decibels at any sleeping room.

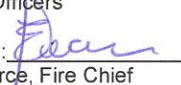
REQUIREMENTS FOR LABELS AND SIGNAGE

1. All labels shall be prepared as a red label with white font no smaller than 1/2" inch.
2. All signage posted on the exterior of the building shall be visible at the main service panel. The signage shall not be covered or restricted by any material or exterior coverings.
3. The required signage will depend on the quantity of power sources, the selection of power sources, and the location of the power sources.
4. Labels and signage required shall include the following, depending on the alternative power sources used on site:
 - a. Conduit Label (See example #1.)
 - b. Power source label (See example #2)
 - c. Disconnect Label (See example #3)
 - d. Additional Disconnects (See example #4)
 - e. Site Plan Placard (See example #5)

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Page: 3 of 8

5. Signage including, but not limited to, site card placards shall include the location and placement of photovoltaic arrays (panel layout on the roof), the location of the main service panel, and the location of any disconnect only.

EXCEPTION: Energy storage systems installed on the interior of a structure shall be provided on any signage as well.

6. Site card placards shall numerically identify each disconnect on site with a legend identifying the power source it services. The amount of disconnects shall match the amount of power sources serving the structure. (See example #5)

LABEL AND SIGNAGE EXAMPLES:

Example #1- Exterior /Interior Conduit Label: Shall be installed every 20 feet. On conduit mounted vertically one sign shall be mounted at eye level.

CAUTION
**Solar PV Wiring May Remain Energized
After Disconnection During Daylight Hours.**

Example #2- Power Source Warning Label: The label shall be posted on the exterior and interior of the main service panel. The label shall include the following three items: (1) how many power sources supply the building/structure; (2) what power sources are available; (3) How to cut all power to the building.

This label is dependent on the types of power sources selected and the quantity. Some examples are provided below, but should not be considered the only combination of power sources available.

Example 2a (DUAL POWER SOURCE WITH PV)

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Page: 4 of 8

WARNING
TWO POWER SOURCES
**SOURCES INCLUDE: UTILITY GRID AND
PV SOLAR**

**TO SHUT OFF ALL POWER: SWITCH THE
MAIN SERVICE BREAKER TO THE OFF
POSITION**

Example 2b (TRI POWER SOURCE WITH ESS AND PV)

WARNING
THREE POWER SOURCES
**SOURCES INCLUDE: UTILITY GRID,
BATTERY AND PV SOLAR ENERGY
SYSTEM**

**TO SHUT OFF ALL POWER: SWITCH
ALL (# of disconnects) LABELED
DISCONNECTS TO THE OFF POSITION**

Example 2c (QUAD POWER SOURCE WITH ESS, PV, AND STAND BY
GENERATOR)

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Page: 5 of 8

WARNING
FOUR POWER SOURCES
SOURCES INCLUDE: UTILITY GRID,
STAND BY HOME GENERATOR,
BATTERY, AND PV SOLAR ENERGY
SYSTEM

TO SHUT OFF ALL POWER: SWITCH
ALL (*# of disconnects*) LABELED
DISCONNECTS TO THE OFF POSITION

Example #3- Disconnect Label: The disconnect label shall be affixed to the disconnecting means and shall identify the power source it is affiliated with.

BATTERY DISCONNECT

PV DISCONNECT

GENERATOR DISCONNECT

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Date: 8-21-2017

Revision: 8-21-2017

Page: 6 of 8

Example #4- Disconnect Location label: The disconnect location label shall be placed on a permanent sign attached at the main electrical disconnect from P.G. & E. It shall contain written directions to any of the disconnects outside of the main disconnect. The label shall be placed in a visible location when shutting down the main disconnect.

ADDITIONAL DISCONNECTS ON SITE

This building is supplied with an alternative power source.

Additional disconnect located (*describe location - on the right, below etc.*) of this main disconnect. Both/All must be used to disconnect power.

Example #5- Site Card Placard: A site placard is required to be posted on the exterior at the main service panel and at the equipment, if installed internally, that lists the location of the main service panel, shut offs, and all power source equipment. This will be required and verified at the final inspection.

The disconnects shown on the site card placard shall indicate the power source attached and be labeled numerically to match the amount of power sources providing energy to the structure.

(See example on page 7)

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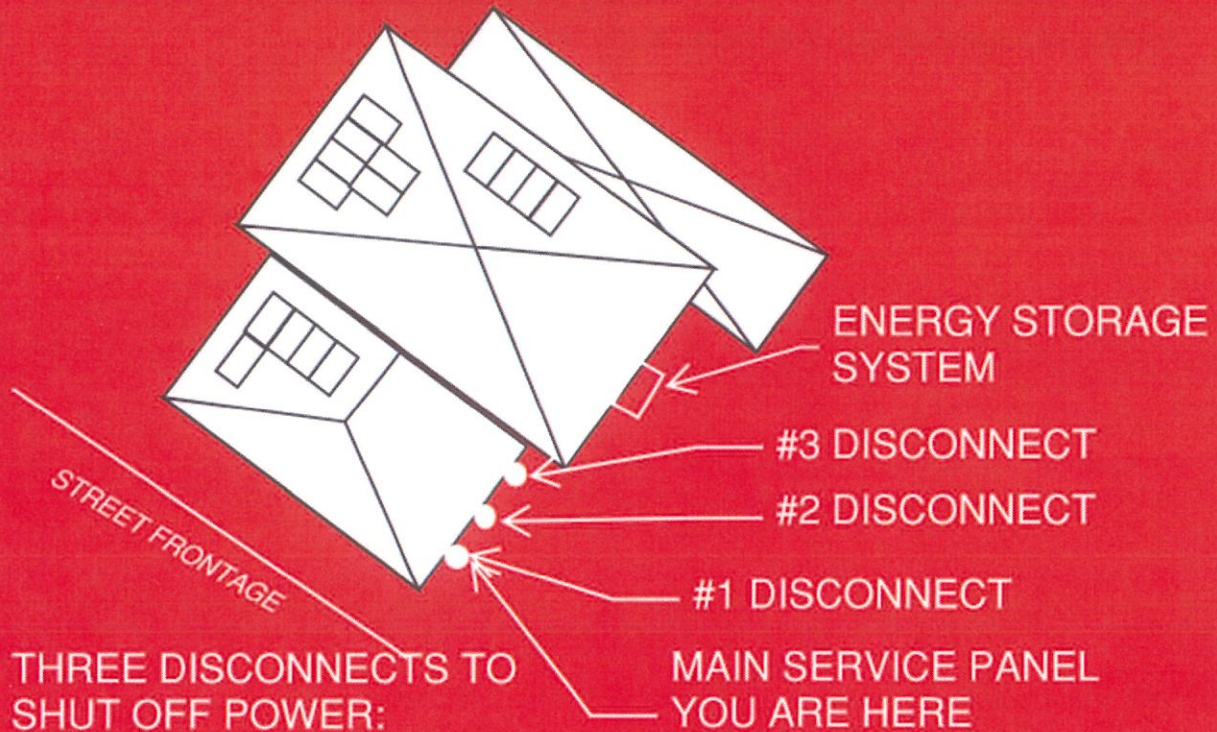
Date: 8-21-2017

Revision: 8-21-2017

Page: 7 of 8

CAUTION

ENERGY STORAGE SYSTEM AND PV SYSTEM CONNECTED



- #1- MAIN DISCONNECT
- #2- PV DISCONNECT
- #3- ESS DISCONNECT

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Revision: 8-21-2017

Page: 8 of 8

REQUIREMENTS FOR TESTING

1. New installations shall be tested for complete power and energy system shutdown. All shutoff switches will be tested at the time of the inspection and must be operational.
2. A normal power failure shall be simulated by closing the main service breaker supplying normal power to the building. Upon transfer from main power to alternate power source(s), the single disconnect(s) shall be used to disconnect alternate power from all alternate energy sources.
3. A successful result of the shutdown test shall include termination of all alternate energy power sources serving the building (i.e. main service, photovoltaic system, energy storage systems, and generators, when installed).