California Solar Initiative – Inspection Protocol

I. Scheduling an Inspection

a. It is highly recommended, but not required, that the applicant attend the inspection.
    i. If neither the host nor the applicant are present for the inspection, the inspector will **not** conduct the inspection unless permission was previously obtained in writing or via e-mail allowing the inspector to conduct the inspection without the host or the applicant present.
    ii. Access to all of the equipment must be provided or the inspector will **not** conduct the inspection.

II. Array ID

a. When PV modules with different PTC rated outputs are installed at one location, a separate EPBB calculation must be run for each type of module.
b. When an installation is split into sections having different tilt angles or different azimuth orientations, a separate EPBB calculation must be run for each section of the array.
c. When inverter models with different peak efficiencies are installed at one location, a separate EPBB calculation must be run for each type of inverter.
d. A unique array ID should be assigned for each EPBB calculation.

III. Photovoltaic Modules

a. Manufacturer/Model Verification
    i. Verify manufacturer and model numbers from the PV module nameplates. If the nameplates are inaccessible, use invoices from the installer. The modules must be on the CEC's list of eligible equipment or in the EPBB calculator.
    ii. Identify the type of PV cell (mono-crystal / multi-crystal / etc.).
    iii. Identify the module PTC output.
b. Count the number of modules installed for each Array ID.

c. True Azimuth Documentation
    i. The azimuth of an array is the horizontal direction that a module face is pointing. For arrays that are tilted along two axes, the azimuth is the horizontal direction of the steepest tilt (see III.d.ii below).
    ii. The azimuth of an array pointing due south is 180°.
    iii. Take magnetic azimuth readings using a handheld compass 10-15 feet away from metal and unknown objects.
    iv. Correct the magnetic azimuth reading to the true azimuth by adding the magnetic declination to the compass reading. The magnetic declination in California is typically 13° to 16° east of true north depending on the location of the site. Magnetic declinations can be obtained from http://www.ngdc.noaa.gov/seg/geomag/jsp/Declination.jsp .
    v. Azimuth is irrelevant when the tilt angle is 0°.
    vi. Note if the array azimuth is fixed or adjustable (Fixed/Seasonal/Automatic).

d. Tilt Documentation
    i. Using an inclinometer or digital level, the tilt of the PV modules should be measured parallel to the sloped edge of the panel.
    ii. For modules that are tilted along two axes, the measuring tool should be placed on a module and slowly rotated in the plane parallel to the module. The steepest angle seen during the rotation of the measuring tool is the tilt angle of the module.
    iii. If the array is inaccessible, estimate the rise and run of the array on site and confirm with documentation from the installer.
    iv. Use the tilt of the array, not the roof shingles.
    v. Note if the array tilt is fixed or adjustable (Fixed/Seasonal/Automatic).

IV. Inverters

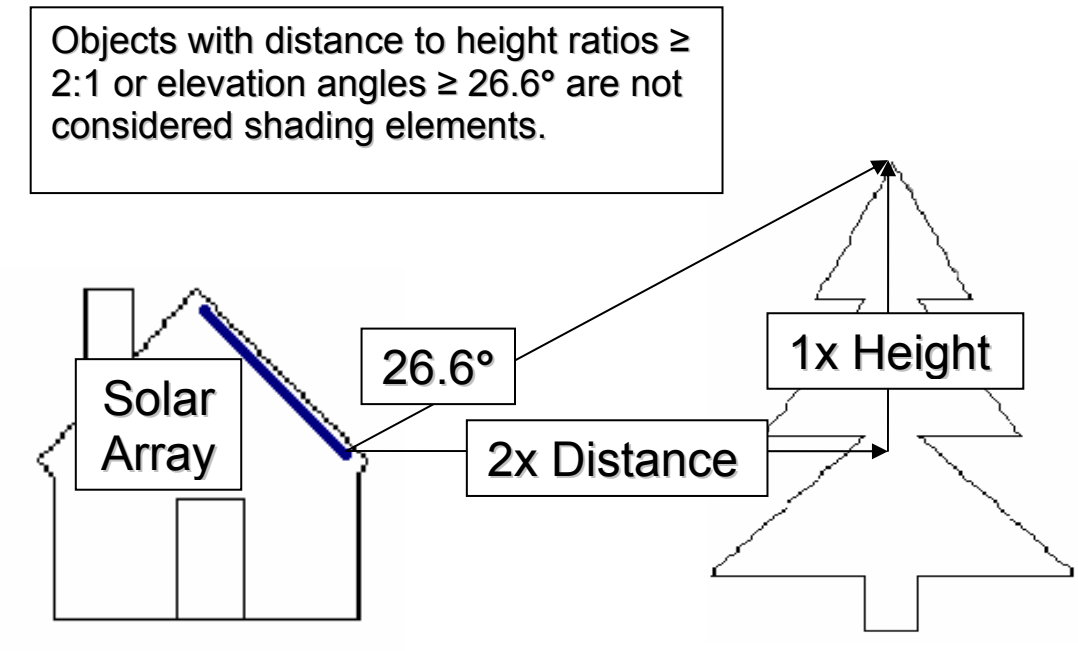
a. Note the total AC power output during the inspection. For multiple inverters, sum their output. Note that some inverters can be networked to indicate the combined system output on all displays.

b. Manufacturer/Model Verification
    i. Verify manufacturer and model from nameplate. If the nameplate is inaccessible, use invoices from the installer. The inverters must be on the CEC's list of eligible equipment or in the EPBB calculator.
    ii. Identify inverter peak efficiency from the CEC's list of eligible equipment.

V. Shading Documentation

a. Use a Solmetric SunEye, Solar Pathfinder, or equivalent tool to perform a shading analysis. The Solar Pathfinder must be used in conjunction with the Solar Pathfinder Assistant Software for systems with an azimuth other than 180º.
b. There are a number of ways to perform a shading analysis. The following are suggestions:
    i. The most common method is to take shading measurements at the major corners of an array and average the values for each month. "L" shaped arrays may require measurements at six points (one at each vertex).
    ii. In cases where corner shade measurements do not adequately represent the shading of an array, it is critical that the positions of the shade measurements are documented and communicated so the analysis may be duplicated.
c. Depending on site location, objects in the northerly direction, roughly between 305° to 55° relative to the most northerly points on the PV array, may not be considered shading elements for minimal shading.
d. An object is not considered a shading element for minimal shading if its distance from the closest point on the PV array is at least twice its height above the array (see diagram below).
    i. If all shading objects have altitude angles less than 26.6°, the array is minimally shaded.

ii. An altitude angle is the inverse tangent of the shading element's height above the array divided by the shading element's distance from the array.



VI. Site Meter

a. The site electric meter measures the net energy consumed by the site.
   i. Note the utility meter number.

b. The net generation meter measures the total output of the PV installation.
   i. A net generation meter with an accuracy of ±2 % must be installed on all PBI systems.
   ii. A net generation meter with an accuracy of ±5 % must be installed on all EPBB systems. The display of cumulative kWh and instantaneous kW must be visible on the host customer site. In most cases, this will be handled by an inverter integrated display or a standalone meter, though other means are possible.
   iii. The net generation meter must be on the CEC's list of eligible equipment.
   iv. Note the net generation meter manufacturer, model number, and serial number, if present.

VII. Installation Issues and Photos

a. Confirm physical permanence as demonstrated in accordance with industry standards.
b. Confirm that the PV system serves the host customer site.
c. Note whether the system is Racked / Anchored / Self-ballasted / Building-integrated and whether it is located on Roof / Ground / Carport.
d. Photograph all major system components and nameplates.

VIII. Ambient Conditions

a. Note sky cover and temperature during inspection from on-site measurement or local weather station.
b. Take an irradiance measurement in the plane of the array.
c. Note time of day of inspection.

IX. Safety Protocol

a. The safety of the inspector, applicant, and host is the first priority.
b. The inspector will not mount any roof, house, building, or structure under the following conditions:
    i. The inspector does not deem it to be safe. This could be if the roof is too steep, too slippery, too fragile, too wet, too hot, etc.
    ii. The inspector judges that part of the roof could easily be damaged during the inspection.
    iii. The inspector does not have a safe way to get up (i.e. ladder is damaged).
    iv. The weather makes the conditions unsafe, such as lightning, strong wind, rain, etc.
c. If the inspector is unable to complete the inspection safely, s/he will work with the applicant and/or host to determine as best possible the most appropriate values for the inspection report.