Comments on CEC-Staff Draft Guidebook of October 5, 2006
Docket number 06-NSHP-1

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These comments are relevant to the CEC-Staff Draft Guidbook of October 5, 2006, Docket number 06-NSHP-1. Specifically they relate to **Appendix 4, section F, subsection 2 "Accounting for Actual Shading" and subsection 3 "Measuring Heights and Distances or Altitude Angles".**

The comments are as follows:

Allow the opportunity for higher resolution compass headings
In Appendix 4, section F, subsection 2 "Accounting for Actual Shading", an approximate representation of shade-causing obstructions is described that is simple and easy to acquire. It is important to give installers this simple option. However, the representation dramatically over-estimates the effects of shading, causing a smaller rebate to be issued. For installers who wish to make more accurate shade measurements and thus receive a larger rebate that more closely reflects the expected performance of the system, a more detailed representation should be allowed.

The currently described representation divides the compass into 22.5 degree segments. The highest obstruction in each segment is used for the entire segment even if the highest obstruction is narrow. So, for example, a telephone pole with an altitude angle of 45 degrees may only takes up 5 degrees of compass angle due to its narrow width. But since its the highest point in the segment it causes the entire 22.5 degree segment to be given an altitude of 45 degrees. This dramatically overestimates the effect of shading for that segment. Similarly all segments in which the minimal shading criteria is not met will be over estimates.

The solution to this problem is to allow installers to optionally use a finer resolution than 22.5 degrees. I recommend that the installer be allowed to submit either data for 22.5 degree segments OR data for 5 degree segments. An installer trying to maximize their rebate will be inspired to collect the extra data. It should be noted that the collection of finer resolution data need note take longer to collect. For example, the new shade analysis tool, the Solmetric SunEye, collects higher resolution (or lower resolution) data quicker than each of the low resolution methods described in the current draft.

Allow the opportunity to measure shade data from more than one location

There is another important aspect of the current methodology that results in a further over-estimation of the shading and hence a lower rebate. The current draft requires the installer to measure the shading at a single location in the layout of the panels. This location is specified as "…the point on the PV array that has the maximum shading." This method is easy to implement, and it is important to give installers this simple option. However, it dramatically overestimates the shading on an array. Arrays can be made up of twenty or more panels and can span forty or more feet. The shading at one end of the array can be dramatically different than the shading at the other end. Since arrays typically have at least one bypass diode per panel, it is entirely possible for an array to continue to produce power even if one side of the array is shaded.

By requiring installers to report the shading for the entire array as the shading for the worst case location on the array, the production will be dramatically underestimated resulting in a lower rebate. While installer should be allowed to make the shade measurement at one location on the array, they should also be allowed to make multiple measurements on the array. This way an installer who wants to accurately measure the performance of an array and maximize the rebate received can take the extra time to measure and submit data for multiple points on the array.

If the currently described representation of shade-causing obstructions is used—altitude readings for different compass headings--then multiple tables must be submitted, one for each location in the array measured. This makes this table difficult to use. An alternative representation is a day/time table which is capable of incorporating multiple measured locations into a single table. This table has a row for each month of the year, and a column for each hour of the day from sunrise to sunset. The value in each location is a percentage that is the amount that that month and time period is not in shade. If multiple locations are measured, they each produce a table as described. The multiple tables are then combined by averaging the corresponding cells together. The result is a single day/time table for the entire array and the percentages include shade data from multiple locations on the array. Optionally, the individual tables can be combined by a weighted average, rather than a straight average. The weighting is based on the number of panels covered by the location in the array where the shade was measured. Also, the month/time table just described has a course resolution (similar to the azimuth/altitude table using 22.5 degree segments). Installers should also be allowed to submit a higher resolution table that has days as the rows and quarter hours as the columns. This will result in a more accurate shade analysis.

Allow the ability to submit shade data via an electronic file

The current draft does not describe how the shade data for each segment is to be submitted to the PV Calculator. I would like to recommend that the option be given to submit the data manually by filling in an online form or, more importantly, electronically by uploading a data file. This is especially important if higher resolution data and multiple point readings are to be allowed as described above. The file should have a predefined format that needs to be described in the Guidebook.

The file is either a set of azimuth/altitude pairs where the azimuth and altitude numbers are separated by a comma and each pair is on a new line. The azimuth is the compass heading angle. Or the file is a day/time file where each day (or month) is on a new line and each time segment for that day (or month) is separated by a comma. The file that is specified should correspond to which method of representation is chosen for the PV Calculator—azimuth/altitude or day/time.

Include the Solmetric SunEye in the list of methods for measuring shading.
In Appendix 4, section F, subsection 3 "Measuring Heights and Distances or Altitude Angles" three specific tools are described: a) tape measure, b) digital protractor, and c) Solar Pathfinder. Instead of the current title for subsection d), "Using a Digital Camera with Fisheye Lens", the title should be "Using a Solmetric SunEye".

The Solmetric SunEye is a new tool for quickly and easily measuring shade-causing obstructions. With the press of a button it collects the azimuth/altitude angles with a compass heading resolution of better than 5 degrees (or optionally any resolution, such as 22.5 degrees). Data can be read off the display or transferred electronically via an exported file. This tool is very powerful and is used by installers who desire accurate and quick measurements of site-specific shading. Please see the attached product sheet. Below is an image of the SunEye: