SunPower Consulting™

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Comments on the CSI Expected Performance Based Buydown (EPBB) Calculator

Introduction

The CSI Expected Performance Based Buydown (EPBB) calculator does not properly estimate the expected performance of a solar system at many locations in California. Additionally, it does not fairly provide incentives for solar electric system customers based on the expected performance of their system. In its current form, the EPBB calculator can also negatively impact the reputation of solar electric companies, encourages gaming between industry competitors, and incorrectly set aside incentives for the PBI program. Because it has been created by the California Public Utility Commission, consumers may reasonably rely on the results of the calculator to create a benchmark for their system's performance. A routine engineering study created by a solar electric company using commercially available software or other solar modeling techniques will likely create conflicting results when compared to the EPBB calculator. This will certainly cause confusion and potentially mistrust between potential customers and solar businesses. By allowing the continued use of the calculator in its present form the CPUC may damage the reputation of the solar electric industry. A disclaimer is now displayed on the results section of the EPBB calculator. It states:

The CSI-EPBB calculator is a tool available to the public and participants of the CSI program, whose sole purpose is to determine the EPBB Design Factor and calculate an appropriate incentive level based on a reasonable expectation of performance for an individual system. The results of the calculator should not be interpreted as a guarantee of system performance. Actual performance of an installed PV system is based on numerous factors, and may differ with the results summarized in the CSI-EPBB calculator. For this reason, contractors, participating customers, and other interested parties should only utilize the calculator to determine an appropriate incentive when applying to the CSI incentive program. Additional uses for the calculator other than its intended purpose as stated above are not endorsed or encouraged.

The addition of the disclaimer leads an informed reader to conclude that the CPUC is aware of some of the issues with the EPBB calculator. These comments are intended to help the CPUC better understand some of the issues and impacts created by the current EPBB calculator.

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Discussion on EPBB Formula and Geography

The EPBB calculator formula in itself allows the possibility of an accurate estimate of annual kilowatt hours and a fair incentive payment. The formula is:

EPBB Incentive = Incentive Rate x System Rating x Design Factor

EPBB Incentive = Incentive Rate x System Rating x Geographic Correction x Design Correction

$$\text{EPBB Incentive} = \text{Incentive Rate} \times \text{System Rating} \times \left(\frac{\text{kWh of Proposed System's Geography}}{\text{kWh of Reference System's Geography}}\right) \times \left(\frac{\text{kWh of Proposed System's Design}}{\text{kWh at Prop Syst's Opt Summer Design}}\right)$$

However, the CPUC by limiting the geographic correction term to 1 (one) has intentionally limited the EPBB Incentive, the result of the formula. It is unclear why this policy decision was made as no information can be found on this determination. The decision creates a situation where some of the best performing systems, ones that will produce more summertime kilowatt hours than the reference location Orange, receive the same incentive as the reference location. In the example provided, Lancaster, a location that produces many more summertime kilowatt hours than Orange, receives the same incentive as the reference Orange.

Orange - Reference Location

$$\$12{,}500 = \$2.50 \times 5{,}000 \times \left(\frac{1.000}{1.000}\right) \times \left(\frac{1.000}{1.000}\right)$$

Redway

$$\$10{,}513 = \$2.50 \times 5{,}000 \times \left(\frac{0.841}{1.000}\right) \times \left(\frac{1.000}{1.000}\right)$$

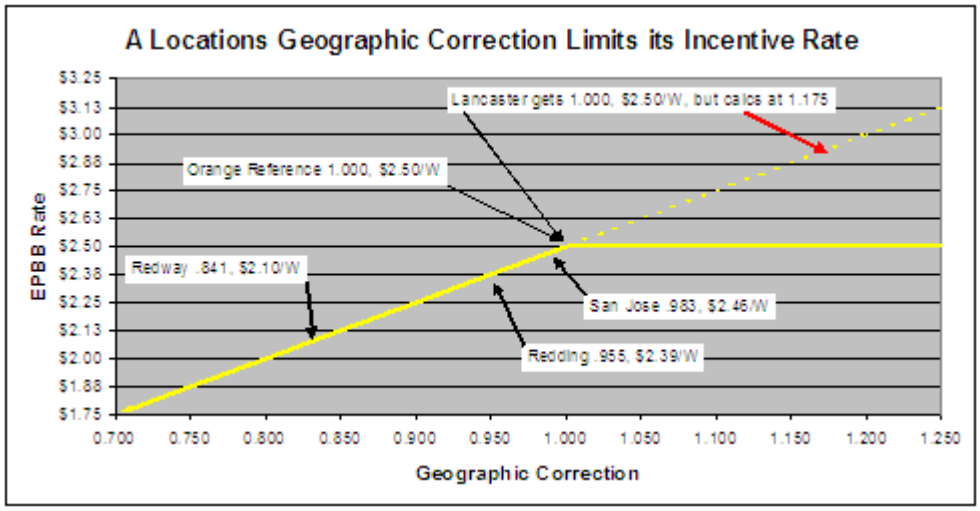
Lancaster with Geographic Correction Issue

$$\$12{,}500 = \$2.50 \times 5{,}000 \times \left(\frac{1.000}{1.000}\right) \times \left(\frac{1.000}{1.000}\right)$$

Lancaster without Geographic Correction Issue

$$\$14{,}688 = \$2.50 \times 5{,}000 \times \left(\frac{1.175}{1.000}\right) \times \left(\frac{1.000}{1.000}\right)$$

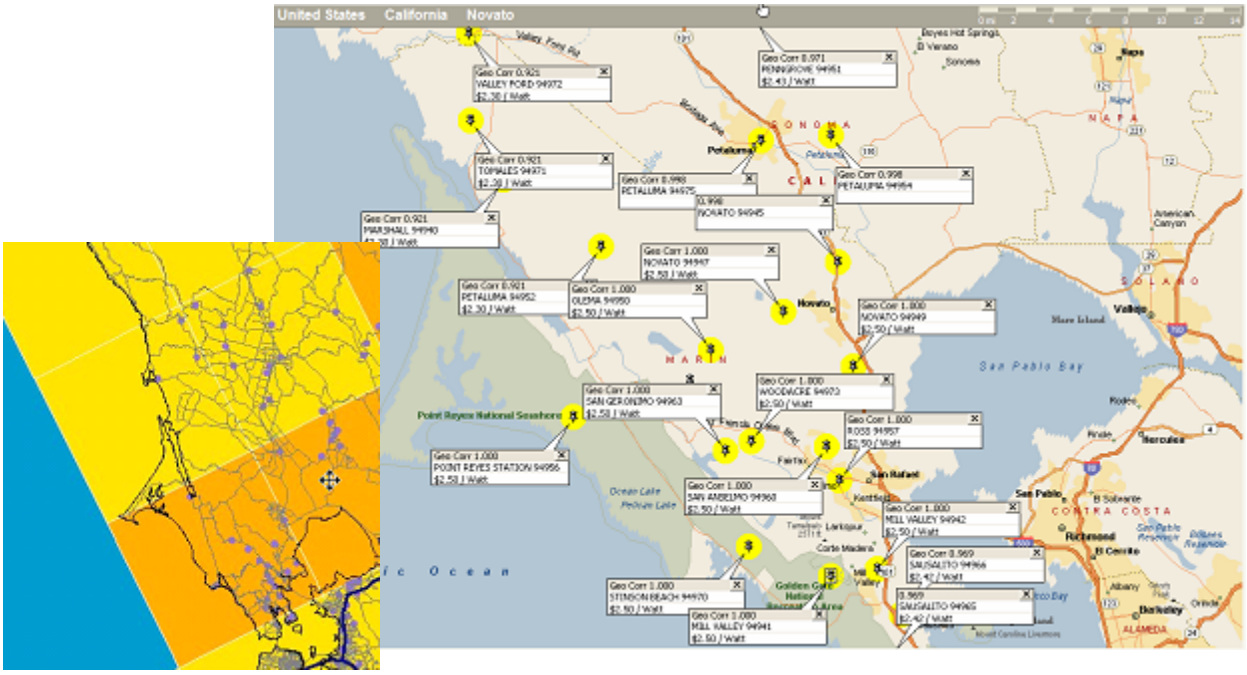
As shown in the next chart, the EPBB Calculator has some characteristics of a performance based tool for systems with a geographic correction lower than the reference location Orange. For all geographic locations that perform better than the reference, the calculator is a capacity based tool.



Additionally the selection of Orange as the reference can unfairly impact lower performing locations, up to $.40/watt, when the incentive rate is $2.50/watt. As an example Redway, a low performing location receives 16% less incentive for only 10% less summer kWh. This also negatively effects potential purchasers.

NREL Information Creates Issues

Next, the use of NRELs 40 km map creates issues. Solar professionals report that numerous microclimates can exist inside of an NREL 40 km square. This can benefit or penalize a solar electricity customer. Also, as shown in the example, an adjacent 40 km square can cause geographic correction differences of about 8% within a few miles. Solar professionals in the area shown, Petaluma, have reported the inaccuracy of this data and the increasing awareness of potential solar electric customers about the issue.



Shading Method Creates Issues

The calculator currently concentrates 100% of the shading derate factors into the summertime months, May through October. When shading derate factors are entered for the winter months there is no impact on the design correction factor or incentive paid. This creates an unrealistic and unfair design correction penalty for systems that have summertime shading and causes the EPBB calculator to incorrectly estimate annual and Summer kilowatt hour production. The chart shows that summer

months receive all the Design Correction factor. This method for calculating shading unfairly penalizes systems that have even slight shading. Also the shading methodology is not similar to any shading methodology generally accepted by the solar industry.

Shading Design Correction and % Weights by Month
180 Degree Azimuth, Optimum Tilt

	Lancaster		Orange		San Jose		Redding		Redway	
	DC Fac	Weight	DC Fac	Weight	DC Fac	Weight	DC Fac	Weight	DC Fac	Weight
January	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000
February	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000
March	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000
April	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000
May	0.822	0.178	0.821	0.179	0.824	0.176	0.829	0.171	0.813	0.187
June	0.824	0.176	0.823	0.177	0.820	0.180	0.827	0.173	0.816	0.184
July	0.824	0.176	0.818	0.182	0.812	0.188	0.813	0.187	0.806	0.194
August	0.827	0.173	0.822	0.178	0.826	0.174	0.820	0.180	0.831	0.169
September	0.847	0.153	0.848	0.152	0.846	0.154	0.842	0.158	0.854	0.146
October	0.857	0.143	0.868	0.132	0.871	0.129	0.868	0.132	0.881	0.119
November	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000
December	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000
Total		0.999		1.000		1.001		1.001		0.999

Use of the EPBB Calculator for PBI annual kWh estimates

The reservation request forms requires that an applicant use the EPBB calculator to estimate annual production of the system. Comparing four different modules from different manufacturers, shown below, the calculator returns a wide variation, over 115kWh annually for a 1MW CEC AC system. For any PBI size system this effect may cause the program administrator to deposit either too much or not enough money into an interest bearing account. Additionally this miscalculation can be used by competitors to demonstrate an expected annual kWh to a potential customer that is driven questionable math.

Manufacturer	Webel-SL	Mitsubishi Electric	SunPower Corp	Solar World
Model	W1600-165	PV-MF165EB3	SPR-215	SW165 Mono/T
STC	165	166	215	166
CEC PTC Rating	143.9	146.9	197.6	154.0
PTC/STC%	87.21%	89.03%	91.91%	93.33%
Number of Modules	7,278	7,129	5,300	6,800
STC DC Rating	1,200.9	1,176.3	1,139.5	1,122.0
PTC DC Rating	1,047.3	1,047.3	1,047.3	1,047.2
Inverter Efficiency %	99.50%	99.50%	99.50%	99.50%
CEC AC Rating	1,000.18	1,000.12	1,000.15	1,000.07
Annual kWh	1,765,401	1,729,259	1,675,181	1,649,454
Difference		-36,142	-90,220	-115,947
Summer kWh	1,072,058	1,050,111	1,017,271	1,001,648
Difference		-21,947	-54,787	-70,410

The Calculator Methodology is Not Transparent

The methodology of the calculator is cloudy to experienced solar professionals. In addition to creating inaccurate summer and annual kWh estimates, the EPBB calculator uses rounding or other mathematical operations in creating the incentive. It is reasonable to think that a company might wish to reproduce the calculator for their own purposes, however the information is not available to do so.

Summary

These brief comments do not attempt to demonstrate all the issues or impacts of the EPBB calculator. Others such as the amount of the incentive rate, tilt and azimuth create additional accuracy and fairness issues. The work and studies that support these and other observations are available from SunPower Consulting, our clients and many other companies in the industry. After running thousands of simulations starting in December 2006, creating tests to determine it's methodologies and characteristics, and discussing the EPBB calculator's use and impact with hundreds of industry participants, some conclusions can be drawn.

First, while it may be difficult to estimate the exact impacts the combination of these issues and others have on the solar market, it's a easy to estimate that in sum they act to create confusion, misunderstanding, the potential for unfair competition, incorrect allocation of program money and perhaps most importantly, reduce the size of the total solar electric market.

Second, all the information about the calculator, it's assumptions, algorithms, formulas, and calculation methods should be made available to the industry.

Third, there are a number of simple solutions available that can improve the current calculator.

Fourth, the CPUC can and should act quickly in collaboration with the solar industry to correct and improve the accuracy and fairness of the EPBB calculator and to stimulate demand. It is essential that action be taken now as an increasing number of companies are reporting that their businesses are at risk.

Respectfully submitted,

Glenn Harris
Managing Director