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November 7, 2006

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 06-NSHP-1
1516 Ninth Street
Sacramento, CA 95814-5512

Re: Comments of the PV Industry on Appendix 3 - Criteria for Testing, Listing, and Certification of Eligible Components of the November 6th Energy Commission Staff Draft New Solar Homes Partnership Guidebook

To Whom It May Concern:

This letter provides formal input from the photovoltaic manufacturing industry on the topics of module performance certification and the precision and accuracy of module power rating. These topics are currently under discussion in the context of development of the CEC's guidelines for the New Solar Homes Partnership program, and there are a variety of different views that have emerged in several conference call discussions sponsored by the CEC. As these are issues that fundamentally impact the business of PV module manufacturers, the PV manufacturing industry, as represented by the signatories to this letter, have developed the consensus proposal outlined below that we believe meets the needs of all parties to this discussion in the most effective manner. We hope you will seriously consider and adopt our proposal.

The PV module manufacturing industry agrees that performance and quality standards for PV modules are necessary at some level to protect consumers. We recognize that the precision and accuracy of module power rating are of particular importance under capacity based incentive structures where incentives are not directly linked to actual measured performance, and instead mathematical models are used to estimate how a PV system will perform when installed in the real world. However, we caution the CEC against putting into place product qualification or labeling requirements inconsistent with those accepted in the rest of the world, as this may put the California market at a disadvantage by either forcing higher prices (to cover costs of complying with specialized requirements), or simply cause industry to move product to other markets where such requirements do not exist.

The US Department of Energy, under its Solar America Initiative, has just launched a three year program to develop national system-level PV equipment performance certification standards. Meanwhile the IEC is developing standard 61853 for the performance of PV modules. It is likely that these highly deliberative and involved processes will result in new, consensus-based performance standards that will be adopted nationally, if not globally, in the coming years. In the meantime, we urge the CEC not to trump these efforts and put in place requirements that hurt the developing California PV market.

Prior to the completion and acceptance of national and international PV performance standards, we feel California can adequately protect consumers and its own investment with minimal negative impact on the California PV market and the companies that serve it.

First, all are in agreement that UL 1703 serves to ensure product safety and California should continue to make this a requirement of its program.

Second, with regard to performance data for the EPBB model, we agree that providing these data through testing under the relevant (electrical performance) portions of the IEC 61215 (61646 for thin film) is ultimately the best solution. However, we must consider that there are small technical differences (cable connectors for example) in products we sell in Europe under IEC 61215 and those that are sold in the US listed under UL1703, and in some cases products cannot meet both standards. Therefore, some flexibility must be allowed to accept performance data for "like" modules tested in the IEC standard. Also, we want to ensure that testing facility requirements are consistent with those accepted for product testing internationally (i.e., TUV). Further, some manufacturers that only sell in the US have never put their products through the IEC 61215 qualification process. Therefore, we propose a phase in approach to utilizing the IEC 61215 (61646 for thin film) qualification testing for providing parameters for EPBB calculation as follows:

- Effective Jan.1 2007, manufacturers will report the values listed in Table 1 (V_{low}, I_{low}, P_{low}, and P_{NOCT} optional until Jan. 1, 2008).
- Effective Jan. 1, 2008, manufacturers will provide those values in Table 1 as measured by a lab accredited to perform the 61215/61646 tests.
- Effective Jan. 1, 2008, manufacturers will provide these values listed in Table 1 for BIPV products using the full mechanical situation as specified in Table 2.

Table 1

Parameter	Symbol	Units
Voltage at maximum power	V_{mp}	Volts
Current at maximum power	I_{mp}	Amps
Open Circuit Voltage	V_{oc}	Volts
Short Circuit Current	I_{sc}	Amps

Nominal Operating Cell Temperature	NOCT	°C
Temperature Coefficients	β_{Voc} (at V_{oc}) β_{Vmp} (at V_{mp}) α_{Isc} (at I_{sc}) α_{Imp} (at I_{mp})	%/°C
Voltage at maximum power and low irradiance	V_{low}	Volts
Current at maximum power and low irradiance	I_{low}	Amps
Maximum Power	P_{mp} (In no case would this exceed the nominal rated power)	Watts
Power at Low Irradiance	P_{low}	Watts
Power at NOCT	P_{NOCT}	Watts

Table 2.

Tilt angle	the test modules shall be positioned so that they are tilted at $23^{o} \pm 5^{o}$ (5:12 roof pitch) to the horizontal.
Configuration:	the test modules shall be located in the middle of an array that is at least four feet high and four feet wide. The array shall be surrounded on all sides with a minimum of three feet of the building system for which the BIPV system is designed to be compatible, and the entire assembly shall be installed and sealed as specified by the manufacturer for a normal assembly.
Substrate and Underlayment:	the test modules shall be installed on a substrate of oriented strand board with a minimum thickness of 15/32 inch that is covered by #30 roofing felt with a minimum R-10 continuous insulation under and in contact with oriented strand board and include any other manufacturer recommended underlayments .

Finally, one of the most contentious issues in the current debate is how to treat the tolerance of the module power rating provided by the manufacturer. Some tolerance in the nameplate rating is necessary due to manufacturing processes, measurement accuracies, and product marketing considerations. A power rating with a tolerance should be acceptable to consumers and the state, as it is common that product performance ratings are generally comparative and include some acceptable level of variation. For example, the National Fenestration Rating Council, which rates the U-value of windows (upon which many utility rebates are based), rates products to a tolerance of +-10% of U-value. However, it has been argued that the +- 10% tolerance on electrical parameters required in order to meet UL 1703 is too broad, and can lead to consumers getting less actual power than what they thought they were getting based on module nameplate power ratings.

One proposal to address this concern has to base incentives upon the "minimum guaranteed module power" as calculated by subtracting the lower limit of the rated power tolerance from the nominal rated power (a module labeled as 100W +-5% would be treated as a 95W module). It would certainly lead to price increases AND program administration cost increases. Manufacturers would tend to divide up their normal production model distribution into many products instead of one in order not to "give away" watts. This would create complications for manufacturers and installers to deliver the right product to the right customer and would result in a higher rate of change requests to approved rebates. The PV industry strongly opposes this proposal.

Another proposal (that published in the current draft of the guidebook) is for manufacturers to certify an average delivered power over some sample of production modules. While this is less onerous than the "minimum guaranteed module power" concept, in practice it is difficult to administer and verify, and it creates a new process both for manufacturing and the CEC. The PV industry does not recommend this proposal either.

Instead of either of these two ideas, we propose that the CEC simply raise the lower limit of the acceptable manufacturer's tolerance to -5% of nominal rated power (power as shown on the label) as a way to address the concerns of those that feel the +-10% tolerance on module power rating is too broad. Compliance would be assured by the UL 1703 standard, which while setting the maximum tolerance of +-10%, also requires that if a manufacturer states a different tolerance, then that tolerance must be met in order to achieve UL listing.

Raising the lower limit of allowed power rating tolerance band to -5% would ensure that in no case would a consumer get less than 95% of the rated power on any given module installed in the program. It would make it nearly impossible for a manufacturer to deliver significantly less on average than the nominal rated power of any module line, due to inherent distribution of actual power measured at the end of a module production line. And, studies have shown that module-to-module variability of up to 5% in actual module power installed in a given array has a negligible impact on array mismatch losses. Under this scenario, the CEC could continue to offer incentives based on the nominal rated module power.

In summary, our proposed recommendations are:

- Require all modules eligible for CEC program must be UL listed with a lower limit on the power tolerance of -5% or smaller.
- Base incentives on nominal rated power.
- Phase in requirement for performance parameter testing under IEC 61215/61646 over a one year period.

In addition to these recommendations, the PV manufacturing industry is also interested in better understanding the EPBB performance modeling algorithms. As we look into the details of how this model calculates PV system performance, we expect to provide

additional comments and recommendations. Specifically, there is concern over how Light Induced Degradation is incorporated into the model, given that there is not a current verifiable industry standard means of measuring LID.

We appreciate the opportunity to provide input into this process, and look forward to further discussing these topics in further detail in upcoming NSHP workshops.

Respectfully submitted, representing the manufacturers of a majority of all solar modules produced worldwide in 2005,

BP Solar
Energy Innovations
Evergreen Solar
Kyocera Solar
PowerLight Corporation
SCHOTT Solar
Sharp Solar
SolarWorld California
SunPower