CPV Standard Conditions

Sandheep Surendran
290 Division St, Suite 401, San Francisco, CA 94103, USA

Introduction

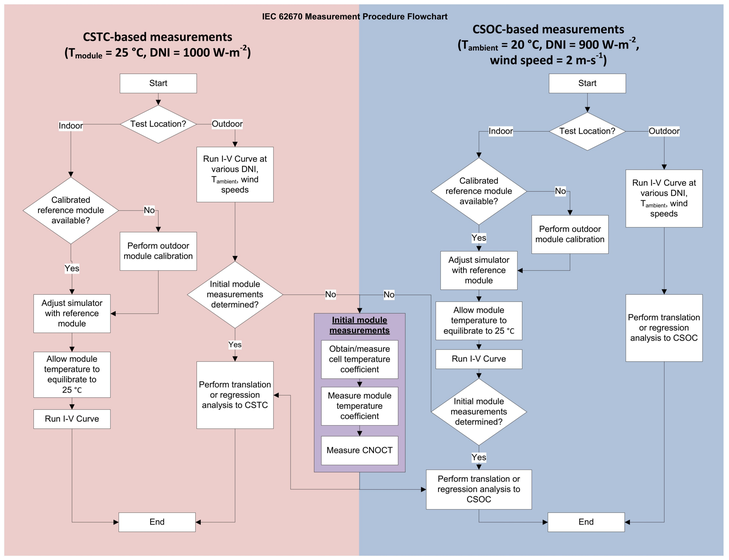
As the CPV industry matures, there is greater need for standard methods to assess module power. These methods must be flexible enough to accommodate both the wide variety of CPV architectures and the challenges of indoor testing. At the foundation of these methods are standard conditions under which the modules are to be assessed. This poster presents the standard conditions for CPV as proposed in IEC 62670-1 and the rationales behind them.

Approach

To maintain consistency with the precedent set by PV standards , IEC 62670-1 provides two standard conditions:

- Concentrator Standard Test Conditions (CSTC) - similar to PV standard test conditions
- Concentrator Standard Operating Conditions (CSOC) - similar to PV standard reference environment for determining nominal operating cell temperature (NOCT)

Though CSTC and CSOC facilitate indoor and outdoor testing respectively, performance at either condition can be assessed in both locations.



Conditions and Rationale

CSTC – Concentrator Standard Test Conditions		
Irradiance	1000 W·m^{-2} direct normal irradiance	• Numerically consistent with PV STC (IEC 61215) • Often defined as “one sun” • Precedent from Progress in Photovoltaics
Temperature	25 °C	• Consistent with PV STC (IEC 61215)
Temperature Location	Cell	• Easily measured in indoor testing
Spectrum	Direct normal AM1.5 spectral irradiance distribution consistent with conditions described in IEC 60904-3	• Consistent with PV STC (IEC 61215)

CSOC – Concentrator Standard Operating Conditions		
Irradiance	900 W·m^{-2} direct normal irradiance	• Accounts for reduced irradiance in the direct beam in CPV -appropriate locations • IEC 62108 references 900 W/m2 DNI • This irradiance is readily available in the field for outdoor testing
Temperature	20 °C	• Consistent with PV standard reference environment for determining NOCT (IEC 61215)
Temperature Location	Ambient	• Easily measured in outdoor testing
Wind Speed	2 m·s^{-1}	• This is a compromise between average wind speeds in CPV-appropriate locations and the measurement consistency achieved on calm wind days.
Spectrum	Direct normal AM1.5 spectral irradiance distribution consistent with conditions described in IEC 60904-3	• Consistent with PV STC (IEC 61215)

Next Steps

These standard conditions will be up for vote as IEC 62670-1 by the IEC national committees later this year. There is an effort underway to amend IEC 60904-3 to include the direct spectrum.

Progress continues on the CPV module performance assessment methods which are targeted to be published at IEC 62670-3 in 2014.

References and Acknowledgements

[1] S. Kurtz et al., “Considerations for How to Rate CPV,” in 7th International Conference on Concentrating Photovoltaic Systems, 2011 © American Institute of Physics.

[2] *Concentrator Photovoltaic (CPV) Module and Assembly Performance Testing—Standard Conditions*, IEC Standard 62670-1, 2012 (expected).

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