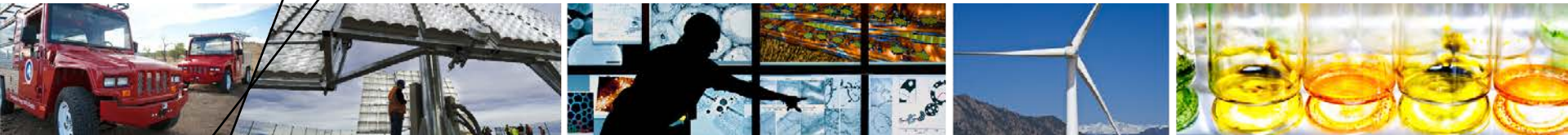


Task Group 9 Update



National Renewable Energy Laboratory

Nick Bosco

NREL PV Module Reliability Workshop

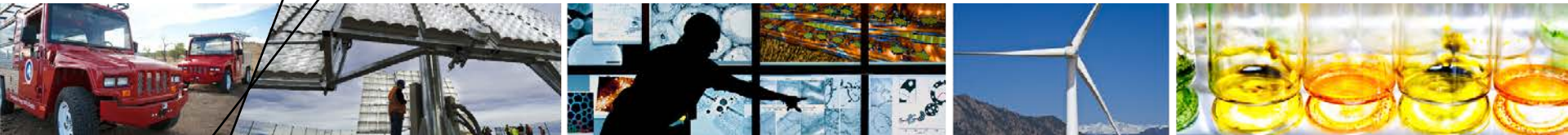
February 25, 2014

Golden, Colorado

NREL/PR-5J00-62600

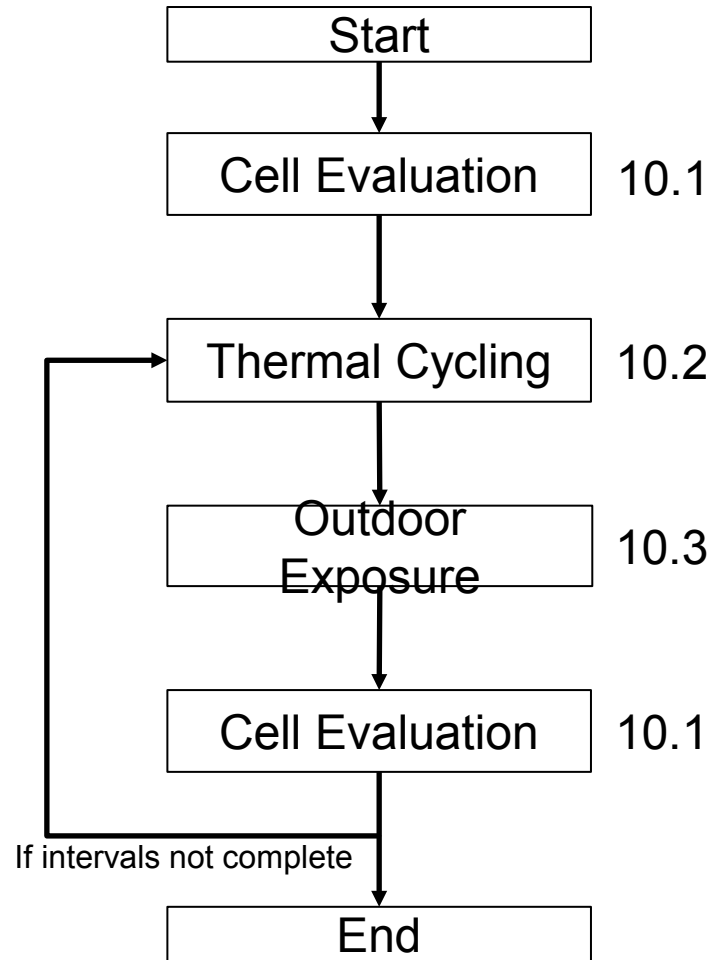
COMPARATIVE THERMAL CYCLING TEST FOR CPV MODULES TO DIFFERENTIATE THERMAL FATIGUE DURABILITY

NWIP submission

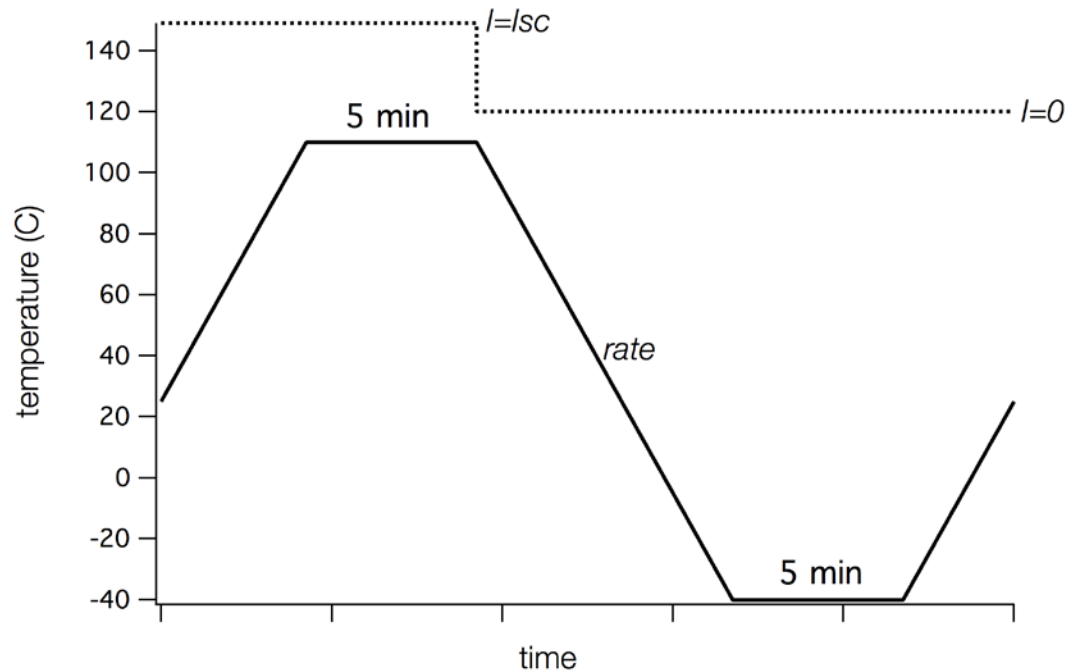


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Test Procedure

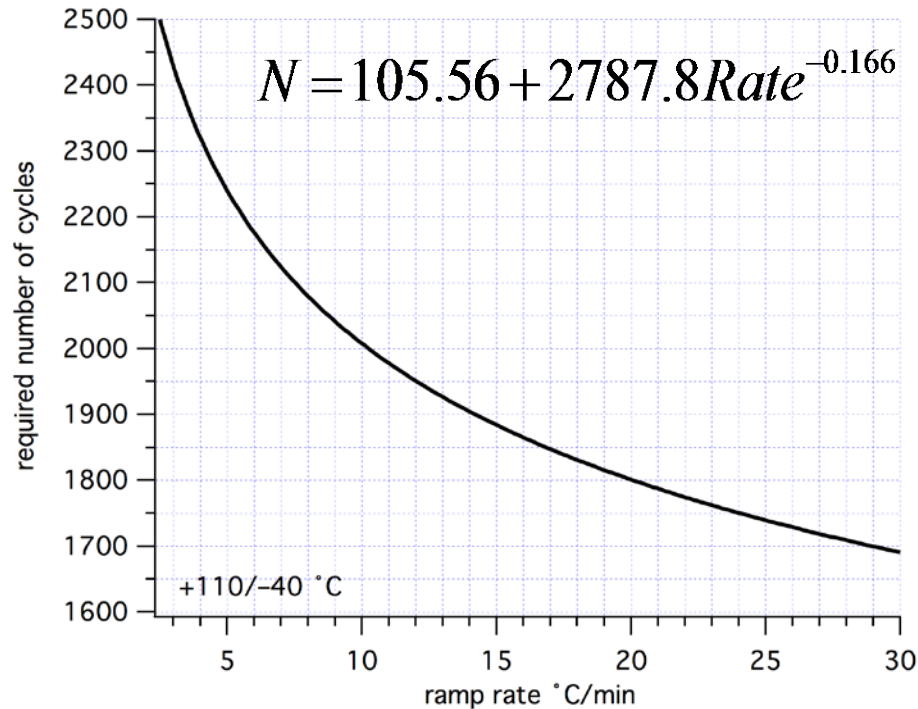


Test Procedure: Thermal Cycling



- 110 to -40 °C with 5 minute dwell times
- I_{sc} applied at 25° C until end of hot dwell
- Maximum average ramp rate of 30 °C/min
- Number of cycles required depends on *rate*

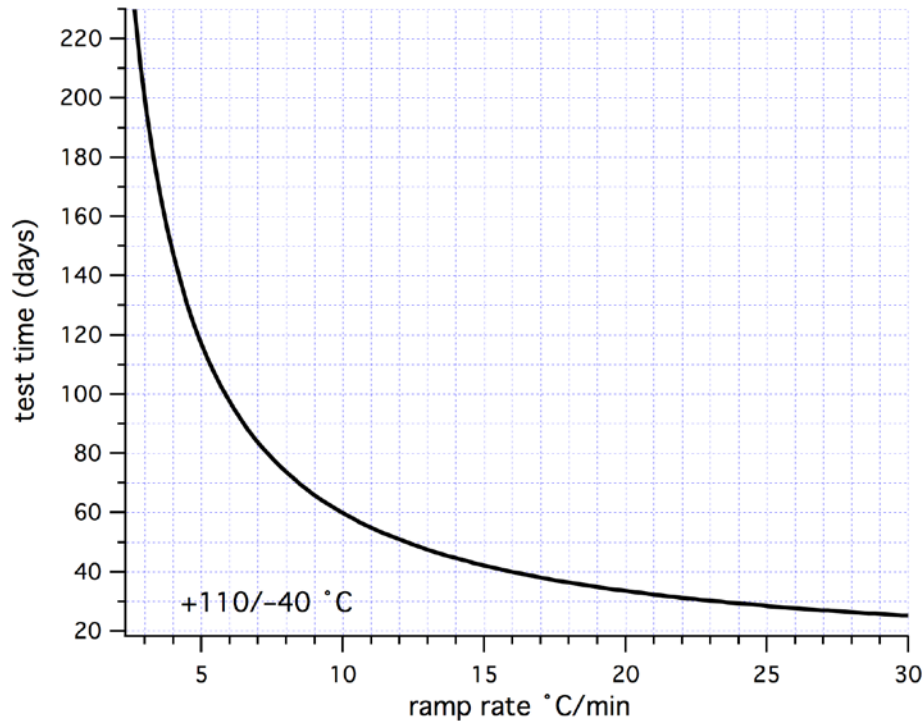
Test Procedure: Thermal Cycling



- Test equivalency is ~5x qualification level
- Number of cycles required depends on *rate*

N. Bosco, T. Silverman, and S. Kurtz, "SIMULATION AND EXPERIMENT OF THERMAL FATIGUE IN THE CPV DIE ATTACH," in International Conference on Concentrating Photovoltaics (CPV-8), Toledo, SP, 2012.

Test Procedure: Thermal Cycling



- Motivation for increasing ramp rate....to a point.

Rating

The rating system is based on the qualification level of testing.

$$\textit{rating} = N_C \frac{N_R}{5}$$

N_C : number of completed cycles

N_R : number of required cycles, according to Equation (2)

The rating achieved is therefore reported in terms of multiples of the qualification level of thermal cycling.