Reliability Demonstration Test

Mission Statement

- Provide the industry a **robust** and **comprehensive** test protocol to evaluate long-term PV module aging behavior for a reasonable price in a reasonable amount of time.
  - **Robust**: only a fraction of module types tested will perform well
  - **Comprehensive**: stimulates all failure behaviors witnessed in the field while avoiding non-realistic failures

- Designed with the most current knowledge – protocol evolves with experience

Reliability Demonstration Test

Test	Duration	Primary Degradation Behaviors Stimulated
Thermal Cycling	600 cycles	Solder joint degradation, cell cracks, Jbox failure, Polymer embrittlement, solder peaks cutting through backsheet
Damp Heat	2,000 hours	Delamination, Corrosion, polymer embrittlement, discoloration, cell degradation, Jbox failure
Damp Heat w/ +1kV	600 hours	In addition to aging behavior above: Ion migration, electrolytic corrosion, polarization
Damp heat w/ -1kV	600 hours	
Humidify Freeze	30 cycles	Solder joint degradation, cell cracks, Jbox failure, Polymer embrittlement, delamination, cell degradation
1. Mechanical Load 2. Thermal Cycling 3. Humidity Freeze	1. 1,000 cycles 2. 50 cycles 3. 10 cycles	Cell cracks leading to performance loss, solder joint degradation, delamination, frame fatigue
UV Exposure	90 kWh	Discoloration, embrittlement, cell degradation, delamination

- Details and frequency of module characterization is very important
- All modules sun soaked before testing starts

PVEL Services

- Reliability & Performance Testing
- PV Module Latent Defect Screening
- Ongoing Degradation Testing
- Supplier Qualification
- Solar Reference Cells
- Warranty Support
- PAN Files
- PV-EPI[1]

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1. Energy Performance Index