Solar Panel Benchmarking - DML Tool (NCPRE IIT Bombay)

Objective:

- Dynamic Mechanical Loading machine to simulate static and dynamic stresses which comes on solar panel due to adverse weather like snowstorm, strong winds in hills & to study effect of stress on performance of solar panel.
- Study resilience of new solar panel designs to survive snow and wind loads as per the latest IEC standards.
- EL and flash I-V of the PV module to study damages due to stresses.
- Tool design for static and dynamic loading of solar panels for testing.

Approach:

- Various size of solar panels are manufactured for different applications so decision was made to design a tool which can be used to test all variation of solar panels with small adjustments of knobs.
- Special unit using centrifugal pumps will be made using pumps to give Pressurized air and vacuum to apply load on the panel.
- Camera setup will be made opposite to the DML machine to take EL of the PV module to study damages & performance during & after the test.

Solution:

- Tool developed can be used to give number of stress cycles on solar panel as per IEC standards and can be controlled using PLC & HMI.
- Specialty of this fixture is Solar Panel of any size can be fitted with small adjustments of knobs & Pressurized air was used in order to apply load on the panel.
- Setup can test solar module of variable size ranging from 900 mm x 700mm to 2100mm×1100mm (customized and adjustable).
- Air & vacuum system designed can apply Static loading as per IEC standard and beyond up to 8000 Pa, Dynamic loading as per IEC standard and beyond up to 2500 Pa.
- Camera setup will be made opposite to the DML Tool can take Electroluminescence picture of the PV module as programed in PLC and as desired, captured pictures can be used to study and compare damages & performance of solar panel during & after the test.
- Interconnect ribbons between cells are susceptible to breakage or likely to fail due to the mechanical stresses experienced by solar panel this damage can be easily studied using EL & flash I-V pictures of the solar panel.

My Role:

- Conceptualization
- CAD & Production drawing GD&T
- Design for Manufacturing & Assembly
- Manufacturing from vendors
- Assembly, Testing & installation at site

Stress induced on solar panel by creating vacuum on back side of solar panel :

• DML Tool Installed at IIT Bombay :



Sample of EL Picture :



Stress induced on solar panel by supplying compressed air on back side of solar panel :

