

Reliability Survey of PV Modules in India (PV-5)



A joint India-U.S. research consortium funded under the *Joint Clean Energy Research & Development Center (JCERDC)*

Scientific Achievement:

A comprehensive field survey of PV modules located in different climatic zones in India was undertaken to obtain degradation rates (% reduction in power per year). The main factors found to affect degradation are: climate, module quality, and installation practice.

Significance and Impact:

The success of India's 100-GW solar target will depend on reliable performance in the field. The survey captures many phenomena seen in the field and gives pointers to how reliability can be improved. Some important results are: 1) the hot climates of India pose a reliability challenge; 2) rooftop installations perform worse than ground-mounted ones; and 3) modules in small PV systems degrade faster than those in large systems.

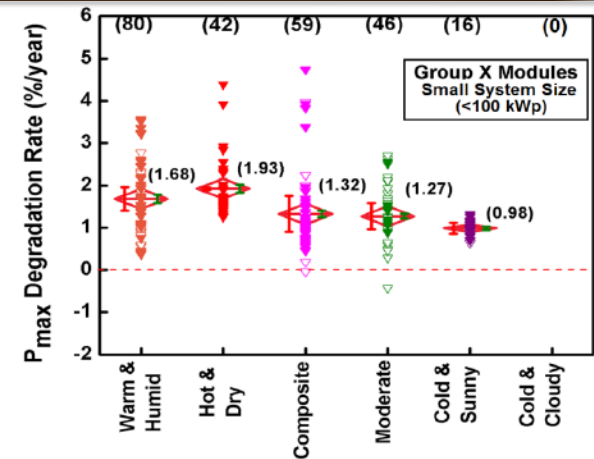
Research Details:

Studied > 1,000 modules at 51 sites using a variety of techniques (visual inspection, electrical measurement, electrolum. and infrared imaging, line breakage, insulation resistance). The surveyed modules were spread over:

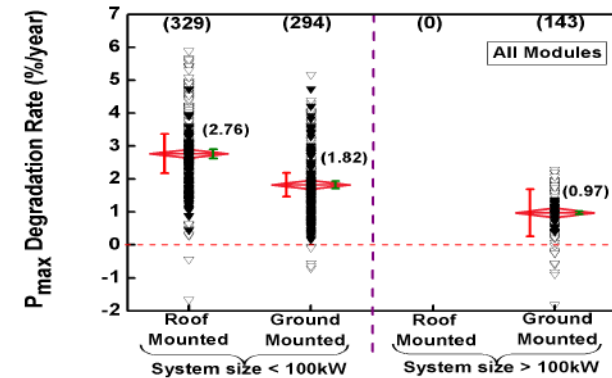
- All 6 climatic zones of India
- 6 different solar cell technologies
- Ground- and roof-mounted systems
- Age varying from 2 to 25 years

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Publication: R. Dubey, S. Chattopadhyay, V. Kuthanazhi, A. Kottantharayil, C.S. Solanki, B.M. Arora, K.L. Narasimhan, J. Vasi, B. Bora, Y.K. Singh, and O.S. Sastry, "Comprehensive study of performance degradation of field-mounted PV modules in India," *Energy Science and Engineering* (2017).



Climatic variation of degradation rates of P_{max}. Mean values are shown by the red bar. Modules in hot climates degrade faster.



P_{max} degradation rates showing that rooftop-mounted and those in small systems degrade faster.

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