

Evaluation of c-si PV modules performances in desert environment

Z. Kherici⁽¹⁾, H. Cheghib⁽¹⁾, N. Kahoul⁽¹⁾, A Neçaibia⁽²⁾, M. sadok⁽²⁾

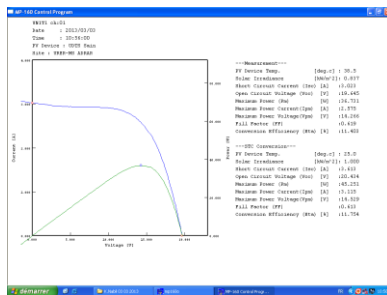
⁽¹⁾ *Laboratory of Electromechanical Systems, Badji Mokhtar University, Annaba, Algeria.
Phone Number: 213 667 39 30 92, e-mail: taq2011@hotmail.fr.*

⁽²⁾ *Research Unit of Renewable Energy in Saharan Middle (URER/MS), Adrar, Algeria.*

1. 1. Introduction – The main contribution of this paper is focused on the evaluation of crystalline silicon solar cells performance that operated in extreme environmental conditions. The following study was carried out at research unit of renewable energy in Saharan middle (urerms.cder.dz), Adrar, in the extreme south Algeria. All data values were measured every 2s from 7:00 a.m. to 7:00 p.m. The evaluation usually consists of I-V curves field measurements and visual inspections. The studied PV modules have been subjected to long-term outdoor exposure for over 11 years in particular geographic region, where the sun at maximum power, the modules were often exposed to the extraordinary constraints; extreme temperatures (with peaks around 63 C° in July, in outdoor), high illumination (exceeds 1000 w/m²) and sandstorm. Thereafter they have been tested for assessing their long-term reliability. Obtained results show a great disparity compared to the results obtained in the literature. Experimental analysis revealed some defects, such as, increase in the cell series resistance and physical material defects.

Key-words – c-Si PV module; Degradation; I-V curves; Visual inspection; Failure; Reliability.

2. Experimental - The study was carried out at research unit of renewable energy in Saharan middle (urerms.cder.dz), Adrar in southern part of Algeria. All panels have been tested under field conditions using MP-160 I-V curve tracer, the I-V curve measurements converted to STC.



Images. Experimental platform

3. Results and Discussion - Electrical performance analysis of tested modules revealed some defects, such as, increase in the cell series resistance R_s , decrease in the cell shunt resistance R_{sh} and physical material defects.

4. Conclusions - Identification of the origin of these degradation modes is essential to improve the long term reliability of crystalline silicon photovoltaic modules in harsh environment. Monocrystalline solar cells can still successfully generate electricity in desert regions or in regions with temperature higher.

5. References

- [1] N. Kahoul et al, "Evaluating the reliability of crystalline silicon photovoltaic modules in harsh environment", *Renewable Energy* 109 (2017) 66-72.
- [2] N. Kahoul et al, "Assessing the early degradation of photovoltaic modules performance in the Saharan region", *Energy Conversion and Management* 82 (2014) 320–326.