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Analysis and evaluation of the impact of climatic conditions on thephotovoltaic modules performance in the desert environment

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Abstract: The main objective of this study is to investigate the impact of climatic conditions on the performance ofphotovoltaic modules installed in the desert region in south of Algeria. Firstly, the performance ofISOFOTON 100 module under daily weather conditions is evaluated. Next, the effects of partial shadingand accumulation of sand dust for a period of two months on power loss and the current–voltagecharacteristics of photovoltaic modules are examined. Finally, the visual inspection of the degradationof the UDTS 50 modules such as discoloration of encapsulant and delamination show the influence ofhigh temperature and the other climatic factors in the Saharan environment after a long time exposureof more than 10 years observed in the field at the Unit of Research in Renewable energy URERMS Adrar.The performance degradation is also assessed using (I–V and P–V) curves normalized at STC conditioncompared with the nominal STC data given by the manufacturer. The experimental results show thatthe performance parameters such as maximum output current (Imax), maximum output voltage (Vmax),maximum power output (Pmax), open-circuit voltage (Voc), short-circuit current (Isc) and fill factor (FF)of UDTS 50 modules are degraded after these years of exposition.

Keywords : Photovoltaic module, Performance evaluation, degradation, Desert environment