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Correlation of Thermal Imaging and Current-Voltage characteristics of PV module strings

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Thermal infra-red (TIR) imaging is a fast and inexpensive technique for detecting defects in Photovoltaic (PV) modules in large-scale solar PV plants. Abnormalities in the current-voltage (I-V) curve of a module string can be indicative of an underperforming module in the string. The physical location of this fault can only be identified by performing electrical measurements on each module in the string. Since it is not practical and feasible to measure I-V curves for individual modules in a large PV plant, correlating the thermal signatures with electrical I-V parameters of module strings makes it possible to identify and understand the effects of the thermal anomalies on the performance of modules in large PV plants. In this study copper-indium-gallium-deselenide (CIGS) and multi-crystalline Silicon (mc-Si) modules in an operational PV system were investigated and TIR images correlated with electrical performance. Thermal anomalies resulting from module defects were identified and their effect on performance determined. Results show that a single defect such as a crack in one of the modules in a string can result in a power loss greater than 8%. In addition to power loss, defects that result in areas of increased temperature or “hotspots” also pose a fire hazard on power plants. Furthermore, this work has a direct impact on the improvement of the operation and performance in PV plants.

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no

Level for award
 (Hons, MSc,
   PhD, N/A)?

N/A

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