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A Case Study into the Effects of Partial Shadowing on a 4 kWp Photovoltaic array

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Abstract :

Photovoltaics provides a feasible alternative to traditional fossil fuels, however, cell mismatch significantly affects the performance of photovoltaic (PV) modules. Cell mismatch occurs when a solar cell in a series connected string produces lower current than the other cells in that string due to shading, degradation or the accumulation of dirt. A 3.880 kWp PV array consisting of 2 series-connected module strings with 8 modules per string was installed in a residential area and their performance is continually being monitored. The array is connected to the municipal grid via a 4 kW grid-tie inverter that has 2 maximum power point trackers (MPPTs) and energy generation data measured by the inverter and a municipal smart meter configured for gross feed-in metering. Due to the constraints of the installation site, the array is orientated north-east and there is inevitable shading on the array. In this study, the effects of the presence of morning shading on the energy performance of the array were investigated and are reported in this paper. Shading on the east module string of the array in the morning resulted in a power loss of up to 39% measured against the unshaded west string, depending on the shading pattern. An energy loss of 19% for the string was measured during the time while shading is present.

Award :

yes

Level :

PhD

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Paper :

No

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