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Performance analysis of a 3.2 kWp grid-connected PV system in the Eastern Cape, South Africa

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Abstract :

This paper analyzes and compares the actual and simulated performance of a 3.2 kWp grid-connected photovoltaic system. The system is located at the Outdoor Research Facility (34.01oS, 25.67oE) in the Nelson Mandela Metropolitan University (NMMU), South Africa. The system consists of 14 poly crystalline silicon modules connected in two strings of 7 series-connected modules, each facing north at a tilt of 34o. The data presented in this study was measured in the year 2013 where the system supplied 5756.7 kWh of energy to the grid. The performance of the system was simulated using PVsyst software with measured climate data (solar radiation, ambient temperature and wind speed) at the site for the same year. The measured annual irradiance on the solar plane was 2119.8 kWh/m², and the measured specific energy yield is 1787.8 kWh/kWp/year, while the predicted value is 1741.6 kWh/kWp/year. The results of estimation of energy yield using PVsyst software are in agreement with actual measured value with difference of 2.6%. The performance ratio ranges from 81 to 86% with an annual mean value of 84%. This paper discusses the difference between measured and simulated energy yield and the validity of assumptions.

Award :

No

Level :

PhD

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Paper :

Yes

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