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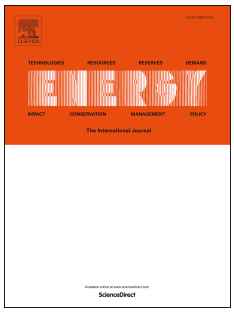

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A Simple Stochastic Method for Modelling the Uncertainty of Photovoltaic Power Production Based on Measured Data

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Abstract: This paper describes statistical quantification tools for predicting photovoltaic (PV) production considering uncertainty in PV production at same irradiation levels and PV panel temperatures. When analysing measured data, it is observed that there are different PV power production levels for the same irradiation levels and panel temperatures. These PV power spread out can be caused by different causes, such as dust deposition over the panel, non-ideal working of maximal power point tracking devices, device efficiencies' dependence on power, different temperatures over the PV panel, and others. Due to the stochastic character of these occurrences, they can be challenging when considered in the deterministic mathematical models usually used for PV power prediction. The probabilistic method for PV power production is proposed based on the probability density function with respect to the solar irradiation and the panel temperature. The simulation results are compared among the different models based on the probability density function with respect to the solar irradiation and panel temperature. The best overlapping between measured and calculated PV power production gives the proposed stochastic models dependent only on irradiance. The proposed stochastic model gives a PV energy prediction on a yearly basis with an error of less than 1%.