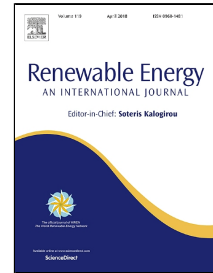


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Investigation and Modeling of Long-term Mismatch Loss of Photovoltaic Array

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Abstract

Many studies have been conducted to analyze and reduce mismatch loss (MML) in photovoltaic array. They have concluded that MML is typically less than 1 % at installation and the economic loss is insignificant. In this study, long-term MML effect on photovoltaic array is explored quantitatively. An outdoor test has been conducted to verify that MML is increasing over time for a string of photovoltaic modules. The electrical parameters of the modules in the string are measured at the standard test condition (STC) before installation and after the exposure of 5.5 years. MML is estimated and compared for the data by two approaches; using a stochastic model and string simulating by a SPICE program. It is confirmed from the two methods that MML increases over time. Long-term MML model is developed based on the test data and several results from previous studies. The model expected that the MML keeps increasing over time and is substantial to the output of a solar power plant. The study reveals that MML could be a detrimental factor to the long-term maintenance of solar power plant.

Keywords: Mismatch loss; Photovoltaic array; Long-term reliability; Solar power plant maintenance

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