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Effect of Shading on Series Solar Modules: Simulation and Experimental Results

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Abstract

This paper is on the five-parameter modeling for photovoltaic systems. Normally, the technical information for photovoltaic panels is too restricted to identify the five parameters. So, an undemanding heuristic method is adopted in this paper, requiring only information on open circuit, maximum power point and short circuit conditions. The I-V and the P-V curves for a series connected monocrystalline photovoltaic system is obtained from the parameters identification using the heuristic method and validated by comparison with experimental curves. Also, a simulation for partial shading on the photovoltaic system is presented to illustrate a feasible assessment during the design of a PV system for loss of energy conversion due to shading.

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Keywords: PV system; effect of shading; algorithm for parameter estimation; simulation; experimental results

1. Introduction

The demand for energy, the shortage of fossil fuels and the need for carbon footprint reduction have resulted in a global awareness of the importance of energy savings and energy efficiency [1] and programs on the Demand-side Management have been developed in order to assist consumers on energy usage. Also, renewable energy sources coming from wind and solar energy sources are attractive to go into exploitation, considering not only large scale systems, but also micro and mini scale conversion systems, i.e., Disperse Generation (DG) owned by consumer.

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