

# Improving the Effect of Non-uniform Thermal Distribution and Electrical Mismatch for PV Panel During Partial Shading Condition



Abdul Hadi Mohd Hanif, Mohd Shawal Jadin, Norizam Sulaiman, Airul Sharizli Abdullah, and Lee Woan Jun

**Abstract** Solar power is a sustainable energy source that generates electricity from the sun radiant. More than 114.9 GW of photovoltaic (PV) systems have been installed and commissioned in the world last year, which results in the new global total installed capacity at the end of 2019 reached at least 627 GW. However, the drawback of solar power is PV mismatch, generally due to partial shading condition (PSC). Hence, this research aims to analyse the effect of non-uniform thermal distribution and to improve the performance of the PV module under PSC. The experiment was held under different shading, and data were collected using MATLAB Simulink. The outcome reveals that with bypass diode improve the performance of the PV module under PSC. Moreover, mitigation from this drawback causes another problem, making maximum power point tracking (MPPT) hard to track global maximum power point (GMPP) because of multiple peaks to appear on the power versus voltage  $P$ - $V$  graph.

**Keywords** Partial shading · Shading pattern · Performance PV · Solar cell · PV module

## 1 Introduction

Solar power is a sustainable energy source, having the advantage of environment-friendly and low maintenance [1]. In 1839, the first photovoltaic (PV) effect was found by Alexandre Edmond Becquerel. Since then, solar power becomes a target in the scientific world [2]. A new era begins when three American researchers Daryl Chapin, Calvin Fuller, and Gerald Pearson working at Bell Laboratories. They created a PV cell that might transform sufficient solar power into electricity to run any standard electrical equipment in 1954 [3].

At the early age of PV, the technology was not appreciated due to cheap oil and low energy prices. However, the oil crisis began in 1973, and 1974 had changed the

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A. H. M. Hanif · M. S. Jadin (✉) · N. Sulaiman · A. S. Abdullah · L. W. Jun  
Faculty of Electrical and Electronic Engineering Technology, University Malaysia Pahang, 26600  
Pekan, Pahang, Malaysia  
e-mail: [mohdshawal@ump.edu.my](mailto:mohdshawal@ump.edu.my)