MATEC Web of Conferences
Volume 225, 5 November 2018, Article number 04018
2018 UTP-UMP-VIT Symposium on Energy Systems, SES 2018; VIT Tamil NaduTamil Nadu;
India; 18 September 2018 through 19 September 2018; Code 141921

Evaluation on Methods in Estimating the Photovoltaic Performances Affected by Module Operation Temperature in Tropical Region

(Conference Paper) (Open Access)

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Abstract

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This research work is intended to evaluate the reliability of commonly utilized empirical correlations of module operation temperature in estimating the photovoltaic performances in tropical region . The Nominal Operation Cell Temperature (NOCT) model, Tropical Field Operation Cell Temperature (tFOCT) model and the experimental back module temperature were selected for evaluation purposes. The models were evaluated by comparing the performance characteristics of a 250W monocrystalline photovoltaic module installed at University Malaysia Pahang. The monocrystalline back module temperature and power output as well as the environmental data including both solar irradiation and ambient temperature were monitored to assist the analysis. Based on the 5 consecutive day experimental data, results indicated that the module operation temperature estimated by tFOCT model had the closest value to the experimental back module temperature . Whereas, the temperature estimated by NOCT model showed the highest deviation up to 25.8% from the experimental back module temperature . However, in terms of estimating the photovoltaic module power output, the NOCT model had the closest value to the experimentally measured power output. The results also indicated that utilizing the back module temperature often mislead the estimation of photovoltaic module power output. In addition, the deviation of estimated power output from NOCT model, tFOCT model and back module operation temperature as compared to the experimental power output were 15.4%, 18.87% and 21.2%, respectively. Thus, the NOCT model demonstrated better estimation of power output as compared to the experimental result than tFOCT model, and back module temperature . However, better estimation method for tropical regions is still needed because three methods evaluated in this study shows deviation of more than 15.4% from the measured power output.

SciVal Topic Prominence

Topic: Photovoltaic cells | Solar energy | photovoltaic thermal

Prominence percentile: 99.767

Indexed keywords

Engineering controlled terms: Photovoltaic cells | Tropical engineering | Tropics

Engineering uncontrolled terms: Empirical correlations | Environmental data | Estimation methods | Nominal operations | Operation temperature | Performance characteristics | Photovoltaic modules | Photovoltaic performance

Engineering main heading: Thermoelectric power

Funding details

Funding sponsor	Funding number	Acronym
Ministry of Higher Education, Malaysia	FGRS/1/2014/TK06/UMP/01/1	MOHE
Ministry of Higher Education, Malaysia	RDU140119	MOHE

Funding text

The author would like to acknowledge the authority of Malaysia Ministry of Education and University Malaysia Pahang upon the funding provided for the research under grant RDU140119 or FGRS/1/2014/TK06/UMP/01/1

ISSN: 2261236X
Source Type: Conference Proceeding
Original language: English

DOI: 10.1051/matecconf/201822504018
Document Type: Conference Paper
Volume Editors: Abdul Karim S.A.,Zainuddin N.,Sa'ad N.,Yusof M.H.
Publisher: EDP Sciences

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