

A simple approach in estimating the effectiveness of adapting mirror concentrator and tracking mechanism for PV arrays in the tropics

Abstract

Mirror concentrating element and tracking mechanism has been seriously investigated and widely adapted in solar PV technology. In this study, a practical in-field method is conducted in Serdang, Selangor, Malaysia, for the two technologies in comparison to the common fixed flat PV arrays. The data sampling process is measured under stochastic weather characteristics with the main target of calculating the effectiveness of PV power output. The data are monitored, recorded, and analysed in real time via GPRS online monitoring system for 10 consecutive months. The analysis is based on a simple comparison of the actual daily power generation from each PV generator with statistical analysis of multiple linear regression (MLR) and analysis of variance test (ANOVA). From the analysis, it is shown that tracking mechanism generates approximately 88 Watts (9.4%) compared to the mirror concentrator which generates 144 Watts (23.4%) of the cumulative dc power for different array configurations at standard testing condition (STC) references. The significant increase in power generation shows feasibilities of implying both mechanisms for PV generators and thus contributes to additional reference in PV array design.

Keyword: Mirror concentrating; Tracking mechanism; PV technology