

Increasing energy harvest of photovoltaic arrays under uniform illumination: a case study on photovoltaic arrays in Boulder CO and Tucson AZ

ABSTRACT

Studies on photovoltaic (PV) arrays have demonstrated that some arrays suffer from mismatch power losses even under uniform illumination. This mismatch power loss that is attributed to the inequality of characteristic parameters between a PV array's modules is conventionally addressed by sorting techniques - which stands for sorting PV modules in an array by one of their characteristic parameters such as I_{sc} , $IMPP$ or $PMPP$. Another recently suggested method to address this problem is arranging modules by genetic algorithm (GA). This paper applies this new technique to three PV arrays with relatively high mismatch losses. I-V curves for each array's modules are measured under different levels of radiation to provide a precise model. This precise modeling is used to run an annual simulation of energy yield and mismatch losses. Simulations carried out in this study show that a proper arrangement of modules in arrays decreases the mismatch losses and increases annual energy output more than what is gained by sorting techniques.

Keyword: Photovoltaic; Mismatch losses; Arrangement; Module