

Performance of Non-uniformly Cooled-PV modules

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Abstract

The ambient temperature strongly influences the electric performance of photovoltaic (PV) modules. Thus, integrating cooling systems with PV modules represents a very important aspect keeping modules within acceptable operating temperatures.

The objective of this study is to analyze the performance of PV modules where their series interconnected cells share different operating temperature values. The PV modules are cooled with a fluid serving as both a heat sink and a solar heat collector. This enhances the electric efficiency values of the PV modules by preventing them from elevated temperatures. The new consideration in this paper over the existing ones is that the temperature distribution on each PV cell is taken into account, in the calculation of the whole current voltage characteristics of the PV modules, resulting in a more accurate analysis. The difference in temperature values is a result of the temperature gradient of the fluid flowing through the pipes. The potential of this study becomes more important for countries of high temperatures like United Arab Emirates (UAE).