



Temperature Impact and Efficiency Analysis of Hybrid PVT System

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Abstract

Hybrid photovoltaic thermal (PV/T) systems are a type of solar system that combines the functions of a photovoltaic and a solar thermal in one unit [1]. The PV panels generate electricity from sunlight, while the thermal collection system captures the excess heat produced by the PV panels and uses it to produce warm water or space heating [2].

According to the recent analysis, the efficiency of the solar energy production in particular solar photovoltaic system is still low [3]. There are several factors to be considered that affect the energy production during the operation of hybrid PVT system. There are several internal and external or environmental parameters are responsible for this output disruption. The parameters found to be affecting are solar irradiance, environmental and module surface temperature, humidity, wind speed, shading, dust and many others [3]. Solar irradiance and temperature are the key role-players among all the variables. The light intensity or solar irradiance value is related with PV production as it affects short circuit current of the absorbed photons in the semiconductor material.

The most important parameter which is the main concern of this work is the inside and outside temperature of the panel. If there is rise in ambient temperature, then the short circuit current only increases that results in decrease in power output [3-4]. As a result, the maximum power point (MPP) also decreases with the rise of temperature. Temperature is considered as a negative parameter in the panel, but it turns into positive in the proper use of hybrid PVT system. In this work, the impact of temperature rises in the panel and its related power output is shown which clearly identifies the negative result on the panel. Additionally, the MPP output due to temperature rise is also explained in the figure. Afterall, the changes in efficiency due to the temperature rise also analyzed in this work.

One of the main advantages of hybrid PVT system is that it helps to regulate the panel temperature that tends to improve its efficiency. The PVT system can keep the panels cooler with high efficiency by capturing and using the excess produced heat. Temperature can be regulated in a PVT panel using several methods which will improve overall efficiency. Thus how, the PVT panel will be cooled producing more electric energy including thermal energy. This work proves that the impact of temperature rise can be mitigated, and efficiency is improved using hybrid PVT system properly.

Key words: PVT System, Temperature Effect, Efficiency Analysis, MPP.

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