

ABSTRACT

Increased solar panel temperatures can significantly reduce efficiency, especially in hot environments. This study aims to design and implement an ESP32-based direct air cooling thermoelectric system on Solar Energy Harvester and improve solar panel efficiency. This cooling system utilizes thermoelectric modules (Peltier) controlled automatically using an ESP32 microcontroller connected to DS18B20 and DHT22 sensors. The test results compare the efficiency values of solar panel with and without cooling systems. The results show that the cooling system can increase the efficiency value by 8.22% from the average efficiency value of solar panels without cooling, which is 6.73%, to 14.95% with solar panels using cooling, so that the use of direct air cooling thermoelectric cooling can increase the efficiency of solar panels.

Keywords: *thermoelectric, peltier, ESP32, DS18B20, DHT22, solar panel efficiency, direct air cooling.*