A Novel Approach on Improving the On-Demand Cooling of Solar Panels Through the Use of an Automated Algorithmic Control System

Botello, Christopher

Through prior experimentation conducted in Year 1 and Year 2 of the student research, it was determined that as the temperature of a solar panel decreases, the power output increases. It was also concluded that by creating a cooling manifold that cooled the solar panel from the back by specifically utilizing the evaporative cooling effect of water, a power increase of 10-12% could be achieved as a result of a 20^{o}C temperature change in the winter months. The cooling system design differed from others investigated in its ability to effectively cool the solar panel from the back, instead of the surface, while also functioning without the use of a water pump, and by specifically utilizing the evaporative cooling effect of water through an originally designed duty cycle. However, changing temperatures influence the amount of heat energy diffused out of the panel with a given water consumption thus establishing the need for an algorithmic control system that could adaptively change the duty cycle of the cooling manifold in order to maximize the energy output for the least amount of water consumption under changing conditions. In order to create the algorithmic control system, variations of the duty cycle were used in varying temperatures to establish the range of the system in constant solar conditions through the use of a pyranometer. By doing so, a current value of 754 watt hours of energy per gallon of water consumed was achieved thus proving the hypothesis and providing promise for future utility and domestic applications.