Facile and Green Assembly of a Novel Photovoltaic Array Cooling Mechanism: A Study Preventing Hot Spot Damage Using a Sealed Liquid Cooling Unit within a Hydrophobic Encasement

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Limited resources and increased demands for energy underscores the importance of alternate sources of efficient, renewable energy. This project's aim is to develop a hydrophobic weatherproof technique that prevents hot spots on solar panels. When a solar panel reaches a specified temperature, a sealed liquid CPU cooler with a copper plate retrofitted beneath the solar panel paired with a corresponding thermostat primed to activate automatically would hypothetically lower the surface temperature, thus preventing hot spots. It is intuitive that the cooling mechanism encased in Plexiglas would enable the device to withstand extreme weather conditions. One hundred independent trials provided valuable data. Tests consisted of measuring the solar panel's surface temperature with an electronic thermostat probe attached to the top of the array. The thermostat recorded the surface temperature of the panel and automatically activated the sealed liquid CPU cooler with a copper plate at 34.3°C. The mechanism operated for 30-second intervals at which time the cooled panel's temperature was recorded. The liquid cooling mechanism consistently lowered the panel's surface temperature to 26.76°C. As predicted, the liquid CPU cooler lowered the panel's surface temperature by an average of 7.54°C. An ANOVA test confirmed the significance of the data. This innovative design demonstrates that a liquid CPU cooler with a copper plate combined with a hydrophobic weatherproof encasement, can prevent hot spots and weather damage to the solar panel and cooling mechanism.

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