Innovative Cooling Design For BIPVT

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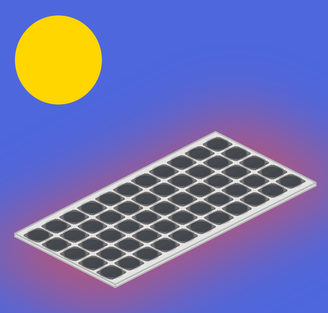
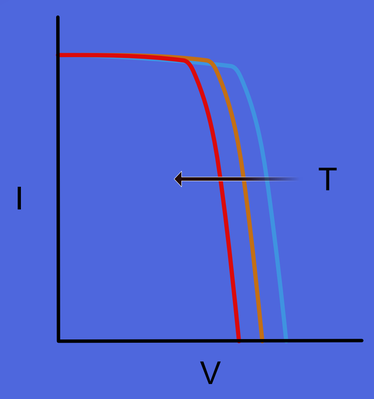
1. Introduction

The efficiency of photovoltaic (PV) modules is inversely correlated with their operating temperature.

PV modules typically convert up to 20% of the incident solar radiation into electrical power. The rest is dissipated as thermal energy, inevitably increasing the temperature of the panel.

This causes a linear drop in efficiency of up to 0.5 %/°C *.





Maintaining a stable and low surface temperature ensures enhanced PV efficiency, power generation and a prolonged life span of the modules.

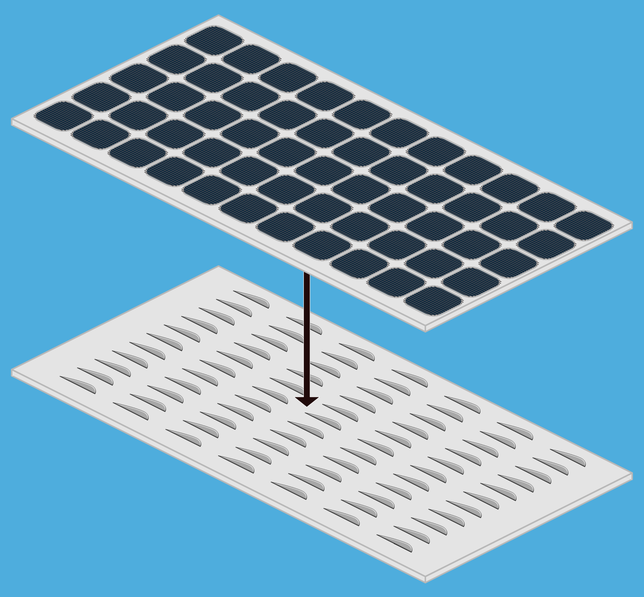
This can be achieved by the efficient cooling of the PV panel surface.

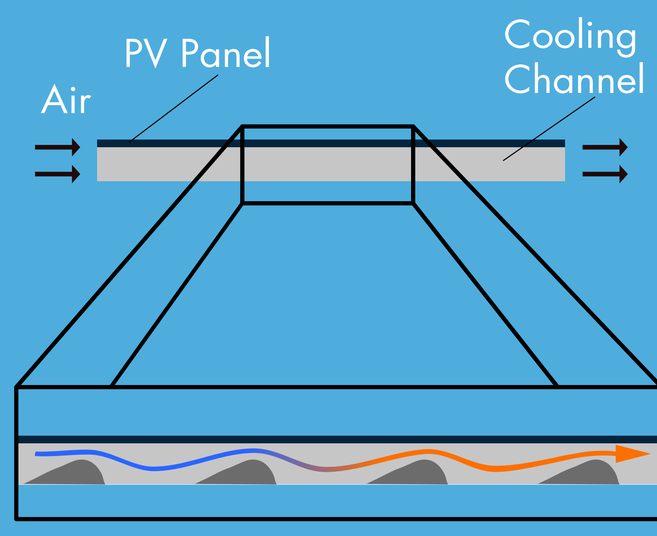
The extracted heat can be potentially recovered and be utilized in building energy service systems.

2. Methods

Computational Fluid Dynamics are employed to discover the optimal fin and baffle geometries for an Air Cooled BIPVT.

Mock-ups of top performing geometries will be constructed with state-of-the-art 3D printers, to verify results in the lab.



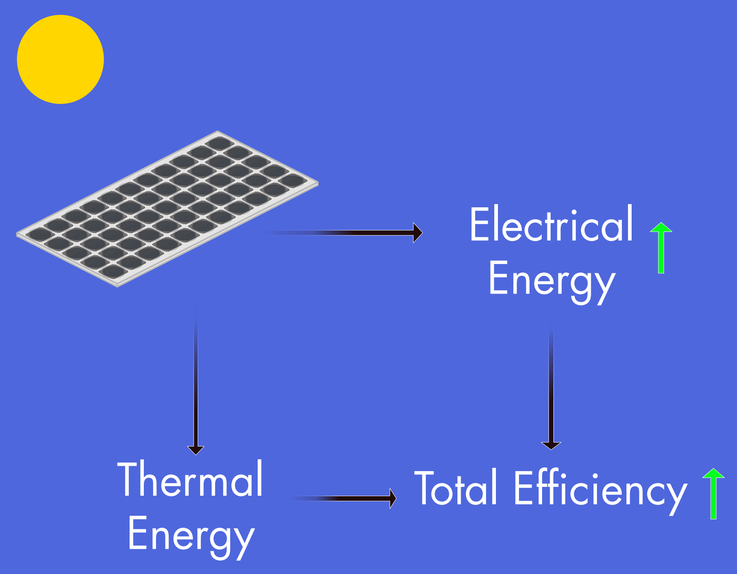


3. Goals

The objective is to achieve a uniform reduction of surface temperature.This will lead to an increase in electrical efficiency in nominal operation.

Additionally, thermal energy is supplied in the form of warm air.

Thus, the overall conversion of solar energy is enhanced.



The study aims to show that it is feasible to efficiently cool BIPVT with Air, in order to enhance both its electrical and total output.

The next step is to design an all-in-one solution compliant with industry standards, as well as the exploration of suitable applications for the generated thermal energy.

Integration scenarios with energy systems

Funding

Swedish Energy Agency

Reference *

Skoplaki, E. Palyvos, J.A. On the temperature dependence of photovoltaic module electrical performance: A review of efficiency/ power correlations. Solar Energy. Vol 83, pp. 614–624 (2009)

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