A Preliminary Analysis on the Night Cooling Potential of Photovoltaic/thermal (PV/T) Panels for European Cities - DTU Orbit (09/08/2019)

A model of three PV/T collectors of 3.9 m² area was developed in TRNSYS for analysing its cooling potential in Athens, Greece; Madrid, Spain; Milan, Italy; Bucharest, Romania; Frankfurt, Germany; Copenhagen, Denmark and Oslo, Norway between 1st of May and 30th of September. An in-depth analysis over the model was conducted for Copenhagen, Denmark where supply temperature, collector slope, and flow rate were varied. For the other six European cities subject to different climates, the only parameter varied was the supply temperature while the optimum slope for electricity production was selected for the PV/Ts. A coverage ratio was determined, representing the amount of cooling demand of an office room covered by the cooling energy produced by the PV/Ts. With respect to Europe, a higher cooling potential was found for northern climates. For a representative supply temperature of 21°C, a specific cooling power ranging from 35 to 70 W/m² was determined. Finally, the same trend was visible for the coverage ratio, ranging from 55% to 120%. The results show that this cooling technology has a potential to be further used, when coupled to appropriate room cooling systems, such as water-based high temperature cooling systems.

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