

Examination of the cooling effectiveness of wind in elevated photovoltaics modules using CFD

Initial conditions and goals

The efficiency of PV panels is primarily impacted by the module's temperature during operation. Because the active cooling of the solar modules is often inefficient, the use of natural sources to lower the temperature are of interest. This project investigated the impact of wind on the temperature of 230 W modules using CFD simulations. The heating of the modules by the sun was also considered in this context. The goal of the project was to determine the temperature distribution on the modules and the improvement of the cooling effects by the wind through design adjustments. The results of these simulations were subsequently validated using measurement data.

Simulations at varying wind speeds showed, as hypothesised, that wind speed affects the module's temperature. The effects of the relative position of the module in relation to the direction of the wind are negligible in this context. The temperature distribution on the module particularly showed warmer areas in the centre of the area, rather than in the margins. In the comparison with the measurement data, it was considered that the simulations assumed a consistent flow of the wind. Disruptions, such as eddying due to house edges or obstacles were not considered, which explains the deviations in the comparison with the measurement data.

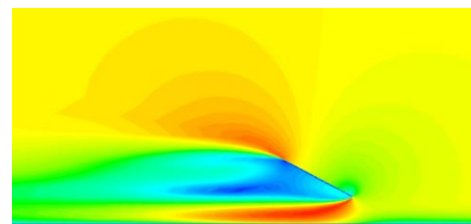


Fig. 1: Flow velocity around the PV module

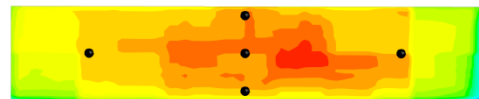


Fig. 2: Temperature distribution on the model including measuring points

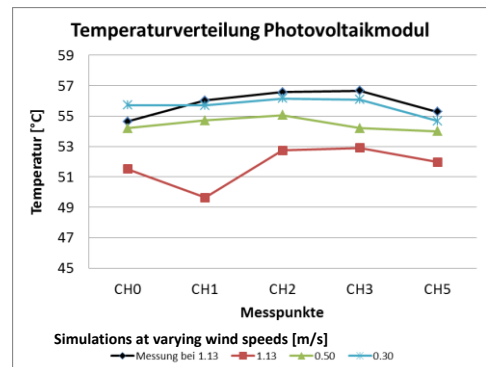


Fig. 3: Temperature distribution on the measurement points at varying wind speeds