



Influence of solar spectrum and climate on the performance of c-Si, a-Si and CdTe modules

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Within the scope of the project PV-SPEC we investigate the performance of different types of photovoltaic (PV) modules as a function of the regional climate of Austria. Three types of modules were chosen for the present study: monocrystalline silicon cells (c-Si), amorphous silicon cells (a-Si) and cadmium telluride cells (CdTe). The criteria for the selection of the cells is on the one hand their different spectral sensitivity and on the other hand the need of research in the domain of thin film technology. The aim of the project is the exact estimation of the potential energy yield of these three module types in the different climatic regions of Austria. Thereby the effects of the very inhomogeneous and structured topography in Austria need to be fully taken into account.

As a first step the characteristics of the PV modules as well as their spectral sensitivity were determined in the laboratory.

In a second step routine measurements of the module performance were performed at Observatory Kanzelhoehe (1600 m altitude), and in Vienna (170 m altitude). In order to investigate the influence of temperature, wind, cloudiness and solar spectrum some additional measurements of these quantities were performed. In order to investigate the influence of the orientation of the modules, we performed for each module type the measurement of the performance of three modules with different orientations: one module oriented towards south, one towards east and one towards west.

In a third step we then analyse the performance as a function of time of the day, as a function of the season, as a function of the meteorological parameters (temperature, wind and cloudiness) and as a function of the spectral distribution of the solar radiation.

The meteorological influence on the PV module performance is quantified using one array type function for each module type.

Using this function and a radiative transfer model we may in a last step calculate the energy yield potential of the three PV module types for the different regions of Austria.