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MODELLING SOLAR ENERGY FOR ANTARCTIC PHOTOVOLTAIC APPLICATIONS

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Environmental concerns, rising fuel prices and the abundance of solar energy, during the summer months, have led to the development of a mathematical model for estimating solar energy captured at any site, during any time frame. The model takes into account factors such as the exact sun position, air mass, shading from the surrounding topography, photovoltaic panel angle and uses statistical analysis of historic temperature and weather patterns to help predict the likely total energy production. The cooler temperatures in Antarctica mean output powers of PV panels, if used in conjunction with a Maximum Power Point Tracker (MPPT), can often exceed their rated output. This gives greater energy yields and makes Antarctica, during the summer months, an attractive prospect for solar photovoltaic applications.

The model is an ideal tool for investigating and costing projects involving photovoltaic installs in both field camps and Antarctic bases. Optimum panel angles can be calculated, depending on the above mentioned factors and basic cost benefit analysis can be applied to compare energy price with that of fossil fuel generation. A case study, involving the installation of a PV system on a remote research hut is used as an example.