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ESKOM, Irradiance and Sunny Skies - the physics of solar irradiance in South African conditions

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Abstract content
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Solar power generation efficiency is not only a function of the detector technology and configuration, but also depends on the amount, spectral distribution and angular profile of sunlight at ground level. This paper reviews some common techniques used estimate the solar photon field at its interface with the detector. It examines the suitability of the associated light transmission and scattering models from a physical perspective under atmospheric conditions representative of the dry South African western plateau (where most local solar power stations are planned to be sited). The article concludes with a presentation of a simple ground-level spectral irradiance model formulation specific to South African condition that is readily adaptable to site conditions. Applied to the configuration and spectral responsiveness of a solar device this model is expected to yield better estimates of electricity generation than many internet-based tools commonly used for this purpose.

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