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Characterisation of the solar resource at the Fort Hare Institute of Technology

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The sun is the primary source of energy on earth as almost all the sources of energy emanate either directly or indirectly from the sun. It is also at the center of the photovoltaic technology in which case, sunlight is directly converted to electricity with the use of solar cells. An in-depth knowledge of the sun and the various factors that affect its intensity are very vital for photovoltaic system manufacturers and operators. This will improve the efficiency of an already efficiency-limited photovoltaic energy technology. However, solar characterization for locations in the Southern hemisphere are not common in literature. Attention is mostly paid to locations in the Northern hemisphere. Here, existing mathematical models were used to perform a holistic solar characterization at the Fort Hare Institute of Technology which is located in the southern hemisphere. The variation of solar parameters such as solar declination, elevation, zenith and azimuth angles as well as air mass ratio were examined. Also the variation of different components of solar radiation such as; direct beam, diffuse and reflected components were evaluated. These results were compared to the results obtained from an onsite weather station. The comparison between the calculated and the on-site measured values yielded just a 1.1% difference. This means in the absence of weather stations, mathematical models can be used to evaluate various solar radiation parameters with a high degree of certainty. Finally, the results obtained from the computations and measurements were compared with data from nearby weather stations.

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Edson Leroy Meyer, University of Fort Hare, emeyer@ufh.ac.za

Raymond Taziwa, University of Fort Hare, rtaziwa@ufh.ac.za

Primary author: Ms BUMA, Carine (University of Fort Hare)

Co-authors: Prof. MEYER, Edson (University of Fort Hare); Dr KASEKE, Richmore (University of Fort Hare); Dr RAYMOND, Taziwa (University of Fort hare); Mr OVEREN, ochuko (FHIT)

Presenter: Ms BUMA, Carine (University of Fort Hare)

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