



University of Venda

**ANALYSIS OF THE PEAK POWER OF A PHOTOVOLTAIC
ARRAY SYSTEM UNDER OUTDOOR CONDITIONS AT
VUWANI REGION OF LIMPOPO PROVINCE**

A Dissertation Submitted to the Department of Physics

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Abstract

An attempt has been made to test the performance of a solar array under the outdoor condition. Experimental investigations have been made to find its suitability for the rural Limpopo for the small scale electricity generation. This research is also geared towards the testing of validity of the data provided by the manufacture as the commercially available PV modules are rated at standard testing conditions (STC). A 450W ground mounted photovoltaic (PV) system has been designed and installed at the Vuwani Science Resource Centre in Vuwani region, Limpopo Province, South Africa which has geographical coordinates: $23^{\circ}07'51''\text{S}$, $30^{\circ}04'28''\text{E}$. It is well known that the performance of PV system is dependent on system configuration and weather conditions. The instruments and data acquisition packages have been installed to record some of the main parameters such as peak power and air temperature. The estimated data of solar radiation are used in the present work. The photovoltaic array was connected to the maximum power point tracking (MPPT) charge controller to record daily peak power value produced by the photovoltaic array system. In addition to this, for the testing purposes the DS I-V curve tracer was used to take the electrical current and voltage (I-V) curves of the photovoltaic array installed for normal mode as well as the disturbed mode. The peak power data of the PV system over a period of ten months of operation is recorded, analyzed and the results obtained are discussed. It is noted that the PV system designed and installed is suitable for the chosen location.