

**PERFORMANCE ANALYSIS OF A SMALL  
STAND ALONE PHOTOVOLTAIC SYSTEM  
UNDER OUTDOOR CONDITIONS IN THE  
VUWANI REGION OF THE LIMPOPO PROVINCE**

*A Dissertation Submitted to the Department of Physics*

*For the fulfilment of a M.Sc Degree*

By

**RAVHENGANI TSHFHIWA SOLOMON**

**STUDENT NUMBER: 8703237**

**In the School of Mathematical and Natural Sciences,**

**University of Venda**

**THOHOYANDOU, LIMPOPO PROVINCE**

Supervisor : Prof. V. Sankaran, UNIVEN

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## Abstract

Public awareness of the need to reduce global warming and the drastic increase in crude oil prices have encouraged many countries around the world to adopt new energy-policies that promote renewable energy applications to meet energy demands and to protect the environment. The solar electricity is presently a rapidly growing renewable energy form. The advantage of this type of energy is that it is renewable and environmental friendly. These advantages of using solar electricity over other energy forms still put it on top, for example, no rapid depletion and do not contribute towards growing global warming.

In the current study the outdoor performance of the photovoltaic module was monitored for a period of one year. An attempt has been made to understand the peak power and the peak voltage output of the module under study at the solar research station at Vuwani Science Resource Centre under University of Venda. This was done to assess the design of the stand alone solar photovoltaics system on the rural area of Limpopo, South Africa. Currently the design and use of the PV stand alone photovoltaic energy system is the solution to the rural remote area where there is no national grid line. The outdoor measurements of the peak power was performed to understand the energy output of the module under realistic condition and to make sure that it is possible to design and use this type of photovoltaic systems in this area.

Solar radiation data was estimated using a linear Angstrom model. The data computed were used to understand the performance of the PV module from its peak power and peak voltage. The value of these parameters was measured using the Maximum Power Point charge controller. The results obtained are discussed in details. It was found that the peak power monitored using the Maximum Power Point charge controller is nearly corresponding to the manufacturer listed data.