

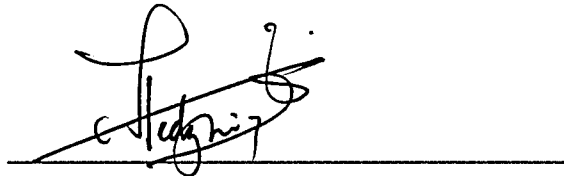
**MONITORING OF A 1 kW_p UiTM SOLAR PHOTOVOLTAIC (PV)
SYSTEM**

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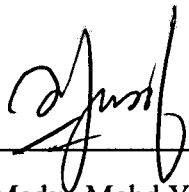
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The Final Year Project Report entitled “Monitoring of a 1 kW_p UiTM Solar Photovoltaic (PV) System” was submitted by Mohd Firdaus Bin Malek, in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Sciences, and was approved by



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ABSTRACT

MONITORING OF A 1 kW_p UiTM SOLAR PHOTOVOLTAIC (PV) SYSTEM

A 1 kW_p 'stand alone' PV system has been set up on January 2007 in Faculty of Electrical Engineering UiTM Shah Alam. This system consists of 4 module (2 BP SX75U module and 2 BP 275F module), inverter, 2 thermocouple, 3 voltage sensor, 3 current sensor, 4 battery and data logger (Data Taker DT80). The main objective of this research is to monitor a 1 kW_p UiTM solar photovoltaic (PV) system. The specific objective of this research is to design, develop and test the photovoltaic monitoring system. This research involve nine parameters which are irradiance (I_a), ambient temperature (T_{amb}), module temperature (T_{mod}), module voltage (V_{mod}), battery voltage (V_{bat}), load voltage (V_{load}), module current (I_{mod}), battery current (I_{bat}) and load current (I_{load}). All parameters were measured using the equipments and sensors that connected directly to data logger (Data Taker DT80) to interpret and show the data on computer using the Delogger software. This research was done for 2 weeks from 14 March 2008 to 27 March 2008. The data was taken for every 10 minutes time interval everyday in 24 hours. The data then was transferred into the computer and analyzed using the Deview and Microsoft Excel software to determine the performance indices for the stand alone PV system. From the analysis a few performance indices were determined. The range of daily solar irradiation is between 2.20 kWhm⁻² to 4.00 kWhm⁻², while the range of total global irradiation is between 5.76 kWh to 10.48 kWh. For daily total energy yield, the range is between 0.23 kWh d⁻¹ to 0.28 kWh d⁻¹. The range for clearness index is between 0.49% to 0.89%. The range for final yield is between 0.77 kWh d⁻¹ kW_p⁻¹ to 0.93 kWh d⁻¹ kW_p⁻¹ while the range of array efficiency is between 2.53% to 4.65%. Lastly, the range of the performance ratio is between 22.08% to 40.58%.

CHAPTER 1

INTRODUCTION

Photovoltaic, or PV for short, is a solar power technology that uses solar cells or solar photovoltaic arrays to convert light from the sun directly into electricity. The discovery of PV dated back to 1839 when it was discovered by Alexandre Edmond Becquerel in a solution form. The PV effect was observed in solid selenium by Adams and Day in 1876. It took nearly a hundred years later when Chapin, Fuller and Pearson announced a 6% efficient silicon (Si) solar cell in 1954. A photovoltaic cell is a nonmechanical device usually made from silicon alloys (Strong and Scheller, 1993). The PV cell was discovered again in 1954 by Bell Telephone researchers examining the sensitivity of a properly prepared silicon wafer to sunlight. Solar PV technology was used in space in 1958 on the USA Vanguard 1 space satellite.

The success of PVs in space generated commercial applications for PV technology. The simplest photovoltaic systems power many of the small calculators and wrist watches used everyday. More complicated systems provide electricity to pump water, power communications equipment, and even provide electricity to our homes (Honsberg, 1993). Sunlight is composed of photons, or particles of solar energy. These photons contain various amounts of energy corresponding to the different wavelengths of the solar spectrum.