PERFORMANCE ANALYSIS FOR GRID CONNECTED PHOTOVOLTAIC SYSTEM

By

BARRY ANAK IGAI

Report is submitted as the requirement for the degree of
Bachelor Engineering (Hons) (Electrical)

UNIVERSITI TEKNOLOGI MARA
OCTOBER 2007

ACKNOWLEDGEMENTS

Here I would like to express my gratitude to God Almighty for sustaining me and providing me strength to carry out and complete this project successfully.

Many thanks and appreciation to my project supervisor, Assoc. Prof. Dr. Haji Zainazlan Md. Zain, for his never ending support and continuous encouragement, invaluable recommendations and suggestions in monitoring and assisting throughout the initial stages of the project until its completion.

Not to forget, special thanks goes to the members of the photovoltaic research team members for their never ending assistance, ideas and encouragement that was much appreciated in the completion of this work.

Appreciation also to fellow final year students in ASP laboratory for their collaboration during the research, and not forgetting the laboratory assistants and staff who spent their time to enable us to borrow equipments needed for the experiments and completion of the work.

My special appreciation goes to my family, whose love and encouragement has brought me to this level; and for their moral support and prayers that have helped me to succeed in finishing this final year project.

ABSTRACT

The usage of alternative energy is one of the important aspects of obtaining other resources of energy available. Due to the depleting resources of fossil fuels sources such as coal, petroleum and natural gas, the need of alternative energy are being implemented more in providing power. As the global situation that demands alternative energy to reduce the effect of global warming and greenhouse effects, photovoltaic energy is a resource that can be utilized, implemented and developed as the energy from photovoltaic is free, clean, safe and does not produce waste. Malaysia as one of developing nations are taking steps in studying and promoting the use of photovoltaics energy to cater for the increasing demand of power due to its fast growth.

Photovoltaic energy is generation of energy due to photoelectric effect when light from the sun strikes the surface of solar cells. Solar cells are semiconductor materials that generate electricity through process of doping when photons from the irradiance of the sun enter the material. This work focuses on the study of the characteristics of a solar panel, and the various parameters that are related to the generation of power from a solar panel. The behavior of a solar panel, in real and controlled environment is also examined in this work as a preliminary work before evaluating the performance of grid connected systems.

The performance of a grid-connected photovoltaic system was also analyzed and conducted on a photovoltaic facility located in SIRIM Berhad, Shah Alam. The purpose of the study is to evaluate the possible performance rating of the plant

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 General

As a fast developing nation, Malaysia is experiencing more extensive growth throughout the country. As development progress, so will be the need of energy usage in the country, will increase. Due to the depletion of fossil fuel in the world and in this country, other possible alternative energy is needed.

Various renewable energy sources such as wind power, geothermal and even energy harnessed from waves. One major source of renewable energy which is clean, free and safe is the solar energy. Solar energy can be harnessed in two methods; by obtaining the thermal energy caused by heating due to the radiation of the sun, or generation of electricity when the irradiation of the sun strikes specially manufactured material. Photovoltaic is the process of converting the irradiation from the sun into electricity.

Photovoltaic is a term that involves the use of solar cells to generate electricity. The generation of current is done by reaction of electrons in semiconductor materials. When the sunlight strikes the surface of material, free electrons in the material will be doped, thus creating a potential which in turn, providing voltage. The principle of a solar cell is based on the creation of electron hole pairs through radiation from the sunlight, and the separation of the positive and negative charges by potential gradient within the cells. In