



**AVAILABILITY OF SOLAR ENERGY FOR NATURAL LIGHTING AND
ELECTRICITY**

**MOHD NAZLI BIN ABDUL GHANI
(99300211)**

A thesis submitted in partial fulfillment of the requirements for the award of
Bachelor Engineering (Hons) (Mechanical)

Faculty of Mechanical Engineering
Universiti Teknologi MARA (UiTM)

MARCH 2002

ACKNOWLEDGEMENT

In the name of ALLAH, the Most Beneficent and Merciful, first of all I would like to express my gratitude and appreciation to my project advisor, Prof. Dr. Azni Zain Anmed for this supervision and suggestion in this thesis project. I also would like to thank to En. Azhar Bin Ishak from Jabatan Perkhidmatan kajicuaca Malaysia, Bahagian Kajiiklim for giving the valuable information about whether for this thesis project. My gratitude goes also to my partner, Mohd Badrul Azha Bin Johari for his full cooperation and ideas to complete this thesis project. Their continuously patient guidance, valuable advise, constructive criticism and repeated encouragement throughout this project have made it possible to complete my project. Finally, I would like to thank to my family for their help and patience during the course of thesis project, my classmates and lecturers, who give me full support on the completion of my course.

ABSTRACT

The application of Solar Photovoltaic (PV) is not widely used in Malaysia especially in the rural areas where no electricity is available. This study focuses in the viability of using solar PV technologies for lighting in building. The objective of this study are to determine the typical solar radiation available in Klang Valley that is needed to convert to electrical energy using solar panel; to determine the amount of time and solar energy to recharge the batteries and to determine the cost of using this technologies as compared to conventional electrical energy.

TABLE OF CONTENTS

CONTENTS		PAGE
	PAGE TITLE	i
	ACKNOWLEDGEMENT	ii
	ABSTRACT	iii
	TABLE OF CONTENTS	iv
	LIST OF TABLES	viii
	LIST OF FIGURES	ix
CHAPTER I	INTRODUCTION	
	1.1 Solar Energy	1
	1.2 Photovoltaic history	4
	1.3 The Objectives of this project	6
CHAPTER II	SOLAR RADIATION	
	2.1 Solar Radiation	7
	2.1.1 Extra terrestrial solar radiation	7
	2.1.2 Units for solar radiation	8
	2.1.3 The solar constant	8
	2.2 Theory of a solar cell	9
	2.2.1 Basic principle of a solar cell	9
	2.2.2 Amorphous Silicon a solar cell	9
	2.3 Operation of a solar cell	10
	2.4 Principle of p-n junction a solar cell	13
	2.4.1 The IV characteristic of a solar cell	14

CHAPTER III SOLAR APPLICATIONS

3.1	Solar Energy Application	15
3.2	Solar Thermal	15
3.2.1	Domestic Water Heating	15
3.2.2	Swimming Pool Heating	16
3.3	Solar Energy	16
3.3.1	Photovoltaic Modules	16
3.3.2	Stand-alone system	18
3.3.2.1	Small stand-alone DC system	18
3.3.2.2	Stand-alone AC-DC system	19
3.3.2.3	Stand-alone AC system	20
3.3.3	Hybrid system	21
3.3.4	Grid-integrated system	23
3.3.4.1	Utility interface	23
3.3.4.2	Net metering	24

CHAPTER IV METHODOLOGY

4.1	Experiment set up for the testing	26
4.2	Main Objectives	26
4.2.1	The main objectives of this project	26
4.2.2	To study the availability of solar radiation	27
4.3	Experiment set up for part 1	27
4.3.1	Frame Structure Design	27
4.3.2	Site of System set up	28
4.3.3	Angle	29
4.3.4	Cost of Frame Structure	30
4.3.5	Location	30
4.3.6	Equipment Figure for Experiment	31
4.4	Equipment Description	34
4.5	Testing Procedures	36