

**BATTERY CHARGE CONTROLLER FOR PHOTOVOLTAIC (PV)  
SYSTEM**

**Thesis is presented in partial fulfillment for the aw**

**Bachelor of Electrical Engineering (Hons.)**

**UNIVERSITI TEKNOLOGI MARA**



**MOHD AZHAR BIN ZAMRI  
FACULTY OF ELECTRICAL ENGINEERING  
UNIVERSITI TEKNOLOGI MARA  
40450 SHAH ALAM  
SELANGOR DARUL EHSAN  
MALAYSIA  
MAY 2009**

## **ACKNOWLEDGEMENT**

In the name of Allah The, Most Generous and The Most Merciful. With the deepest sense of gratitude to Allah the Almighty for giving me strength and ability to complete my final year project and thesis.

I would like to express my gratitude and appreciation to my project supervisor Assoc. Prof. Dr. Ahmad Maliki Omar for her guidance, assistant, support, encouragement and advices in completing for this Final Year Project.

Last but not least, I am also would like to express my appreciation to my beloved family, friends and anybody who are involved directly or in indirectly for their support and advices during completing my final year project.

Thank you.

## **ABSTRACT**

This thesis presents a report on the development of battery charge controller for stand alone Photovoltaic (PV) system. Battery charge controller is a most importance part in stand-alone photovoltaic (PV) systems and it is the components that require completing the system. In general, a standalone PV system consists of a PV array, which converts sunlight to direct-current electricity, energy storage in the form of secondary batteries, loads or appliances, and a control system, which battery charge controller charging and operation of the load.

This paper presents typical strategies for battery charge regulation or controller and load control used in stand alone PV systems. The project was developing to introduce 5 stages of development which are literature review, conceptual design, physical design, program or unit testing, and experimental test and hardware modification. Experimental tests have shown satisfactory results during the testing process at the Power Electronic Laboratory and Photovoltaic Monitoring Center (PVMC). The result shows the battery voltage increase during the charging using Pulse Width Modulation (PWM) method and the controller able to monitor battery temperature increases.

# TABLE OF CONTENTS

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	x
LIST OF TABLES	xii
LIST OF ABBREVIATIONS	xiii

<b>CHAPTER</b>	<b>PAGE</b>
<b>1.0 INTRODUCTION</b>	
1.1 Introduction	1
1.2 Problem Statements	3
1.3 Objectives of Project	3
1.4 Scope of works	5
1.5 Organization of the thesis	6
<b>2.0 LITERATURE REVIEW</b>	
2.1 Introduction	7
2.2 Stand alone system	7
2.3 Nature of solar radiation	8
2.4 Photovoltaic Technology	9
2.5 Photovoltaic Generator	11
2.6 Type of solar cells	12

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

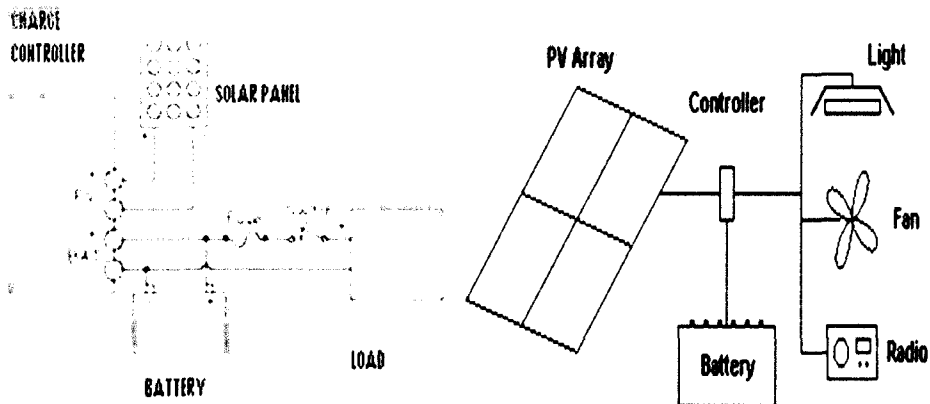


Figure 1.1: Solar PV system diagram.

Energy is the most basic and essential of all resources. All the energy we use on Earth comes from fission or fusion of atomic nuclei, or from energy stored in the Earth. The problem with both fission and fusion is that they have dangerous radioactivity and side effect [1]. Very much exploitation and research for new power has been done not only in the area of nuclear power generation but also in the area of unlimited energy sources such as wind power generation and solar energy transformation. The most effective and harmless energy source is probably solar energy. For many applications it is so technically straight forward to use. Solar energy can be harvested by the use of photovoltaic (PV) array.

Photovoltaic (PV) is a technology of converting sunlight directly into electricity. The PV power generation is caused by radiation separating positive and negative charge carriers in an absorbing material [2]. The electric produce, will flow to charge controller and finally to the battery. The Renewable energy systems and particularly the photovoltaic system are now experiencing a fast development. As a consequence,