

# **DESIGN AND DEVELOPMENT OF A CONTROLLER FOR SWITCHING SOLAR BASED MULTIPLE PUMPS**

A Project submitted to the

Dept. of Electrical & Electronic Engineering, BRAC University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering

By

TASNIM AKTER

SYEDA MAHJABIN AHMED

Dept. of Electrical and electronic Engineering, BRAC University

August 2014

### Declaration

We do hereby declare that the project titled “**design and development of a controller for switching solar based multiple pumps**” is submitted to the Department of Electrical and Electronics Engineering of BRAC University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronics Engineering. This is our original work and has not submitted elsewhere for the award of any other degree or diploma.

SYEDA MAHJABIN AHMED

ID : 10221069

TASNIM AKTER

ID : 10221070

  
(Prof. Dr. S.M. Lutful Kabir)

### **Acknowledgements**

We are extremely grateful to our Supervisor, Prof. Dr. S. M Lutful Kabir for his ideas, advice, guidance and assistance. Without his continuous support the project work would not have been possible.

We are also thankful to Maisun IBN Monowar for helping us with the laboratory work.

## Abstract

Conventional photovoltaic systems for pumping are designed with panel capacity over 30 to 40 percent so that pumping can be continued during low insolation. This adds much to the cost of such system. The new system eliminates over capacity requirement of PV modules by using a combination of pumps where load become variable with the change of PV power output. This developed system continues pumping even during low solar isolation. Directly fed DC motors drive the pumps to avoid design complexity and eliminate battery and its maintenance cost. The designed system is superior to existing system, increasing the water output for the same installed PV module capacity. The objective of this project is to develop a controller for switching the pumps for reasons described above. The controller will be designed with the microcontroller and electronic switch. The input of the controller will be the power from solarpanel and the output will be the number of pumps to be switched depending on the isolation.

# Table of Contents

## Chapter 1 : Introduction

---

1.1 Background .....	6
1.2 Literature Review .....	10
1.3 Objectives .....	14

## Chapter 2 : Methodology

2.1.1 Component Used .....	15
2.1.2 Circuit Design .....	15
2.1.3 Microcontroller .....	20
2.1.4 Microcontroller Programming .....	24
2.1.5 Relay Connections .....	28
2.1.6 Regulators .....	30
2.1.7 Printed Circuit Board .....	32

## Chapter 3

3.1 Conclusion .....	34
3.2 Suggestions for further work .....	34
References .....	35
Appendix .....	37

.....END.....

## Chapter1

### Introduction

#### 1.1Background

The operation of solar powered pump is more economical mainly due to lower operation and maintenance costs, most importantly more environment friendly than pumps powered by an internal combustion engine (ICE). This type of photovoltaic powered pumps especially very convenient for Bangladesh, a developing country of south east Asia with large population has agricultural economy. About fifty nine percent of cultivable lands need irrigation. During dry season and due to climate change demand of electricity for irrigation is increasing day by day. Grid current is also not available in many rural areas. Due to shortage of electricity it is difficult to meet the demand. Use of solar power is a good alternative to grid electricity.

Running DC pumps in contrast to AC pumps using solar power is more convenient as from solar panel we get direct current. So, there is no need of AC to DC converter which effectively reduces the costs of the system and also the maintenance costs.