Faculty of Electrical and Electronic Engineering Technology

A DEVELOPMENT OF CONTROL CHARGING SYSTEM BY SOLAR PANEL

MUHAMMAD SYAHIR BIN MOHD NURUDIN

Bachelor of Electrical Engineering Technology with Honours

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A DEVELOPMENT OF CONTROL CHARGING SYSTEM BY SOLAR PANEL

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I declare that this project report entitled "A Development of Control Charging System by Solar Panel" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

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Date : 20/02/23

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Date : 22/02/23

DEDICATION

My dissertation honours my family and numerous friends. My dear parents, En. Mohd Nurudin bin Kadri and Pn. Rozila binti Abu Bakar, whose words of encouragement and push for perseverance continue to echo in my ears. My dear brothers and family who have never abandoned me.

This dissertation is also dedicated to my many friends and family members who have supported me throughout the process. I will be eternally thankful for everything they have done for me, especially my fellow classmates who have helped me build my technology skills, as well as the many hours of proofreading and technical expertise.

ABSTRACT

The need for clean power sources is growing since there is an ongoing need for electricity while individuals attempt to reduce the environmental impact of energy collecting. As a result, in the future, the use of renewable energy and control charging systems will become more frequent. As a result, this project is designed to be self-sufficient in solar energy rather than relying solely on electricity. Furthermore, the invention of the solar panel control charging system has further reduced the energy usage of the by only operating when necessary. This project requires the installation of a solar panel system, a solar control charge, and a microcontroller to control the system. For the system to be self-sufficient, the solar panels are expected to generate at least 12Wh. Meanwhile, when the system's controller detects that the battery is fully charged, it will immediately switch off the current. With the microcontroller that was created alongside the system, the functions and settings for the system may be readily altered.In addition , the output from the control charging system also can use for the AC and DC output equipments, usb interface 2.1A and international general socket but for now as a prototype it just allow for 220-240V and below 4000W only. As a result, the system will not only run independently, but it will also consume electrical energy.

ABSTRAK

Keperluan untuk sumber kuasa bersih semakin meningkat kerana terdapat keperluan berterusan untuk elektrik sementara individu cuba mengurangkan kesan alam sekitar daripada pengumpulan tenaga. Akibatnya, pada masa hadapan, penggunaan tenaga boleh diperbaharui dan sistem pengecasan kawalan akan menjadi lebih penting. Hasilnya, projek ini direka bentuk untuk berdikari dalam tenaga suria dan bukannya bergantung kepada tenaga elektrik semata-mata. Tambahan pula, penciptaan sistem pengecasan kawalan panel solar telah mengurangkan lagi penggunaan tenaga dengan hanya beroperasi apabila perlu. Projek ini memerlukan pemasangan sistem panel solar, cas kawalan suria, dan mikropengawal untuk mengawal sistem. Untuk sistem berdikari, panel solar dijangka menjana sekurang-kurangnya 12Wj. Sementara itu, apabila pengawal sistem mengesan bahawa bateri telah dicas sepenuhnya, ia akan segera mematikan arus. Dengan mikropengawal yang dicipta bersama sistem, fungsi dan tetapan untuk sistem mungkin mudah diubah. Tambahan lain,keluaran daripada sistem pengecasan kawalan juga boleh digunakan untuk peralatan keluaran AC dan DC, panel usb 2.1A dan soket am antarabangsa tetapi buat masa ini sebagai prototaip ia hanya membenarkan 220-240V dan di bawah 4000W sahaja.Akibatnya, sistem ini bukan sahaja akan berjalan secara bebas, tetapi ia juga akan menggunakan kurang tenaga elektrik.

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LIST OF SYMBOLS

δ	-	Voltage angle
	-	
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(List of Symbols is optional. Please remove this page if it is not used)

LIST OF ABBREVIATIONS

V	-	Voltage
	-	
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CHAPTER 1

INTRODUCTION

1.1 Background

Concerns over the depletion of fossil energy supplies, as well as the negative environmental and economic repercussions of their overuse [1], have led academics to perform in-depth studies on renewable energy resources as alternatives [2]. For a variety of reasons, solar energy is a viable option for meeting a significant amount of the world's energy needs. This project enables a charging method that is controlled by a solar panel.

Solar energy is turned into electrical energy by photovoltaic cells using a solar panel. The technique is useful for storing energy for usage at night. It necessitates a collection of op-amps that constantly monitor parameters such as panel voltage and load current. When the battery is fully charged, a green LED illuminates, and when it is overcharged or undercharged, a red LED illuminate.

When the load is overcharged or undercharged, a MOSFET or Relay is used to cut it off,whereas a transistor is used to switch the load to another dummy one when it is fully charged, protecting it from damage. When the battery voltage reaches a certain level, thesimplest charge controller controls the device voltage and closes the circuit, thereby terminating the charging process. A mechanical relay was employed by more charge controllers to open or close the circuit, stopping or starting power to electric storage devices.

1.2 Problem Statement

In our daily lives, used a lot of battery-powered electrical equipment was used especially when people go on hiking, camping, road trips, and vacations. When the batteries in these electrical devices run out, frequently left scrambling to find a suitable power source to replenish the batteries. As a result, this battery is intended to be able to store energy for night-time use while also controlling the charging mechanism whether the battery is overcharged or undercharged. In this case, a solar-powered controlled charging system would be a more realistic approach to prevent the mechanism from overcharging.

1.3 Project Objective

This project's major goal is to present a systematic and effective methodology for estimating a system that can control solar panel charging. The following are the specific objectives:

a. To analyze the battery charging system.

b. To study and develop a battery charging by solar panel.

c. To evaluate the effectiveness of controls the charging system for the battery bank before getting overcharged or undercharged.

1.4 Scope of Project

The development and design of device that controlled charging method by solar panel is one of the project's goals.

a. To use supply using Monocrystalline cell as a solar energy

b. To use Mosfet and Timer as a micro controller in this system.

c. To use Solar Rechargeable Battery in this system

1.5 Project Outline

The organization of this report consists of 5 chapters. Chapter 1 describes the introduction of the project which includes the title background of the project, problem statements, objectives, and scopes of the project. In Chapter 2, the previous research related to the project will be carried out and studied. The research about previous journals and articles were made based on similar projects and the subjects included in this project. Meanwhile, all the methods and procedures in developing the project will be described in Chapter 3. A result and discussion of this project will be described in Chapter 4 . Lastly, Chapter 5 will conclude this project , the limitation for the project and also recommendation for future features.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In today's modern society, electrical energy quite important for people to use their electrical mechanism, so this implement can be change by green energy for. reduce from wasting electrical energy. Green energy, also known as regeneration energy, has gotten a lot of attention recently. Sun, water, wind, biomass, terrestrial heat, marine temperature differential, sea waves, morning and evening tides, and other forms of green energy can all be recycled [1]. Solar energy only makes up around 12% of the world's power capacity, and it is still regarded as a low energy-efficient means of producing energy [2].

Consumers encounter difficulties with finances, technological issues, inadequate infrastructure compatibility, and a lack of local expertise, according to surveys. It is still apparent, nevertheless, that a solar energy system is a superior option for an energy source than a more conventional one like burning fuels. Consequently, research is required to make sure that a solar energy system can be constructed that is highly energy efficient by using the best possible components [3]. Additionally, there when it comes to using solar energy systems in homes, there are a few obstacles that are frequent. Solar energy is the most efficient source of electricity generation among these options [4]. Malaysia is located near the Earth's equator. According to research estimates of Malaysia's monthly average daily global solar radiation, this has resulted in Malaysia receiving a significant amount of solar radiation throughout the year [5].

• Low cost to operate and build.

• There is almost no effect on the environment

• Pleasant to the environment

• Modular and therefore flexible in terms of size and use

• Exceptionally dependable and low maintenance

2.2 Control Charging System

A charge controller also known as a charge regulator, is a voltage and/or current regulator that keeps batteries from overcharging. It keeps the voltage and current between the solar panels and the battery in check. A charge controller's principal job is to keep the battery charged to the maximum achievable amount [6]. The charge controller prevents deep. discharge by avoiding overcharging of the battery and eliminating the load. In theory, charge controllers have direct control over the status of the battery. The controller checks and changes the charge level of the battery in between pulses. The charging control system must separate the accumulators from the Solar cell arrays when a certain level of overcharge is reached, as shown. When charged at 0.1C (10% of the rated capacity in amps) , some manufacturers claim that nickel Cadmium accumulators can endure a continuous overcharge of 144 hours. This because the above-mentioned information is rarely available for Lead-Acid accumulators, it is widely thought that they behave similarly to those described above [6].

2.3 Type of Solar Controlled Charge

In today's solar power systems, charge controllers such as solar panels are frequently used. Pulse width modulation (PWM) and maximum power point tracking (MPPT) are two types of PWM (MPPT). Both charge at different rates depending on the battery's full capacity and monitor the battery's temperature to avoid overheating [7].

Solar panels are classified into two types: on-grid and off-grid systems. The off-grid system is a solar panel that operates independently of the electrical grid network, whereas the on-grid system is linked to the electrical grid network in order to distribute electrical energy to clients. The off-grid technique requires the installation of a battery to store the electrical energy generated by the solar panel during the day in order to maintain a consistent voltage. PWM signals are generally fixed in amplitude while variable in pulse width modulation. The pulse width of the PWM is proportional to the magnitude of the SCC output voltage.

The charge controller regulates the charge flow from the PV panels to the Dc supply. The controller has two modes of operation MPPT and VOC, and the operation mode is determined by the battery voltage. Whenever the inverter is turned on and provides the load requirements from the DC bus, there is a load demand. Based on the PV power and load requirements, the batteries may charge or discharge. The MPPT mode is used to collect the most power from the PV panels when the battery voltage falls below the reference limit. If the load is heavy enough to cause the battery to drain, the PV panel gives the maximum possible power to the load, with the battery providing the rest [8].

The Voltage Control mode is used to avoid overcharging of the battery whenever the battery voltage exceeds the reference limit. To provide a consistent output voltage at the battery terminals, the operating point of the PV panels is adjusted correspondingly. Because the voltage is held constant, the pace at which the battery absorbs charge or the current