

# SOLAR POWERED LED DECORATING LIGHT

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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
**FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER**

**BORANG PENGESAHAN STATUS LAPORAN**  
**PROJEK SARJANA MUDA II**

**Tajuk Projek** : SOLAR POWERED LED DECORATING LIGHT

**Sesi Pengajian** : 

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## DECLARATION

“I hereby declare that the work in this project is my own except for summaries and quotations which have been duly acknowledge.”

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## **DEDICATION**

For you, my lovely Mama and Papa, Mak and Abah  
For your truly support and undivided love  
For making me the person  
Who I am today

## ACKNOWLEDGEMENT

Firstly, I would like to thank to God upon his bless until I will be able to complete this project for my Projek Sarjana Muda (PSM). I would like to express my sincere gratitude to my supervisor, Madam Zarina Binti Baharudin Zamani for the continuous support of my project, for her patience, motivation, and immense knowledge. Her guidance helped me in all the time of this project and writing of this thesis. I could not have imagined having a better supervisor and mentor for my bachelor degree study. Most importantly, none of this could have happened without my family. My parents, who offered their encouragement through phone calls. With their own brand of humor, has been kind and supportive to me over this lifetime. To my foster family, for providing me with unfailing support and continuous encouragement throughout my years of study and for my life in general. To my sisters and brother, it would be an understatement to say that, as a family, we have experienced some ups and downs in the few years. Lastly, to my fellow friends for the discussions, for the sleepless nights we were working together before deadlines, and for all the fun we have had in the last four years. This dissertation stands as a testament to your unconditional love and encouragement.

## ABSTRACT

Electricity is a non-renewable energy that is produced by burning the fossil fuels such as coal, natural gas and crude oil. Electricity cannot be renewed because it has a limited resources of fossil fuels on this planet. If electricity is constantly used, it will run out someday. Besides, electricity also contributes on the utility bills because electricity is not free. On the other hand, solar energy is a renewable energy that produces a clean energy, natural, and can be installed anywhere. Consequently, this solar energy has become the emphasis of a sustainable energy nowadays. Therefore, the aim of this project is to develop a solar powered LED decorating light. This Solar powered LED decorating light is an independent device, built to change the current lighting sources. This product has abilities to absorb the solar energy from the sun rays for maximum energy gathering and to indicate the voltage level of the rechargeable battery. This project provides a dependable and improved alternative to current decorative lighting systems.

## ABSTRAK

Elektrik adalah tenaga yang tidak boleh diperbaharui yang dihasilkan dengan membakar bahan api fosil seperti arang batu, gas asli dan minyak mentah. Elektrik tidak boleh diperbaharui kerana ia mempunyai sumber-sumber bahan api fosil yang terhad di planet ini. Jika elektrik sentiasa digunakan, ia akan kehabisan suatu hari nanti. Selain itu, tenaga elektrik juga menyumbang kepada bil-bil utiliti kerana elektrik bukan percuma. Sebaliknya, tenaga solar adalah tenaga yang boleh diperbaharui yang menghasilkan tenaga yang bersih, semulajadi dan boleh dipasang di mana-mana. Hasilnya, tenaga solar ini telah menjadi penekanan tenaga yang mampan pada masa kini. Oleh itu, tujuan projek ini adalah untuk membina satu lampu LED hiasan berkuasa solar. Lampu LED hiasan berkuasa solar ini adalah alat bebas, dibina untuk mengubah sumber pencahayaan semasa. Produk ini mempunyai kebolehan untuk menyerap tenaga solar daripada sinaran matahari untuk mengumpulkan tenaga maksimum dan untuk menunjukkan paras voltan bateri boleh dicas semula. Projek ini menyediakan alternatif yang boleh dipercayai dan lebih baik daripada sistem lampu hiasan semasa.



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## LIST OF ABBREVIATION

CO <sub>2</sub>	-	Carbon Dioxide
PV	-	Photovoltaic
LED	-	Light Emitting Diode
IC	-	Integrated Circuit
LM	-	Linear Monolithic
PCB	-	Printed Circuit Board
RE	-	Renewable Energy
UV	-	Ultraviolet
FeCl <sub>3</sub>	-	Ferric Chloride
DC	-	Direct Current
AM	-	Ante Meridiem (Before Midday)
PM	-	Post Meridiem (After Midday)
TNB	-	Tenaga Nasional Berhad
RM	-	Ringgit Malaysia
GSM	-	Global System for Mobile Communication



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## **CHAPTER I**

### **INTRODUCTION**

#### **1.1 Overview**

Direct sunlight is potentially the most powerful renewable energy source. In less than an hour, the earth receives the same amount of energy from the sun as is used globally by a man during a year. In Malaysia, it is suitable to implement the use of solar energy because of its tropical rainforest climate, being hot and humid throughout the year.

Renewable energy usage has consistently expanded through the years because the world has a limited amount of fossil fuels. Renewable energy is the energy that can be obtained from the natural resources that can always be replenished. Unlike non-renewable resources, renewable resources come in the form of solar, hydro, wind, biomass and other energies. These energy sources emit clean by-products and do not damage the environment with CO<sub>2</sub> emission and fossil fuel pollution. Therefore, renewable energy resources must be used to decrease the harmful impact of fossil fuel waste.

Solar energy is the energy provided by the sun. Solar energy can be harnessed by modern technology such as solar heating, photovoltaics (PV), concentrated solar power, solar architecture and artificial photosynthesis. Nowadays, PV panel is used increasingly to produce electricity for household, water pumps and street light.

One of the most common use of electrical utilities in the world is the decorative light. Decorative lights exist all over the place in the world because they provide enlightenment during the dark hours. The solar powered LED decorating light reduces electrical grid energy consumption and serves as an example to endorse for renewable energy. The LED decorative light addresses the anxiety for clean energy while enhancing the efficiency of the current systems.

This project is to design the solar powered LED decorating light that uses a solar energy as the energy source. This product is the energy self-harvesting where it is capable to harvest the sun rays and convert it to the source of energy for generating electricity. The energy produce will be stored in the rechargeable battery that act as the battery storage power station. The storing power generated from solar panel during the day will be used at night. Besides, this product also contains a battery level indicator. The battery level indicator will indicate the status of the battery just by glowing LED's.

There is none of the project that develops to build the solar powered decorating light system that has a battery level indicator, but mostly the solar energy project are focused on the solar powered street light. The solar powered street light usually installed for many pathways, businesses, residential areas, docks, parks and universities that provide a security, sustainability and an overall green image.

## 1.2 OBJECTIVES

The objectives of this project are summarized as follows:

1. To design the LED decorating light by using a solar energy.
2. To create a low utility cost product.
3. To build a less maintenance product

## 1.3 PROBLEM STATEMENT

Nowadays, the main issue happens because the source of energy that we are using are mostly not a renewable resource. In terms of the sustainability, the use of the non-renewable resources can be run out if we use them in a rapacious and excessively way. The extreme manipulation of the natural resources makes possible by the expansion of technologies has resulted in undesirable by-products such as pollution and waste. Fossil fuels devour and contaminate water, cause global warming, produce poisonous wastes and threaten flora and fauna. This is the further compounded by the concerns about the effect of surroundings as a result of burning fossil fuels and the continually high energy costs for the past few years. As a result, we are now facing greater challenges in discovering the solutions to overcome the problem of diminishing natural resources, energy supply, and climate change.

Furthermore, the conventional LED decorating light is limited as they are required to be plugged into a power outlet. It will cause a troublesome to the owner where they need to find the nearest power outlet or need an extension wire to install the decorating light. Besides, the use of the conventional LED decorating light will contribute to the utility bills for the life of the system as the conventional LED decorates light need to use electricity as the source of the energy. In addition, the previous decorating light does not have a battery level indicator to indicate the voltage level of the rechargeable battery. Therefore, the conventional decorating light has more disadvantages than the advantages.

## 1.4 SCOPE OF PROJECT

Since the solar powered LED decorating light is going to develop for lighting applications, the target user for this product is the home's owner, the restaurant's owner and the shop's owner. This system will be installed either inside or outside of the premises. The project development starts with the understanding of the working principle of the solar panel.

Solar powered LED decorating light will contain a solar panel as the main source of energy. Solar panel electricity systems, also known as solar photovoltaics (PV), harness the sun's energy using the photovoltaic cells. These cells do not need direct sun rays to work, they can still produce some electricity on a cloudy day. The cells transform the sun rays into electricity, which can be used to run the lighting.

The IC 4017 and the 555 timer is required to make the LED's blinking according to the sequence. These two components are used in the LED flasher circuit. The LM3914 are used in the battery level indicator circuit. The LM3914 is a monolithic integrated circuit that senses analog voltage levels and provide a linear analog display.

## 1.5 METHODOLOGY

The project development consists of hardware development parts only. The hardware development can also be called as circuit development in solar powered LED decorating light. The selection of the component is critical since it must be suitable to the solar panel and the rechargeable battery. The circuit system must be able to make the LED lights up and the solar panel can charge the battery well.

The hardware development starts by designing the circuit using the Proteus software. Proteus helps the user to design and develop the product. It has a powerful editing tool and capable of supporting schematic capture for simulation and PCB design.

After the designing process completed, the PCB board will be etched, drilling and soldering. Then, the solar powered Led decorating light circuit will be analyzed according to the time, voltage, temperature and humidity. The analysis purpose of this product is to know exactly the sustainability of this product.

## 1.6 REPORT STRUCTURE

This report contains five chapters. The first chapter is the introduction of the project. This chapter covers the project overview, objectives, problem statement and scope of the project.

The next chapter is covers the literature review. Literature review includes the study of the potential of solar energy in Malaysia and the study of the component use in the project.

The methodology of this project will be covered in the third chapter. The process of the project will be explained in this chapter. The flowchart will be shown and explain the details. All the process is elaborate completely in the chapter.

The fourth chapter is about the result of the project. The result of the simulation using the Proteus software will be added for the proofing that the circuit are functioning well. The results are fully elaborated with the help by the figures and tables.

The final chapter is the conclusion and suggestion. This chapter will conclude the result of the project. The suggestion for further project is stated to improve the system the functionality of the system that has been developed.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 Overview**

This chapter will include the research finding, observation and information seeking about the journal, articles and resources that related to this project, solar powered LED decorating light. Besides, the criteria of the components also will be discuss to further the knowledge about the components being used.

The importance of the literature review is to sufficiently equip the developer with some knowledge of the strength and limitations of several development tools, this chapter will help the developer to choose the right tool to develop the system.