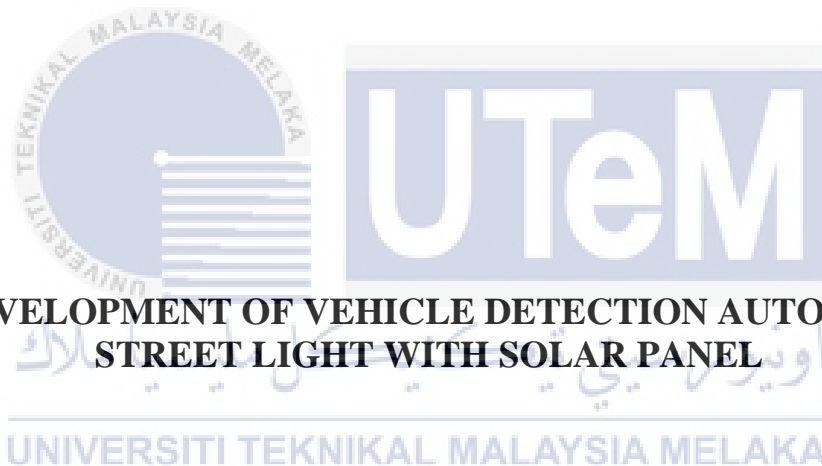




**Faculty of Electrical and Electronic Engineering Technology**



**A DEVELOPMENT OF VEHICLE DETECTION AUTOMATIC  
STREET LIGHT WITH SOLAR PANEL**

**MUHAMMAD FAIZ BIN AHMAD ZOHRI**

**Bachelor of Electrical Engineering Technology (Industrial Power) with Honours**

**2022**

**A DEVELOPMENT OF VEHICLE DETECTION AUTOMATIC STREET LIGHT  
WITH SOLAR PANEL**

**MUHAMMAD FAIZ BIN AHMAD ZOHRI**

**A project report submitted  
in partial fulfillment of the requirements for the degree of  
Bachelor of Electronics Engineering Technology with Honours**



**Faculty of Electrical and Electronic Engineering Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2022**

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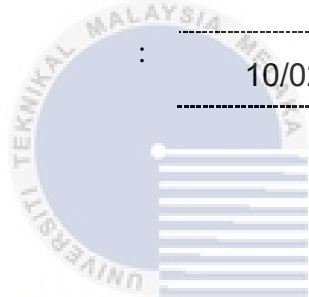
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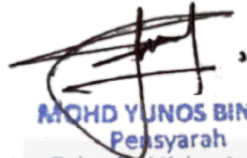
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.....  
.....

## DEDICATION

*To my beloved mother, SUZZANA BINTI MD SAAD, and father, DR. AHMAD ZOHRI BIN ISHAK,  
and to my team member, Muhammad Akhmal Syafi (Co-Sv Dr. Cong), Muhammad Syukri Suliaman, Muhamad Taufiq MD Isa and Muhammad Haziq Kharil Azri.*



## ABSTRACT

Tenaga National Berhad (TNB) provides a large source of electricity for the existing Automatic Street Lights. This street lighting system also only lights up when it is turned on. Furthermore, the available Automatic Street Lights only emit light regardless of how much light is used. To solve this problem, the solar system, which is a renewable energy source, has been used to replace TNB's electricity consumption and save energy. LCD parameters are also stored in the electrical storage system to ensure that electricity consumption is always in line with the amount of energy used. The LDR sensor is also used as an on/off switch to control the light of the Automatic Street Light. The use of IR sensors to detect vehicle movement that control the brightness of the light helps reduce electricity consumption. When the car passes through the study area, the power of the light is 100%, and when the vehicle passes, the brightness is reduced stay at dim condition. The IR sensor position also will be analysis to ensure the system will operate smoothly. As a result, the efficiency of solar panels can be seen in a variety of ways, from light sources to direct current power sources. Solar panel capacity and battery capacity were also studied to accommodate the entire system to operate throughout the day. The streetlight also be monitor using smartphone based on the IoT concept. The system code will be written using Arduino software that has been learned and further simplifies the analysis process.



## ***ABSTRAK***

Tenaga National Berhad (TNB) menyediakan sumber elektrik yang besar untuk Lampu Jalan Automatik yang sedia ada dan hanya tertumpu di kawasan bandar. Sistem lampu jalan ini juga hanya menyala apabila ia dihidupkan. Tambahan pula, Lampu Jalan Automatik yang ada hanya memancarkan cahaya tanpa mengira berapa banyak cahaya yang digunakan. Untuk menyelesaikan masalah ini, sistem solar, yang merupakan sumber tenaga boleh diperbaharui, telah digunakan untuk menggantikan penggunaan elektrik TNB dan menjimatkan penggunaan elektrik yang tidak perlu. Selain itu, dengan penggunaan sistem solar dapat menyediakan lampu jalan di kawasan luar bandar. Parameter LCD juga digunakan dalam sistem penyimpanan elektrik untuk memastikan penggunaan elektrik sentiasa selaras dengan jumlah tenaga yang digunakan. Sensor LDR juga digunakan sebagai suis hidup/mati untuk mengawal cahaya Lampu Jalan Automatik. Penggunaan sensor IR untuk mengesan pergerakan kenderaan yang mengawal kecerahan cahaya membantu mengurangkan penggunaan elektrik. Apabila kereta melalui kawasan kajian, kuasa cahaya adalah 100%, dan apabila kenderaan itu lalu, kecerahan berkurangan kekal dalam keadaan malap. Kedudukan sensor IR juga akan menjadi analisis untuk memastikan sistem akan beroperasi dengan lancar. Hasilnya, kecekapan panel solar boleh dilihat dalam pelbagai cara, daripada sumber cahaya kepada sumber kuasa arus terus. Kapasiti panel solar dan kapasiti bateri turut dikaji untuk menampung keseluruhan sistem beroperasi sepanjang hari. Lampu jalan boleh dipantau menggunakan telefon pintar berdasarkan konsep IoT. Kod sistem akan ditulis menggunakan perisian Arduino yang telah dipelajari dan memudahkan lagi proses analisis.

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## LIST OF SYMBOLS

°C	-	Degree Celcius
I	-	Current
P	-	Power
S	-	Speed
%	-	Percentage



## LIST OF ABBREVIATIONS

V	-	Voltage
TNB	-	Tenaga National Berhad
IR	-	Infrared
LDR	-	Light Dependent Resistor
Ni-Cd	-	Nickel Cadmium
UPS	-	Uninterruptible Power Supply
PWM	-	Pulse Width Modulation)
MPPT	-	Maximum Power Point Tracking
HPS	-	High Pressure Sodium Lamp
LED	-	Light-Emitting Diode
GSM	-	Global System for Mobile communication
LED	-	Light-Emitting Diode
LCD	-	Liquid crystal display
OLED	-	Organic Light-Emitting Diode
UART	-	Universal Asynchronous Receiver-Transmitter
Hz	-	Hertz
ICSP	-	In-Circuit Serial Programming
USB	-	Universal Serial Bus
PV	-	Photovoltaic
A	-	Ampere
DC	-	Direct Current
AC	-	Alternating Current
Km/h	-	Kilometer per hour

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

Malaysia's technological advancements are growing more advanced, as evidenced by the introduction of solar systems, which have been seen to have a favourable impact on the people in addition to allowing the sun's energy to be used to generate electricity. The same might be said about rural areas with only dark roads, but technical advancements and a skilled labour have transformed the situation. This rural area now has power, and the streets have begun to be lit at night with street lights.

Tenaga Nasional Berhad (TNB) is solely responsible for the operation of street lights, which are always turned on to their maximum capacity during the night to provide lighting in these rural areas. The usage of electric energy in this developing area, however, has its own set of drawbacks. With the development of technologies such as solar, an advantage in the natural generation of electric energy can be gained without changes the operation of existing street light systems, and can help to mitigate the negative effects that exist in the previous system.

The upgrading of solar-powered street lighting systems, as well as other technology connectivity such as sensors and the use of the most modern types of lighting, allows for more cost-effective, efficient, and practical operation of street lighting systems in rural areas with lower night time activity rates than in urban areas.

## 1.2 Problem Statement

In Malaysia, street lights are installed on almost every road to provide lighting at night. However, there are still rural regions without street lights due to a variety of circumstances, including the fact that the area is located in a hilly terrain and at the far end of the district, which limits the distribution of electricity from Tenaga Nasional Berhad (TNB).

Furthermore, the operation of street lights in rural area faces the issue of wasted electricity consumption. Because there is no adequate lighting regulation in this remote location, street lights always operate and consume the most electricity at night, despite the fact that there are no road users.

Additionally, the sort of use of fluorescent street lights that demands excessive consumption of electrical energy to light up gloomy places is still in use. This is one of the disadvantages of using ancient street lights over the various types of contemporary lights available on the market that more efficient.

As a result, the usage of solar systems is to solve the problem of supplying electrical energy from TNB. This solar system is further supplemented by a battery, which serves as a storage facility for electricity used at night. Lighting control systems are also included to determine how much lighting is required in specific regions. To combat the problem of excessive usage of electric energy, the type of street lighting used is also taken into consideration. As a result of these modifications, a more effective street lighting system will be created, as well as shared benefits for citizens living outside of the city who are affected by rapid technological advancement.

### 1.3 Project Objective

The purpose of this study is to give a methodical and its functional approach to advancement. The precise objectives are as follows:

- 1) To develop automatic street lighting with Internet of Things (IoT).
- 2) To provide an alternative source by using solar energy to generate electricity for the street lighting system.
- 3) To analyze the efficiency of the streetlight by implementing different kind of DC light.

### 1.4 Scope of Project

The following are the project scopes that required to be addressed and concentrated on during the completion of this project:

- a) Design a small prototype of street lighting.
- b) Using Arduino to build source code.
- c) Find the best position for IR sensor.
- d) Calculate the capacity of battery storage that want to use.
- e) Comparison the performance between type of DC light

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

The literature and previous research on the Auto Street Light system, as well as how the issue is addressed, are discussed in this chapter. All of these sources help and underpin the experimental design and analysis. Various techniques for improving the Auto Street Light are offered based on prior investigations. A quick review at the end of the chapter aids in defining the approaches to be used during the project.

#### 2.2 Previous Project Research

Based on the literature review, which can be summarised as research and finding information relating to my project using current resources such as the internet, books, journals, and other sources. To begin, an understanding of the project is possible.

##### 2.2.1 Type of Solar Power System

Solar energy is a renewable energy source that is abundant in nature. There are several ways to generate power, such as by burning fossil fuels, however all of these methods have significant environmental consequences.

This paper focuses on the several methods of solar power generating. To begin, it discusses how solar panels convert solar energy into electrical energy during their operation. P-type and n-type semiconductors are used to make solar cells.

The main three types of solar power systems that can create electricity are also discussed in this study. On-grid solar, off-grid solar, and hybrid solar are all options.[1]