UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SOLAR POWERED SMARTPHONE CHARGING STATION

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Power) with Honours.

by

LUQMAN NAIM BIN KAMARUDDIN

B071610876

940515-14-5883

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

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Supervisor : TS. DR. ALIZA BINTI CHE AMRAN

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Co-supervisor: AMALIA AIDA BINTI ABD HALIM

ABSTRAK

Tujuan utama projek ini adalah bagi membangunkan stesen pengecasan telefon pintar menggunakan tenaga solar yang boleh digunakan oleh orang ramai. Pada masa kini, kesedaran yang ada pada masyarakat Malaysia mengenai tenaga yang boleh diperbaharui adalah tinggi tetapi tidak banyak yang menggunakannya. Selain daripada itu, teleforn pintar telah terkesan melalui peningkatan teknologi yang mana ia menyebabkan penggunaan tenaga bagi telefon pintar meningkat secara mendadak. Maka bagi menyelesaikan masalah yang telah disebutkan di atas, stesen pengecasan telefon pintar menggunakan tenaga solar akan direka, dibangunkan dan dipasang di sesuatu tempat seperti perhentian bas dan taman-taman bagi mempromosikan penggunaan tenaga yang boleh diperbaharui sambil orang awam boleh mengecas telefon pintar.

ABSTRACT

The main goal for this project is to develop a solar powered smart phone charging station that can be used by the public. Nowadays, most of people have aware regarding renewable energy (RE) but not many have implemented RE in their daily life. Other than that, cell phone has affected by technology that became more advanced which left drawback to the cell phone that causing cell phone energy consumption increase rapidly. To overcome the problems which have been stated earlier a smart phones charging station using solar energy as source electricity will be designed, developed and installed in certain places such as bus stop or park in order to promote renewable energy while the public can charge their smart phone.

DEDICATION

This project is lovingly dedicated to my parents Kamaruddin Bin Abd Ghani and Rafiah Husain who have been my constant source of inspiration. They have given me the drive and discipline to tackle a task with enthusiast and determination. Without their love and support this project would not have been made possible.

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LIST OF SYMBOLS

V	-	Voltage
I	-	Current
P	-	Wattage
Wh	-	Watthour
Ah	-	Ampere Hour
º	-	Degree Angle

LIST OF ABBREVIATIONS

PV	Photovoltaic
LCD	Liquid Crystal Display
USB	Universal Serial Bus
FPC	Flat Plate Collector
ETC	Evacuated Tube Collector
CPC	Compound Parabolic Concentrator
PTC	Parabolic Through Collector
LFR	Linear Fresnel Reflector
CTC	Cylindrical Through Collector
p-Si	Poly-crystalline Silicon
m-Si	Mono-crystalline Silicon
a-Si	Amorphous Silicon
Cd-Te	Cadmium Telluride
CIGS	Copper Indium Gallium Diselenide
CIS	Copper Indium Selenide
DSSC	Dye-Sensitized Solar Cell
DSC	Dye-Sensitized Solar Cell
QDSC	Quantum Dots Solar Cell
QD	Quantum Dots
PSC	Perovskite Solar Cell
Li-ion	Lithium-Ion

Ni-cd	Nickel Cadmium
Ni-Mh	Nickel Metal Hydride
PWM	Pulse Width Modulation
MPPT	Maximum Power Point Tracking
DC	Direct Current
AC	Alternate Current

CHAPTER 1

INTRODUCTION

1.1 Background

The issue between energy and environment has been hotly debated over the past 20 years. Through the environment pollution, public have realized the important of renewable energy which can help to save the earth from pollution. Other than environment pollution, source of oil and natural gas which insufficient to meet future needs also have been one of the main factors which make the renewable energy is so important to use (Quaschning, 2019). There are few natural sources that can generate energy such as wind, sun, tides and geothermal heat. For this project, sun is the source that will be focused on in generating electricity to charge smartphones. Using sun as source of renewable energy is called solar energy and it is one of the cleanest sources of energy. Basically solar energy is produce through the conversion of sun's energy to electricity by using photovoltaic or concentrated power (Gorjian, 2017).

Photovoltaic is categorized as direct solar power that converts solar radiation directly becoming electricity while concentrated power is categorized as indirect solar power which converts solar energy to heat and then to electricity. Photovoltaic (PV) system is divided into two categories which is stand alone and grid connected. The first category is called stand-alone PV system which is used for the small load electrical appliances such as street light and charge electronic device (smartphone, tablet and other USB interface electronic products) and it contains storage battery. For grid connected means that solar panel is connected to the electrical grid of the electrical utility company

and it does not contain storage battery (Rashad, El-Samahy, Daowd, & Amin, 2015). For this project, stand-alone PV system is used as the main objective is to charge smartphone.

In this era of technology, smartphone have become one of important thing in daily life activities and without smartphones the process of activity became difficult. As it is called era of technology, smartphones become open platform that provide many of third-party applications such as Instagram, Facebook, twitter, mobile legend game and many more. Many of these apps has caused the smartphones energy consumption is increased rapidly and as a result, the battery can last for a limited time only (Denzil Ferreira, 2011). Solar powered smart phone charging station that use photovoltaic to generate electricity were propose as an option for the public to charge their smart phone without using electricity source from national grid. The project consists of solar panel, solar charger controller, battery and voltage regulator. This product will be placed at locations that do not have electricity sources such as recreational parks, bus stations and many more. With the existence of this product, it could help public to solve their problem in finding places to charge smartphone while promoting renewable energy awareness.

1.2 Problem Statement

Charging smartphones is a must for every owner that own smartphone and without charging the battery it become useless device. Increasing usage of social media and entertainment application is making the smartphone battery only last for couple of hours. Due to having drain battery, every smartphone owner will always have to prepare to recharge back their smartphone so that it can be use anytime. The main question is where the owner can recharge back their smartphone if they don't any electricity source for example during in public places such as recreational park or bus station. In Malaysia, awareness on Renewable Energy (RE) were quite high, however, not many is using the RE

technology (Kardooni, Yusoff, Kari, & Moeenizadeh, 2017). Therefore, with the implementation of this solar powered smartphone charging station system will be a jump-start for Malaysian people to use RE in their daily activities and be a problem solver for the public or community.

1.3 Objective

Towards completion of this project, there are several objectives to be achieved:

1. To design solar powered smartphone charging station
2. To develop a solar powered smartphone charging station that can charge smart phones using solar module, solar charger controller, battery and other required circuit.
3. To analyse the performance of solar powered smartphone charging station.

1.4 Scope

The target of this project to develop a smart phone charging station using renewable energy as source of electricity. The project focuses on generating electricity using solar energy that can be utilized by public to charge smart phone. Generating optimal electricity is the critical part to achieve but with consideration of few criteria it can be achieved. Type of solar module play an important role but different type of solar panel has different cost. The type of solar module will be choosing based on productivity and the least cost by doing past research. Other than that, amount of solar energy which include shading effect and angle & timing of sun also need to be considered in producing optimal electricity. Lastly, battery also needed to focus on, because it is to make sure that the system has a reliable back-up system.