UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BUILDING ENERGY PERFORMANCE: CHALLENGES & POTENTIAL

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

MUHAMMAD AMMAR BIN MAHADI

B071610388

950307-03-5347

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

TECHNOLOGY

2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: BUILDING ENERGY PERFORMANCE: CHALLENGES & POTENTIAL

Sesi Pengajian: 2019

Saya **MUHAMMAD AMMAR BIN MAHADI** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

☐	SULIT*	Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.

☐ TERHAD* Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.

☒ TIDAK TERHAD

Yang benar,

.....

MUHAMMAD AMMAR BIN MAHADI

Alamat Tetap:

Lot 1301, Lorong Masjid Guntong,

Simpang 4 Limbat,

16150, Kota Bharu, Kelantan.

Tarikh:

Disahkan oleh penyelia:

.....

KAMILAH BINTI JAFFAR

Cop Rasmi Penyelia

Tarikh:

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini

DECLARATION

I hereby, declared this report entitled BUILDING ENERGY PERFORMANCE: CHALLENGES & POTENTIAL is the results of my own research except as cited in references.

Signature: ……

Author : MUHAMMAD AMMAR BIN MAHADI

Date:

APPROVAL

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

Signature: …….

Supervisor : KAMILAH BINTI JAFFAR

Signature: …….

Co-supervisor: EMY ZAIRAH BINTI AHMAD

ABSTRAK

Bangunan komersil menggunakan lebih banyak tenaga dan membazirkan banyak sumber semula jadi yang membawa kepada pengeluaran karbon dioksida yang banyak dan dapat menyebabkan pencemaran alam sekitar. Penyelidikan ini akan menumpukan kepada potensi bangunan untuk mengurangkan penggunaan elektrik dan mengurangkan bil elektrik tanpa menjejaskan penggunaan tenaga peralatan. Sistem pengurusan tenaga dilaksanakan dengan meminimumkan kehilangan tenaga dan memaksimumkan kecekapan tenaga. Selain itu, terdapat beberapa tindakan yang digunakan sebagai langkah untuk penjimatan tenaga dan juga penjimatan kos. Kajian ini menganggarkan penjimatan tenaga yang berpotensi dicapai dengan menggantikan mentol Fluorescent Kompak (CFL) kepada mentol Pemancar Diod (LED) dan memasang sistem Lampu automatik di dalam bangunan MBMB. Audit tenaga terperinci akan terlibat dalam menganalisis prestasi dan parameter bangunan dan juga mengenal pasti kawasan yang berpotensi untuk mengurangkan penggunaan tenaga. Ia menganggarkan bahawa 30384 kWh penggunaan tenaga tahunan dapat dikurangkan melalui penerapan langkah-langkah penjimatan tenaga.

ABSTRACT

Commercial buildings consume more energy and waste more natural resources, which leads to more carbon dioxide production and environmental pollution. This research will focus on the potential of building to reduce its electricity consumption and reducing the electricity bills without negatively affecting the outputs. The energy management system is implemented by minimization of energy loss and maximization of energy efficiency. Other than that, there are some action by applying energy saving measures may result in cost saving. This study estimated the energy saving potentially achieved by replacing the Compact Fluorescent (CFL) bulbs to Light Emitting Diode (LED) bulbs and installing Automatic Light system in the MBMB building. The detailed energy audit will involve in analysing the performance and parameters of the building and identify the area that has potential to reduce the energy consumption. It estimated that 30384 kWh of annual energy consumption can be saved through the application of the energy saving measures.

DEDICATION

This study is wholeheartedly dedicated to my beloved parents, who have been my source of inspiration and gave me strength when I thought of giving up, who continually provide their moral, spiritual, emotional, and financial support. Secondly, I would like to thank my family members, friends, and classmates who shared their words of advice and encouragement to finish this research.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank God Almighty for giving me strength in times of needs and place of comfort. With my deepest sense of gratitude, I would like to express my special thanks of gratitude to my supervisor, Madam Kamilah Binti Jaffar who provided me with never ending encouragement and support to complete this project research, which also helped me in doing a lot of research and I came to know about so many new things that I never experienced before. I'm really thankful to her and not forget to Madam Emy Zairah Binti Ahmad who also involved in this research.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF SYMBOLS

m	-	meter
kWh	-	Kilowatt Hour
kV	-	kilo-Volt
AC	-	Alternative Current

LIST OF ABBREVIATIONS

EEM	Energy Efficient Mortgage
EMMER	Efficient Management of Electrical Energy Regulations
BMS	Building Management System
BEI	Building Energy Index
ISO	International Organisation for Standardisation
EMGS	Energy Management Gold Standard
AEMAS	ASEAN Energy Management Scheme
BEMS	Building energy management system
MSB	Main Switch Box
LED	Light Emitting Diode
CFL	Compact Fluorescent
MS	Malaysia Standard
MBMB	Majlis Bandaraya Melaka Bersejarah

CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter will clarify about the background of the project, problem statement, objective, scope, and project significant of this project which is the highlight of the project.

1.2 Background of Project

Nowadays, electricity is a form of energy that people need it for just about everything because in this era, almost all of modern conveniences are electrically powered. Plus, electricity is a particularly high grade of energy and the lifeblood of a modern society. So huge amount of energy needed for countries with faster economic growth. On the other hand, the energy consumption can be divided into four main sector which are industrial, commercial, residential and transportation. The demand of energy for housing and building is increasing all over the world because of the increasing population and in the meantime, it leads to the rise in the demand of energy use.

Sometime people do not realise that they are wasting a lot of electricity by doing unnecessary task. If the usage of the electricity is not managed properly it could lead to the wastage and the electricity bills also will increase. So, it is something that the user needs to avoid by applying energy saving policies may result in cost saving. Based on A.Allouhi's article, the building sector is considered as the biggest contributor to world energy consumption, greenhouse gas emissions and has exceeded the other major sectors: industrial and transportation. Therefore, a good understanding of the nature and the structure of energy use in buildings is important for the future.

Furthermore, implement the energy management system which is called as energy audit in the buildings can improve and reduce the energy consumption. An energy audit can be defined as a systematic process to evaluate and analyse the profile of energy utilization to develop energy efficiency measures Energy Efficient Mortgage (EEM) in buildings. It is conducted by collecting a simple or detailed energy data of the building's real energy utilization and then to be compared with the normative standard energy utilization for developing the EEMs.

1.3 Problem Statement

Malaysia as a rapidly growing country, has raised concerns over limitation of energy resources, and heavy environmental impacts because of the increasing of the buildings. If there is no any action on the environmental effects, the concentration of the carbon dioxide and other hazardous gases released to the environment would increase over years and at the meantime increase the global temperature.

In 2008, the Energy Commission (Regulatory Agency for electricity supply and piped gas supply industry in Peninsular Malaysia and Sabah) regulates the Efficient Management of Electrical Energy Regulations 2008 (EMEER 2008) which has been gazetted on 15th December 2008 (Under Electricity Supply Act 1990). The regulation states that the consumer in any installation which receives energy from a license or supply authority with a total electricity consumption equal to or exceeding 3 000 000kW has measured at one metering point or more over any period of six consecutive months must notify and appoint an electrical energy manager for energy audit recommendation for electrical energy management.

On the other hand, some of the commercial buildings in Malaysia is not fully automated which is controlled by Building Management System (BMS) so wastage of the electricity would occur. Plus, during the energy audit session, the continuous data monitoring of energy parameters is very important because it needs to be monitored thoroughly for the best adjustment in reducing the electricity usage in the building and further analysis. Also, the lack of the awareness about the of the electricity usage contributes to the increment of the electricity bills where the equipment is not used properly and efficiently.

1.4 Objective of Research

Studies carried out to successfully build this project based on the expected objectives:

I. To carry out energy audit for the commercial building.

II. To analyse energy management system in commercial building.

III. To improve the overall energy performance and efficiency of selected building through sustainable energy management program.

1.5 Scope and Limitation of Research

Implement the energy management system in the building is the main scope of this final year project. This project will focus on the potential of building to reduce its electricity consumption and reducing the electricity bills. The energy management system is implemented by minimization of energy loss and maximization of energy efficiency.