

**ENERGY CONSUMPTION ANALYSIS AT KNOWLEDGE AND
COMMUNICATION SERVICE CENTRE, UTEM**

MUHAMMAD KHAIRUL RAZIQ BIN MOHD NIZAM



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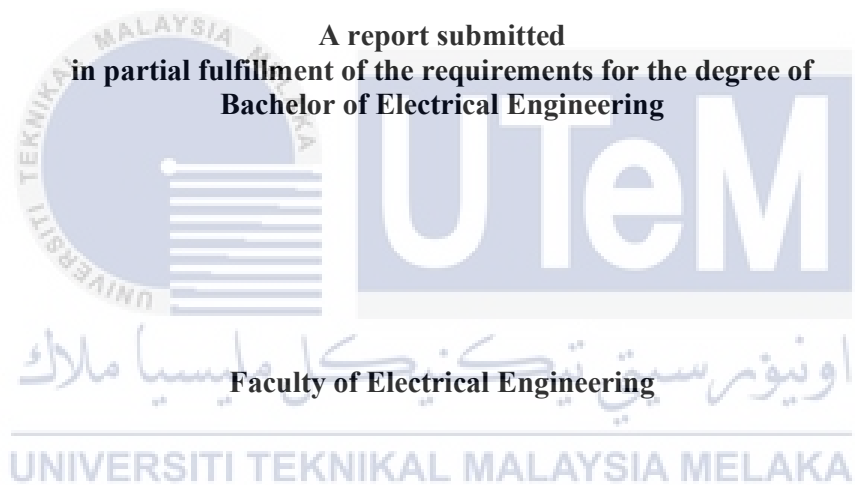
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COMMUNICATION SERVICE CENTRE, UTEM**

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I declare that this thesis entitled “ENERGY CONSUMPTION ANALYSIS AT KNOWLEDGE AND COMMUNICATION SERVICE CENTRE, UTEM” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

I hereby declare that I have checked this report entitled “ENERGY CONSUMPTION ANALYSIS AT KNOWLEDGE AND COMMUNICATION SERVICE CENTRE, UTEM” and in my opinion, this thesis it complies the partial fulfillment for awarding the award of the degree of Bachelor of Electrical Engineering with Honours

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DEDICATIONS

“I dedicated this report to my beloved parents, friends and project’s supervisor that contribute and encourage me to complete this project”



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Alhamdulillah, praise to Allah S.W.T our creator. I am so blessed that I have managed to complete the project assignment successfully with Allah's blessing, I would like to thank Him for giving me good health and the ability to complete this project assignment peacefully and well.

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Thank you very much, once again.

ABSTRACT

Energy plays a crucial role in the production and growth of every country's economy. Due to the higher demand for electricity energy recently, the utilities need to produce more power, which means that more fossil fuel sources are burned to produce the power and leads to emission to the environment. The Malaysian Government has emphasized ensuring adequate, reliable, healthy, and cost-effective supplies and efficient energy resources while minimizing negative environmental impacts. Therefore, efficient energy consumption should be practiced in all levels of consumers like industries, commercial buildings, and residential consumers. Thus, this report aims to analyze the energy consumption of one of the commercial buildings in Universiti Teknikal Malaysia Melaka, the Knowledge and Communication Service Centre's building or Pusat Pengetahuan dan Perkhidmatan Komunikasi (PPPK). In addition, this building is one of the highest energy consumptions building at UTeM. Therefore, energy consumption analysis needs to be done to define how much energy is consumed in this building. The energy consumption pattern at PPPK and the wastage of energy need to identify. All the methods for energy consumption analysis work, starting from desktop audit, analysis from the finding, and reporting, have been implemented to analyze the total energy consumption at PPPK's building. Finally, suggestions on how PPPK can save their energy consumption will be propose which will help PPPK minimize their energy cost.

ABSTRAK

Tenaga memainkan peranan penting dalam pengeluaran dan pertumbuhan ekonomi setiap negara. Kerana permintaan tenaga elektrik yang lebih tinggi baru-baru ini, utiliti perlu menghasilkan lebih banyak tenaga yang bermaksud bahawa lebih banyak sumber bahan bakar fosil dibakar untuk menghasilkan tenaga dan membawa kepada pelepasan ke alam sekitar. Kerajaan Malaysia telah menekankan untuk memastikan bekalan yang mencukupi boleh dipercayai, sihat, dan menjimatkan kos serta sumber tenaga yang cekap sambil mengurangkan kesan persekitaran yang negatif. Oleh itu, penggunaan tenaga yang cekap harus diamalkan di semua peringkat pengguna seperti industri, bangunan komersial, dan pengguna kediaman. Oleh itu, laporan ini bertujuan untuk menganalisis penggunaan tenaga di salah satu bangunan komersial di Universiti Teknikal Malaysia Melaka iaitu bangunan Pusat Khidmat Pengetahuan dan Komunikasi atau Pusat Pengetahuan dan Perkhidmatan Komunikasi (PPPK). Bangunan ini adalah salah satu bangunan dengan penggunaan tenaga tertinggi di UTeM. Oleh itu, analisis penggunaan tenaga perlu dilakukan untuk menentukan berapa banyak tenaga yang digunakan di bangunan ini. Corak penggunaan tenaga di PPPK dan pembaziran tenaga perlu dikenal pasti. Semua cara untuk menganalisis penggunaan tenaga kerja, mulai dari audit desktop, analisis dari penemuan, dan pelaporan telah dilaksanakan untuk menganalisis jumlah penggunaan tenaga di bangunan PPPK. Akhirnya, cadangan bagaimana PPPK dapat menjimatkan penggunaan tenaga mereka akan dikemukakan yang akan membantu PPPK meminimumkan kos tenaga mereka.

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LIST OF SYMBOLS AND ABBREVIATIONS

ABBREVIATION	DESCRIPTION
UTeM	Universiti Teknikal Malaysia Melaka
PPPK	Knowledge and Communication Service Centre
CO ₂	Carbon Dioxide
NEEAP	National Energy Efficiency Action Plan
RDS	Room Data Survey
ACMV	Air Conditional Mechanical Ventilation
ECM	Energy Conservation Measures
GDP	Gross Domestic Products
MEPS	Minimum Energy Performance Standards
BAU	Business as Usual
EPU	Economic Planning Unit
MEGTW	Ministry of Electricity, Green Technology and Water
MIEEIP	Malaysian Industrial Energy Efficiency Improvement Project
GHG	Greenhouse Gas
IPCC	Inter-Government Panel on Climate Change
MMT	Million Metric Tons
CDM	Clean Development Mechanism
RE	Renewable Energy
SCORE	Special Committee on Renewable Energy
SREP	Small Renewable Energy Program
OOP	Outline Perspective Plan
EE	Energy Efficiency

GEF	Global Environment Facility
UNDP	United Nation Development Program
LEO	Low Energy Office
REEM	Registered Electrical Energy Manager
O&M	Operation and Maintenance
M&E	Mechanical and Electrical
HVAC	Heating, Ventilation, and Air Conditioning
FYP	Final Year project
PPE	Personal Protective Equipment
TNB	Tenaga Nasional Berhad
AHU	Air Handling Unit
MSB	Main Switch Board
DB	Distribution Board
SEDA	Sustainable Energy Development Authority
SSB	Sub-Switch Board
ESM	Energy Saving Measures
EMS	Energy Management System
MS1525	Malaysia Standard
RH	Relative Humidity
MCO	Movement Control Order
CMCO	Conditional Movement Control Order
RMCO	Recovery Movement Control Order
SOP	Standard Operating Procedure
LED	Light-Emitting Diode
FCU	Fan Coil Unit

IoT	Internet of Thing
BEI	Building Energy Index
GFA	Gross Floor Area
NFA	Net Floor Area
ACA	Air Conditioning Area



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CHAPTER 1

INTRODUCTION

1.1 Motivation

Nowadays, energy efficiency plays an important role in our life because it can lead to a few benefits such as reducing demands for energy imports, reducing greenhouse gas emissions, and lowering the cost for households and the economy at a wide level. In order to reduce carbon emissions and the usage of energy so there are technology policies that have been introduced as one of the options. In addition, increases in energy consumption efficiency would lead to an effective reduction in the per-unit price of energy services and it will cause rebound effect or a rise in the supply of energy services with a decrease in the effective price [1]. The construction industry is one of the largest consumers of electricity which consumes a large amount of energy and emits a reasonably large amount of CO₂. For example, the European Union (EU) where 40% of the total energy usage is used by the building industry and about 40% of the total CO₂ emissions are released [2].

Next, we can see that energy efficiency measures are widely spread nowadays and there is an issue where people are concern either the efficiency measures are more effective and reliable for the long term. So, in order to give satisfying to the final user or owner needs there will be many measurement scopes that need to be analyzed including environmental, financial, energy, and social factors. Energy experts will do the analysis base on building characteristics, use, type, and climatic conditions and finally, they will evaluate mainly through the simulation.

1.2 Project Background

This project is carried out to support our Government target which is 40% Carbon reduction or CO₂ [3]. The highest usage of energy consumption in our country is basically in building or premises. This project is conducted at the Knowledge and Communication Service Centre, UTeM building. As one of the buildings that have the highest energy consumption at UTeM, therefore the energy consumption analysis is conducted in order to measure the total energy consumption at this building. After completing all the work of energy consumption analysis including data collection, the analysis needs to be done because we want to examine the energy consumption trend at the building of PPPK and finally we will recommend to PPPK the method on how they can use to reduce the energy usage.

Next, by referring to the National Energy Efficiency Action Plan (NEEAP), our government will give a higher concentration on issues related to energy supply by managing demand in an efficient way. The Plan is to improve energy efficiency by implementing the measurement of energy consumption for buildings or agencies that have a higher reading of energy usage. By this action plan from our government, it will easiest the auditor to conduct the energy consumption analysis work because they already have their reference.

There are many stages of work that need to be done in energy consumption analysis work of scope. First, there is a kick-off meeting which means some discussion about the work scope need to be clear. Next, there is also a desktop audit where the building data need to be study and also the building system. Site investigation or site visit needs to be done after the desktop audit in order to know the whole location of the building and it will easiest the energy consumption analysis work. Other than that, the next step is field data measurement where the energy consumption analysis work

at the site such as room data survey (RDS), electrical logging, and Air-Conditioning and Mechanical Ventilation (ACMV) performance measurement need to be done. The next procedure is the data analysis which is finding that needs to be done and also the energy-saving measures.

After completed all of the results and data analysis, the focus is on the reporting section where a draft report need to be create before proceeding with the presentation to the PPPK. Last but not least, the final report is submitted to the PPPK which includes the overall energy usage for that building as well as a suggestion to the PPPK on how to save energy.



Figure 1.1: PPPK UTeM Location

1.3 Problem Statement

Knowledge and Communication Service Centre, UTeM or known as PPPK UTeM is among the highest energy consumer at Universiti Teknikal Malaysia Melaka, UTeM. The monthly electrical bill also high where it is around RM66,000.00 to RM70,000.00 and because of that factor then the energy auditing work is needed to analyze the total energy consumption in the PPPK building.

Energy consumption analysis is a process which is very much central for conducting an energy management project or in general an energy consumption analysis is a study conducted to identify where, when, and how much energy is being used in the building and how to reduce the cost of energy for the premises or building especially for PPPK UTeM building.

The energy consumption analysis work includes four main processes which are data collection, end-use load distribution, Energy Saving Measures (ESM), and lastly is reporting and presentation part. This project will clarify how the comprehensive energy consumption analysis process is being performed at the Knowledge and Communication Service Centre's building.

1.4 Objectives

The objectives of the project are as follows:

1. To analyze load profile and load apportioning at Knowledge and Communication Service Centre or PPPK's building.
2. To identify the wastage energy in PPPK's building.
3. To propose energy saving at PPPK's building.

1.5 Scopes

The purpose of this paper is to analyze the energy consumption at the Knowledge and Communication Service Centre or PPPK's building. The energy consumption analysis needs to be done to measure the total energy consumption at this building and after finish all the analysis parts then suggestions will be provided to help them to save their energy consumption at the particular building. Next, the process of energy consumption analysis including room data survey (RDS) and desktop audit will be implemented. Furthermore, 2 years (2019 & 2020) electricity bill has been monitored in this project. All data obtained has been analyzed and the suggestions on how to save the energy consumption base on the data analysis will be presented.