



اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA



FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNIKAL MALAYSIA MELAKA



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ENERGY CONSUMPTION ANALYSIS AT FACULTY OF INFORMATION AND
COMMUNICATIONS TECHNOLOGY, UTEM

GOUVINRAJ A/L LECHMANAN PALANISAMY

BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS

2021

DECLARATION

I declare that this thesis entitled “ENERGY CONSUMPTION ANALYSIS AT FACULTY OF INFORMATION AND COMMUNICATIONS TECHNOLOGY, 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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:



Name

:

GOUVINRAJ A/L LECHMANAN PALANISAMY

Date

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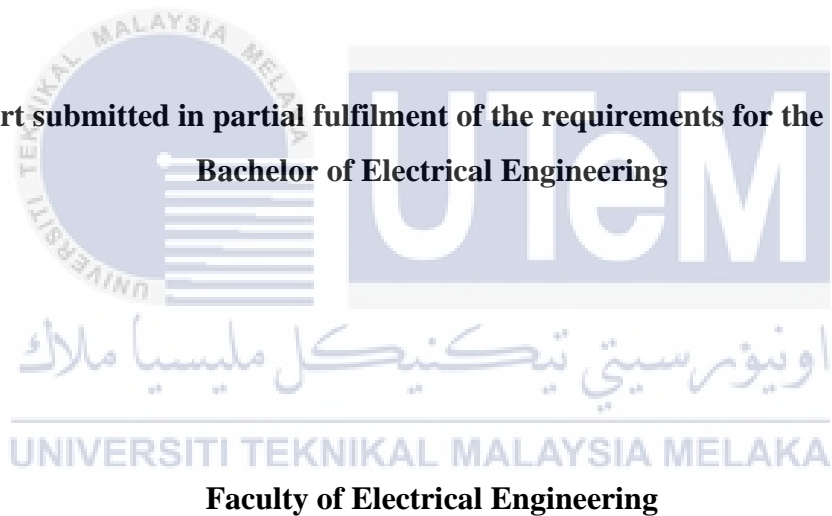
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**ENERGY CONSUMPTION ANALYSIS AT FACULTY OF INFORMATION AND
COMMUNICATIONS TECHNOLOGY, UTEM**

GOUVINRAJ A/L LECHMANAN PALANISAMY

**A report submitted in partial fulfilment of the requirements for the degree of
Bachelor of Electrical Engineering**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

APPROVAL

I hereby declare that I have checked this report entitled “ENERGY CONSUMPTION ANALYSIS AT FACULTY OF INFORMATION AND COMMUNICATIONS TECHNOLOGY, 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

Signature :



Supervisor Name :

IR. DR. AIDA FAZLIANA BINTI ABDUL KADIR

Date :

25/6/2021



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ABSTRACT

Energy is very crucial and important in order to sustain people's every day demand all around the world. The Malaysian government has taken great efforts and steps in order to ensure its citizens will receive reliable, healthy, and low-cost energy supply which is environment friendly as it causes minimal impact or no harm at all to the environment. Energy auditing is very important to be done as it helps to identify the steps needed to be taken to ensure energy is being used efficiently and helps to prevent wastage of energy in order to ensure the durability of energy usage in the future. This project aims to analyse the energy consumption at Faculty of Information and Communications Technology (FTMK) in University Teknikal Malaysia Melaka (UTeM). This building is known as one of the buildings with the highest energy consuming buildings of all the buildings in UTeM. Therefore, energy auditing work has to be done in order to find out how much energy is being consumed in these buildings with their respective equipment and components in the buildings as well as to detect where, how and why high amount of energy is consumed or wasted. All the methods for the energy auditing work beginning from desktop audit, field data measurement, analysis from the finding, and finally reporting will be done in order to analyse the total energy consumption at FTMK buildings. From there, we can suggest FTMK on the ways that they can initiate to save energy in order for FTMK to reduce energy wastage and use energy efficiently.

ABSTRAK

Tenaga sangat berguna dan penting untuk memenuhi permintaan setiap hari untuk warga manusia di seluruh dunia. Kerajaan Malaysia telah mengambil usaha dan beberapa langkah untuk memastikan rakyat jelata akan memperolehi bekalan tenaga yang berkos kurang, sihat, dan dijamin mesra alam kerana ianya memberi impak yang minima atau tiada impak langsung kepada alam sekitar. Audit Tenaga sangat penting untuk dilaksanakan oleh sebab ianya membantu untuk mengenalpasti langkah-langkah yang perlu diambil bagi memastikan tenaga digunakan secara cekap dan juga membantu untuk mencegah pembaziran tenaga pada masa hadapan. Projek ini bertujuan untuk menganalisis penggunaan tenaga di Fakulti Teknologi dan Maklumat Komunikasi (FTMK) di Universiti Teknikal Malaysia Melaka (UTeM). Bangunan ini dikenalpasti sebagai salah satu bangunan yang mempunyai penggunaan tenaga dalam kadar yang tinggi antara kesemua bangunan di UTeM. Oleh itu, kerja-kerja audit tenaga perlu dilaksanakan untuk mengenalpasti berapa banyak tenaga telah digunakan dalam bangunan-bangunan ini dengan menggunakan peralatan dan komponen dalam bangunan ini, dan juga untuk mengesan dari mana, bagaimana, dan mengapa kadar tenaga yang tinggi telah digunakan atau dibazir. Kesemua kaedah untuk audit tenaga, bermula dengan audit desktop, pengukuran data lapangan, analisis daripada penemuan, dan akhirnya laporan, akan dilaksanakan untuk menganalisa penggunaan tenaga keseluruhan di bangunan FTMK. Kemudian, kita boleh mencadangkan FTMK cara-cara bagaimana mereka boleh menjimatkan tenaga bagi memastikan FTMK mengurangkan pembaziran tenaga dan juga menggunakan tenaga secara cekap.

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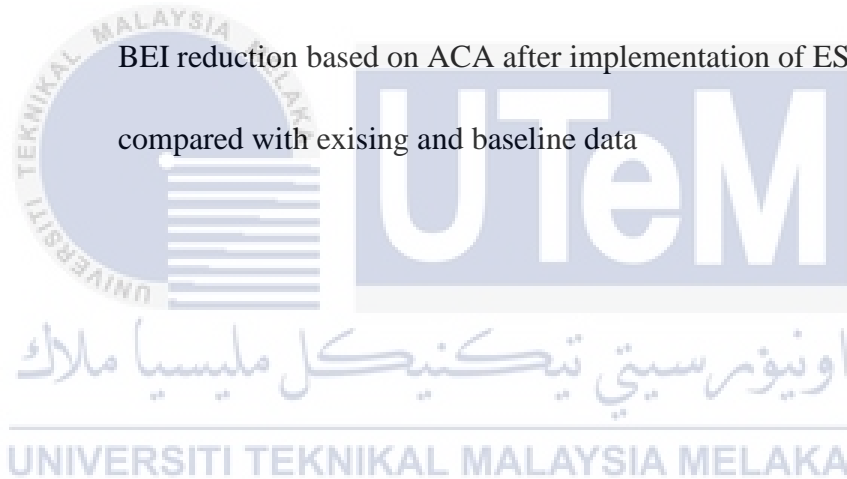
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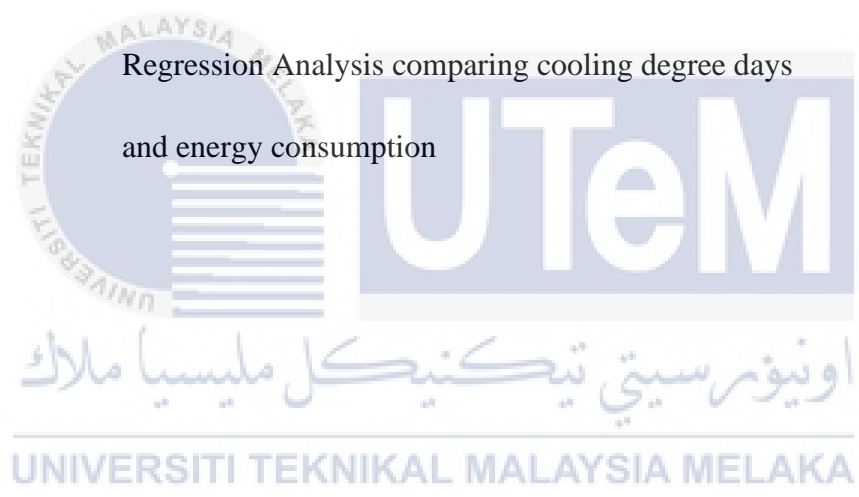
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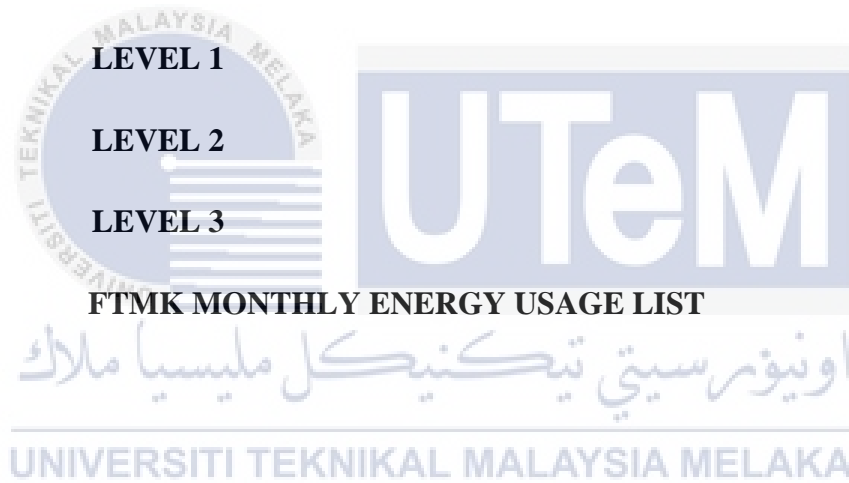
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CHAPTER 1

INTRODUCTION

1.1 Overview

The title of this project is known as Energy Consumption Analysis at The Faculty of Information and Communications Technology, UTeM. This analysis is conducted to identify the problems which are faced by The Faculty of Information and Communications Technology (FTMK) in Universiti Teknikal Malaysia Melaka (UTeM), mainly in terms of high energy consumption. Once these problems are identified, an analysis will be conducted and a discussion will be prepared in order to find a suitable solution for the problems to be overcome. There are several steps needed to be done in order to conduct this project where a literature review is needed to be conducted for a deeper understanding regarding this project, and a research on the methodology is also required to organise the step and methods to conduct this analysis in a proper way.



1.2 Project Background

As we all know, electricity is being used by humans for more than 100 years. Electricity is surrounding us, controlling innovation like our phones, PCs, lights, fastening irons, and forced air systems. It's hard to get away from it in our cutting-edge world. In any event, when you attempt to get away from power, it's as yet grinding away all through nature, from the lightning in a tempest to the neurotransmitters inside our body.

Energy efficiency essentially implies utilizing less energy to play out a similar assignment that is, taking out energy squander. Energy efficiency brings an assortment of advantages: lessening ozone depleting substance outflows, decreasing interest for energy imports, and bringing down our expenses on a family unit and economy-wide level. While sustainable power innovations likewise help achieve these destinations, improving energy effectiveness is the least expensive and frequently the quickest approach to lessen the utilization of petroleum products. There are gigantic open doors for productivity upgrades in each area of the economy, regardless of whether it is structures, transportation, industry, or energy generation.

Therefore, an energy audit is needed to be done in order to use energy more efficiently. The purpose of an energy audit is stated as an examination of all features of an association's recorded and current energy use with the goal of distinguishing and measuring regions of energy wastage inside the association's activities.

1.3 Motivation

At times, a whole lot of electrical energy can be wasted without the consumer knowing about the reason, resulting them to pay more. It is best to let consumers know what are they paying for and to be aware of how the money they spend on bills go wasted and help them to find out ways to conserve energy and save more money so they can use their electricity efficiently.

Based on the National Energy Efficiency Action Plan by the government, the government would concentrate more on the issues related to energy supply by managing demands more efficiently. The plan is to implement the measurement of consumption of energy for agencies or buildings which uses high amount of energy. This plan also provides a view for a strategy to

implement energy efficiency measures in residential, industrial, and commercial sectors which helps to reduce the consumption of energy and economic savings for the consumers [1].

1.4 Problem Statement

From the olden days up till date, energy has become a very important aspect in everyone's daily life, but at the same time, usage of excessive energy may result in global warming and other pollution effects. Excessive energy consumption may result in consumers having to pay extra for their electricity bill. Saving energy may help to reduce energy consumption and will definitely help consumers to lessen their burden by reducing the electricity bill cost. Besides that, as we know, normally there are carbon dioxide (CO₂) gases present around us all the time, but excessive presence of CO₂ gases will result in people experiencing fatigue, tiredness, dizziness, and so on, where when the CO₂ levels increase, more thermal energy are trapped in the earth's atmosphere, resulting in global warming.

In this case, a trend is observed within the year 2019 and 2020 in buildings of Universiti Teknikal Malaysia Melaka (UTeM), where the buildings of the Faculty of Information and Communications Technology (FTMK) has recorded to be the third highest energy consuming buildings compared to other buildings in UTeM based on the monthly energy usage data of UTeM where it reaches around 11% of UTeM's overall energy consumption. Besides, FTMK has also recorded the highest energy cost on the month of May compared to the energy costs of its buildings for the other months from January to October, with the amount of RM 83703.84.

1.5 Objectives

The objectives of the project are as follows:

- i. To analyse the Room Data Survey (RDS) of Faculty of Information and Communications Technology.
- ii. To analyse the load profile, utility bill, and load apportioning of Faculty of Information and Communications Technology.
- iii. To determine the Building Energy Index (BEI) of Faculty of Information and Communications Technology.
- iv. To propose energy saving measures for Faculty of Information and Communications Technology.



1.6 Scope

The project mainly focuses on analysis in Universiti Teknikal Malaysia Melaka, specifically in Faculty of Information and Communications Technology (FTMK). It also focuses on the review of the energy auditing work to measure the energy efficiency of FTMK buildings. Besides that, this project also focuses on comparing the standard energy consumption with the existing readings that were obtained from energy audit in order to study the readings and compare those readings (2019 and 2020) with the previous budget to figure out the efficiencies. It is also crucial to check the efficiencies of the equipment used in the studied building to figure out a proper

solution to save energy more efficiently. The analysis of energy consumption will be for a 1-year-duration.

1.7 Project Outline

This project consists of five chapters in total, namely Chapter 1, Chapter 2, Chapter 3, Chapter 4, and Chapter 5. Chapter 2 explains the literature review about the energy efficiency and also the energy audit of buildings. Chapter 3 consists of the details of methods that are being used to achieve the objectives of this project. Chapter 4 is where the results of this project and the discussion based on the proposed methods in Chapter 3 will be shown. Chapter 5 is where the energy saving measures for the building will be discussed. Finally, the conclusion of the overall report of this project and the future works and corrections that are needed to be carried out for improvements will be discussed in Chapter 6.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the review of the literature from articles, books, journals and other resources. A brief understanding of the National Energy Policy, Energy Audit, Energy Efficiency, and recent findings of energy utilisation and conservation will be discussed in the next sub-chapters.

2.2 National Energy Policy

Malaysia's very first energy-related policies to guarantee maintainability and security in energy supply was the Central Electricity Board (CEB), which was established in 1949. This policy was first shaped before it was changed in the year 1965, to National Electricity Board (NEB). The Petroleum Development Act 1974 was the first policy which truly affected the industry. This policy was vested on PETRONAS, an oil and gas company that is state-owned which has the selective rights to create, explore and produce petroleum resources in Malaysia. Next following it is the National Petroleum policy 1975 to direct downstream oil and gas industry by means of the Petroleum Regulations 1974. The National Energy Policy which was actually introduced in 1979 was the more significant policy with three main objectives, which were utilizing, supplying and environmental [2]. Then, the National Depletion Policy 1980 was implemented and the year after, the Four-Fuel Diversification Strategy 1981 was implemented. The policy was further revised in 1999 with the announcement of the Five-Fuel Diversification Strategy, where the fifth fuel in the energy supply mix was made as Renewable Energy (RE) with the objective to contribute 5% of

the nation's power interest by year 2005. The government has ratified Kyoto Protocol in September 2002, adding to the fifth policy. In April 2009, former Prime Minister, Datuk Seri Najib Tun Razak, launched the new National Green Technology Policy that shall give direction and make new open doors for organizations and businesses to carry a positive effect on the monetary development. While fossil fuel products are required to remain the predominant wellspring of energy for quite a long time to come, RE, for example, solar, wind, biofuel, biomass, and geothermal warmth are relied upon to twofold between now to year 2030 [3]. Table 2.1 shows the energy mix in Malaysia.

Table 2.1: Energy Mix in Malaysia

Source	1980 (%)	1990 (%)	2000 (%)	2003 (%)
Oil	87.9	71.4	53.1	6.0
Natural Gas	7.5	15.7	37.1	71.0
Hydro	4.1	5.3	4.4	10
Coal	0.5	7.6	5.4	11.9
Biomass	-	-	-	1.1

Sources: Abdul-Rahman (2003); BioGen (2003)

2.3 Energy Audit

An energy audit (EA) is a process to recognize working issues, improve inhabitants' comfort, and upgrade energy utilization of existing buildings. Besides that, it distinguishes the open doors for energy conservation. The process is intermittent in nature, and it evaluates changes in building use, the state of existing gear, and the pertinence of new energy-proficient technologies. The EA process starts with the formation of an appropriate energy audit team (EAT) that plainly determines the audit scope. It is critical for the group to take a gander at the accessible assets to outline the time and spending plan for the audit and together all the important structure data prior to beginning the audit. There are several steps for the energy audit process to be conducted. The first step would be the Scope of the energy audit where the scope of the audit, sophistication level of audit, and the anticipated savings are defined. The next step is to form an energy audit team where each members of the team have their specific tasks to perform during the EA. The third step is to plan a time frame and the budget for the audit based on the available resources which will be defined by the EAT. The final step is to construct an energy audit flowchart, which will be shown in Figure 2.1 [4].