IMPLEMENTATION OF SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS) AT ADMIN BLOCK OF FKE

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DECLARATION

I declare that this thesis entitled "IMPLEMENTATION OF SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS) AT ADMIN BLOCK OF FKE 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.

Signature : .....

Name : .....

Date : .....

APPROVAL

I hereby declare that I have checked this report entitled "IMPLEMENTATION OF SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS) AT ADMIN BLOCK OF FKE" 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 : .....

Date : .....

DEDICATIONS

Dedicated to my beloved parents, siblings and friends for the support, encouragement and understanding

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ABSTRACT

This reports present the implementation of sustainable energy management system to achieve 3 star energy management gold standard rating for Faculty of Electrical Engineering by 2019. Faculty of Electrical Engineering, Universiti Teknikal Malaysia Melaka (UTeM) has developed an energy saving plan using Sustainable Energy Management System (SEMS). It has been introduced by the Asean Energy Management Scheme (AEMAS) and Green Tech Malaysia since 2010 which contributes to reduce the energy consumption as well as offers excellence sustainable development, low carbon economy and good corporate responsibility respectively. From this report, we can see reduction of energy as well as produce significant impact to the Energy Efficiency Index and Cost Saving. The admin building of Electrical Engineering Faculty that consist of three blocks (Block A, B and C) is selected to study and determinate its overall lighting, air conditioning system and electrical appliances structure. The major problem are how to improve and monitor the performance of energy consumption and also how to reduce the energy that have been wasted in this building. This an energy lighting, air conditioning and electrical equipment audit classified into two section which preliminary and detailed audit which review and tracking on electrical appliances installed used and its performance of energy consumption. This paper consider energy efficiency index (EEI) as indicator of energy consumption performance. Hence, energy saving can be made by applying SEMS and the main problem of admin block are solved.

ABSTRAK

Projek ini membentangkan pelaksanaan sistem pengurusan tenaga lestari untuk mencapai penarafan standard emas pengurusan tenaga tiga bintang untuk Fakulti Kejuruteraan Elektrik menjelang 2019. Fakulti Kejuruteraan Elektrik, Universiti Teknikal Malaysia Melaka (UTeM) telah membangunkan pelan penjimatan tenaga menggunakan Sistem Pengurusan Tenaga Lestari (SEMS). Ia telah diperkenalkan oleh Skim Pengurusan Tenaga Asean (AEMAS) dan Green Tech Malaysia sejak 2010 yang menyumbang untuk mengurangkan penggunaan tenaga serta menawarkan pembangunan lestari yang mampan, ekonomi karbon rendah dan tanggungjawab bersama yang baik. Dari laporan ini, kita dapat melihat pengurangan tenaga serta menghasilkan kesan yang ketara kepada Indeks Kecekapan Tenaga dan Penjimatan Kos. Bangunan Pentadbiran Fakulti Kejuruteraan Elektrik yang terdiri daripada tiga blok (Blok A, B dan C) dipilih untuk mengkaji dan menentukan struktur sistem pencahayaan dan penyaman udara keseluruhannya. Masalah utama ialah bagaimana untuk memperbaiki dan memantau prestasi penggunaan tenaga dan juga bagaimana mengurangkan tenaga yang telah digunakan secara berlebihan di bangunan ini. Bagi audit pengawalan pencahayaan tenaga dan penghawa dingin diklasifikasikan kepada dua bahagian untuk audit permulaan dan terperinci yang meninjau dan mengesan jenis peralatan elektrik yang dipasang dan penggunaan tenaga. Maka, projek ini mengganggap penggunaan indeks kecekapan tenaga (EEI) sebagai penunjuk prestasi penggunaan tenaga. Oleh itu, penjimatan tenaga boleh dibuat dengan menggunakan SEMS dan masalah utama Blok Pentadbiran dapat diselesaikan.

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EEI	-	Energy Efficiency Index
SEMS	-	Sustainable Energy Management System
G	-	Ground
LED	-	Light Emitting Diode
JKR	-	Jabatan Kerja Raya
HVAC	-	Heating, Ventilation, and Air Conditioning
FKE	-	Faculty Electrical Engineering
PSM	-	Projek Sarjana Muda
UTeM		Universiti Teknikal Malaysia Melaka

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Electricity consumption in commercial buildings have consistent attention as electricity is large energy source that have been used in building [1]. The cost of fossil fuel has steadily increased year by year. Malaysia's electricity tariff will increase as the result of fossil fuel price rise.

In Malaysia, the strong demand from domestic and commercial sector make the demand for electricity is going rise. It is grow in tandem with its Gross Domestic Product (GDP). The demand of electricity will increase if GDP rising continuously, but in different path. Around 1.5 of Malaysia electricity GDP, meaning that for every 1% rise, electric consumption rise by 1.5% [2]. Therefore, the country is going to need more electrical energy to achieve high income status.

The use of electrical appliances is often linked to building energy utilization especially air-conditioning and lighting [3], which each have a very large parts of energy consumption. Most of the rate of energy consumption given by surrounding, management, environmental, building construction and design, mechanical and electrical equipment. [4].

Table 1-1: Energy use in building that effect parameters. [4]

End-Use	Factors
1. Air Conditioning	Occupancy and Building Design and Construction
2. Lighting	Environmental Standard
3. Power and Process	Climate Building design and construction

	Mechanical and Electrical Equipment.

The annual consumption most of typical Malaysian office buildings in Figure 1.1 .Its show that total building energy consumption are 58% from air conditioning, followed by lighting (20%), office equipment such as printer, projector and other (19%) and (3%)[2]. By year 2020, 32 million people to be expected population in Malaysia. This 75% expectation of population will live in modern areas. This shows that the rate of energy consumption will rising due to modern home appliances such as air conditions [5]. In addition, lighting becomes the second electric consumption [6].

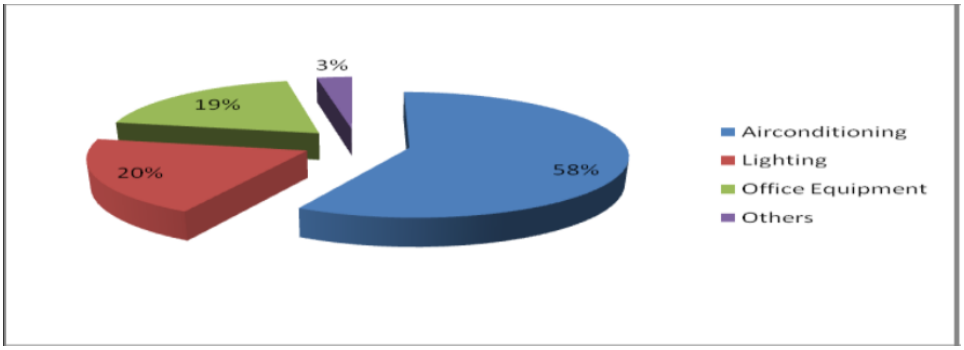

Figure 1-1 Annual Consumption [2]

Based on this matter, gross floor area cannot be ignored in power consumption, since energy consumption based on per unit floor area [4]. On theoretical, the bigger gross floor area of the building, more energy will be consumed. For a building, the meaning of Electric Efficiency Index (EEI) is attach to the size of building and mostly considered as energy used per unit building area. EEI is expressed in kWh/m^2, the saving energy consumption are the lowest EEI

1.2 Motivation

Admin building of Faculty Electrical Engineering is one of the commercial buildings that consume high energy since the building area size is large. Now, Univerisiti Teknikal Malaysia Melaka (UTeM) has achieved 1 star energy management gold standard rating on 2017.For this year, by end of November, the audit

will be made to certified that UTeM will be awarded the 2 star rating under ASEAN Energy Management Scheme (AEMAS).Most of the energy used are flowing to lecture hall, admin building and lecturer room since all of the student and lecturer main activities spend in this building. As the main electricity usage are lighting and air conditioning, energy waste that occur should be identified and at the same time it must using less energy to provide the same energy to encourage sustainable energy management system. To reduce power consumption, performance of energy consumption can be monitor by applying energy efficiency index which it is provides the energy performance comparison. So that it can raise awareness of the building efficiency and start to plan the target for the improvement of energy consumption.

From this report, the power consumption can be analyzed by collecting data of air conditioning, lighting and electrical equipment in order applying the building sustainable energy management system (SEMS) at Admin Block of FKE.

1.3 Problem Statement

The commercial building need a serious awareness since the electricity is the main energy source used. With the increasing of fuel price, its effect consumer to use the electricity continuous and wisely. An energy audit is the one of step undertaken to determine what, when and how energy is used in a building. In order, it is to know the basic problem of the wasting of energy consumption. Most of the electrical load that act as major consumer of electricity in the building are air-conditioner , lighting and office equipment. At that point, FKE's staff and student has slightest energy mindfulness which most of them always take granted by leaving the lecture room with light switch on and running waste of energy and increment utility usage.

Besides, the temperature inside the admin building are higher. There are most of the glasses window are not tinted yet leads to heat move from outside of building into inside of the building. Air Handling Unit (AHU) or Fan Coil Unit (FCU) sometimes failed to cool the area of building because of the power needed to cooling the building are not enough for the space so that the compressor and fan control need to work out more than usual. This will lead to increasing of power consumption.

In addition, Admin Block of FKE has been conduct savings program that related to energy efficiency and energy saving. Therefore, the energy saving should be maintain with any suggestion of SEMS. It is one of the important things to uniform the electrical appliances performances and at the same time decreasing the energy consumption, fulfill consumer demand and reduce the electrical bills.

Energy management system is one of the method to prevent UTeM paying uncontrolled electrical bill. Energy consumption and maximum demand effect the electrical bill. Type of electrical loads, working hours, consumer demands, the temperature surrounding, the quality material of building and people behaviors.

1.4 Objective

There are three objectives to be achieve at the end of this project:

i) To collect and analyze data energy consumption at Admin Block.

ii) To calculate and determine the Energy Efficiency Index (EEI) on the admin building of FKE.

iii) To suggest the sustainable energy management system (SEMS) at Admin Block of FKE

1.5 Project Scope

As admin block is one of the block classification that require to identify power consumption, strategic planning should be formed to achieve energy efficiency. Data collection including lighting, air conditioning and electrical equipment at admin block of FKE. Perform the preliminary and detailed energy audit for lighting, air conditioning and electrical equipment at admin block which consist of Block A, B and C .EEI are determine to track the performance of energy consumption in admin building. By applying sustainable energy management system, to assure that energy of lighting, air conditioning and electrical equipment has been efficiently used, the process of managing the energy consumption should be done. So that, it will verified that SEMS are successful increase the energy performance at Admin Block of FKE

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

By developing energy efficiency, the energy consumptions and greenhouse gas emissions can be lowered indirectly. In order to reduce global warming, sustainable energy management system (SEMS) is the most successive path to guarantee a protected and feasible energy supply. To attain the energy efficiency, the power consumption of Admin Block must be analyzed first by performing preliminary audit, detailed audit and next recommendation plan for improving power consumption can be proposed.

2.2 Introduction of Sustainable Energy Management System (SEMS)

SEMS is the process of managing the energy consumption in the organization to assure that energy has been efficiently consumed. It cover all aspect of energy consumption in the organization and involves not only machines or equipment that consume energy but also looks for the best operations from operators. In order, Nigim and Reiser [7] the efficient use including various of renewable and non-renewable energy resources while limiting the natural resources in the definition of sustainable energy. According to Bossel [8], to sustain the power consumption, it need to fulfil two condition. First, the renewable sources sustainably managed to all energy and secondly high efficiency of energy must use and distributed.

For the sustainable energy management system, Choong [9] suggested how to implement energy management in a university, All of these suggestion were grouped in three major part which is planning, implementing and also monitoring and evaluation. While John and Gorp [10] research that by consistently applying energy management, energy saving will be able to be maintained over time. By ensuring that each building in university will be able to improves power consumption and eco-environmental building