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ELECTRICITY CONSUMPTION: A CASE STUDY OF ENERGY EFFICIENCY PROGRAM AMONG KUIM

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ABSTRACT

Electricity is a key energy source and is essential for economic development in every country because all systems operating in the building are based on electrical power supply. However, what is more worrying now is the use of inefficient electricity can have a negative impact on the environment and humans. This paper aims to propose energy efficiency plans with technical and behavioral improvement measures for Islamic University College of Melaka (KUIM). Quantitative research designs have been developed for the analysis of electrical consumption records to identify trends and usage patterns. The energy efficiency plan contemplates short-term tangibles or intangible actions. It also considers the investment period and the repayment of significant steps. Reduction of energy consumption is expected if energy efficiency plans will be implemented. This paper emphasizes the importance of involving students, faculty and technical staff to work together in assessing the energy efficiency of the buildings they are studying and working.

Keywords*:* Energy Efficiency, Energy Audit Program, Energy Management, Energy Consumption.

1.0 INTRODUCTION

Paralysis of electrical energy causes this system to not operate fully and affect user activity and needs. In energy management, besides the use of electric equipment aspects that can save energy users should also be exposed in use energy efficiently. In other words, consumers need to be aware of the importance of efficient energy consumption as it will save the environment and save costs. Therefore, saving electricity through efficient and optimal use is the best way to reduce carbon dioxide emissions by each individual as well as to provide financial returns from its. The world faces two major challenges in the energy field, which is inadequate, and expensive power supply and a negative impact on human activity on the environment.

The economic growth of power supply is highly dependent on the country sufficient to sustain economic growth. The primary energy source for electricity generation is achieved from fossil sources (such as gas and gasoline charcoal). To maintain environmental sustainability for the well-being of future generations this natural resource stock should be handled and maintained as best as possible.

2.0 ELECTRICITY USAGE AND THE IMPACT OF SUSTAINABLE

Environmental sustainability is a serious concern for the benefit of the whole world. One of the non-negligible components is energy efficiency especially electricity. In particular, the use of energy efficiency aspects should be emphasized as one of the largest contributors to climate change through the generation of fossil fuel and energy generation. Economic development has led us to use all the available resources but it is ironic that the progress eventually destroys the world's population. The desire to manipulate the environment to meet human needs even for self-purpose will only invite future destruction and catastrophic consequences as the environmental system itself will change naturally (Roberts & Lansford, 1979).

The three categories of behaviors that destroy nature are human population growth, over-use of natural resources and ultimately the pollution of air, water, and land and support to this destructive treatment are individuals, organizations and institutions (Bazerman & Hoffman, 1999). The improvement in the standard and lifestyle of the Malaysian society will also result in an increase in energy needs, especially electricity and other fossil fuels.

Hence, communities need to change their lifestyles to a more environmentally friendly life for the sustainability of the environment. But the difficult thing was not the change itself but the transition process brought about by the change (Bridges, 2003). This is because the change is in a situation where the transition is Psychological consisting of a three-phase process that is the first to release, to lose and to finish something followed by the neutral zone phase in the middle and last of a new beginning stage. An incremental approach can be

proposed to start a change (Meyerson, 2008). This means that if we want to adopt a more eco-friendly lifestyle it should start from the user rather than it is set by the authorities. Although the success achieved initially looks small but usually the steps that are taken can be implemented and will ultimately lead to further changes.

Additionally, the use of excessive electricity causes the government to increase the amount of energy generated to meet the needs of consumers. In line with this, the government had to raise electricity tariffs and increase electricity service bills. Excessive use of electricity especially at peak times has caused the world to face a serious energy-related crisis. Among them are inadequate energy supplies and uncertain market prices and environmental damage (climate / climate change). This situation is worsening in developing countries, especially in Southeast Asia, including Malaysia. This is due to the rapidly expanding economic factors that will induce massive use of high-tech materials or products without considering the risk of energy management coming from non-renewable sources of oil and coal.

According to *Human Development Report 2007/2008 Fighting Climate Change: Human Solidarity in Divided World* (UNDP, 2007), Malaysia ranks 26th out of 30 countries producing the highest CO_2 emissions in the world for 2004. Earning rates CO_2 gas in Malaysia has increased from 55.3 metric tons ($MtCO_2$) in 1990 to 177.5 $MtCO_2$ in 2004, making the CO_2 per capita emission rate increase from 3.0 tCO_2 in 1990 to 7.5 tCO_2 in 2004. A total of six gases composed of greenhouse gases were identified by the UNFCC, namely Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Hydroflourocarbon (HFCs), Perflourocarbon (PFCs) and Sulfur Heksaflourida (SF_6). Carbon Dioxide. Elements are major greenhouse gases with annual emissions of 80 percent in 1970 to 2004 from 21 to 38 gigates (Gt) and representing 77 percent of the total anthropogenic greenhouse gases emitted in 2004. The largest increase in greenhouse gas emissions 1979 to 2004 came from the energy supply sector, transport and industry sectors, while disbursements for development sectors such as construction, agriculture and forestry increased at a lower rate (UNDP, 2007).

Electricity generation in Malaysia is one of the major contributors to greenhouse gas emissions (Mahlia, 2002). Consequently, energy saving through efficient and optimal use is the best way to reduce the production of CO_2 gas by each individual as well as provide financial returns from the savings of its use bills. Greenhouse gas emissions are identified as the main cause of climate change caused by anthropogenic activity (human) (Stern, 2006).

3.0 RESEARCH AREA AND METHODOLOGY

The University College of Islam Melaka is a private higher learning institution wholly owned by the State Government of Melaka. This institution was established under the Act of Private Higher Educational Institutions 1996.

The State Government is committed in excelling the education in conformity with the slogan Melaka Developed State 2010. Furthermore, on 1st July 2009, The Ministry of Higher Education has agreed to upgrade this institution to be a university college. As of May 2017, the number of students who are still actively enrolling in KUIM is 4, 562 and 357 staff. This survey is a green audit over the use of electricity at KUIM. Among the data sources of this study are electricity bills for six focal areas for 2014 to 2016. The electricity bill payment data is used to examine the electricity consumption trend for all study focus areas. Six focus areas are chancellery building, faculties, cafeteria, Stadium Thariq Ziyad, pump house of Saidina Abu Bakar Apartment and Masjid Al-Ilmi. This study also put forward suggestions on how to converse electricity efficiently.

4.0 DATA COLLECTION & ANALYSIS

Secondary data finding from the formulation of electricity bill payment by area in 2014 to 2016 is shown in Table 1. The findings show that KUIM has to pay an electricity bill of RM 966, 345.97 in 2014, RM 1, 051,315.69 in 2015 and RM 1, 104, 378.89 in 2016. This shows the average amount of electricity bills payable to reach millions of ringgit.

Table 1:
Total electric Bill for 2014-2016

Year	Electric Bill (RM)
2014	966, 345.97
2015	1,051,315.69
2016	1, 104, 378.89

Table 2 shows a more detailed bill based on the distribution according to the building and the focal area. However, there are buildings that do not have separate bills, instead joining bills from other buildings. This is because they use the same meter. The finding showed that administration blocks contributed to the highest bills in 2014 at RM 456,205.70 while RM 509,487.72 in 2015 and RM 526,255.00 in 2016.

Table 2:
Electricity bill according to building and focus area for 2014-2016

Area	2014 (RM)	2015 (RM)	2016(RM)
Chancellery	456, 205.70	509, 487.72	526, 225.00
Faculty	363, 794.90	372,310.99	397, 209.61
Pump House	68, 274.47	73, 589.23	80, 389.74
Cafeteria	25, 230.32	38, 620.37	47, 505.37
Stadium Thariq Ziyad	29, 403.77	31, 496.48	28, 705.76
Masjid Al-Ilmi	23, 260.48	26, 871.31	25, 969.50

The Chancellery block is the main office building such as Vice-Chancellor's office, Deputy Vice-Chancellor, administrative office, finance unit office, academic affairs office and student affairs office. High consumption due to equipment such as computers, lamps and air conditioning is widely used in this building.

Figure 1: Lighting Block and Rack Extension

The use of lighting and air conditioning is largely influenced by the shape of a building and the arrangement of the furniture in the building where most windows install a light-retaining bar as shown in Figure 1 and the addition of

a bookshelf mounted on the windows makes the window difficult to open. Observations found that most departments and units used light shutters and curtains. In addition, due to the lack of space to put many files, additional shelves are made close to the windows. This causes most offices not to rely on lighting from sunlight and air-conditioning for ventilation. After all, there are still many types of air-conditioning that are still in use. Although some lecture rooms, departments and units have transformed air conditioners into new types like York and others, but still have the old type air-conditioning used.

Findings on equipment also show fluorescent lamps commonly used extensively throughout the KUIM Campus building. This gives potential to the high electricity bills. However, there is a more energy saving lamp option that is compact / compact fluorescent lamps or LED fluorescent lamps. Compact fluorescent lamps use 75% of the energy compared to ordinary fluorescent lamps and have a lifespan of 10 times too. LED lighting can save electricity because it only produces three watts of energy as well as reducing global warming that is a hot issue debated. However, the usual fluorescent lamp conversion has been rationale for implementation at KUIM. This is because the conversion may cost a lot. However, if new developments are made, compact fluorescent lamps should be given priority especially for lamps installed in corridors, stairs and KUIM environments.

5.0 SUGGESTION

Due to the conversion to compact fluorescent lamps is impossible to do since light fixtures have been made since long ago and will cause high cost, therefore, saving measures through eco-friendly lifestyle practices should be customary. Among the saving measures that can be taken such as students, lecturers and all non-academic staff should practice shutting down the lights when leaving rooms, halls and units if uninhabited. In addition, it is responsible for closing the hallway corridors, steps and campus environment if not closed during the day without waiting for others to do so. Construction of new buildings should take into account lighting in departments and units so that windows can be opened as well as get natural light without the need for lights installed throughout the working hours.

However, if new developments are made, it is hoped that the use of compact fluorescent lamps will be emphasized for departments and units and enclosed rooms. For outdoor lights such as street lights and stair lights, LED type light (light emitting diode) is ideal. This is because the LED type lamps are even expensive but very effective for saving while not using mercury. For example, a pilot project was made in Malaysia; the government was able to reduce up to 50 percent of the cost of road lighting fees on 63.1 kilometers of roads comprising three major highways when replacing it with tech-light 'light-emitting diode' (LED).

Uninterrupted sensor use (for lights) as well as automatic controls (for air conditioners) to reduce electricity consumption can also be considered. Automatic lights that can detect the people's movements. Lights will be turned on automatically if they detect people's movements and will be deleted separately if there is no occupant. Automated light sensor devices that are turned on at night and closed during the day are also best suited for corridors, stairs and roads. In addition, the use of computers as a tool to resolve most tasks also causes the computer to be installed during work hours. Hence, practices such as turning off the computer when not in use can also save energy consumption. This is because computers that operate in 'standby' or sleep mode are waste energy. Practice switching off and removing electrical equipment such as computers, printers, photocopiers and others should also be practiced. In addition, other electrical equipment such as printers supplied in almost all departments and units are also the main equipment used. In addition to lighting, equipment such as printers, photocopiers, desktops and others are also widely used for day-to-day operations. This means the equipment is installed from 7.30 am to 4.30 pm. Therefore, to maintain the life span equipment periodic inspection should be done to equipment such as fan, air conditioning and light.

6.0 CONCLUSION

Malaysia needs a generation that will push and advance green technology to address world climate problems. If this objective is to be achieved, where should it begin? The starting point is to instill energy efficiency and energy conservation in individuals. In a move to inculcate energy efficiency and energy conservation among young people, the SWITCH Campaign conducted by the Water and Energy Consumer Association in 2010 across Malaysia to educate children to cultivate energy efficiency and energy habits. It is best to take the habit of cultivating energy efficiency and energy saving initiated at a young age to get a better effect, as the Malay proverb, "*Melentur buluh biar dari rebungnya*". Children are the successors of today's generation. To reduce and save energy consumption, KUIM management can not only look at the technological aspects but also see the aspect of responsibility of all parties, whether students or employees. Aspects of responsibility will arise if there is awareness among consumers; this is because without such awareness the use of modern technology facilities cannot be fully utilized. But if these two aspects are combined it is possible for the reduction of electricity consumption at KUIM to occur and thereby reducing the monthly payments of millions of dollars. Today's generation should not waste existing resources so that future generations can also enjoy the convenience and resources of natural resources. This is because electricity is generated from basic sources such as hydropower, natural gas, crude oil and coal. These sources are known as common energy and will expire as time passes as this kind of energy cannot be renewed. Therefore, electricity needs to be used carefully and wisely.

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