



Implementation of Energy Efficiency Standards and Labelling For Household Electrical Appliances: A Comparison among Asian Countries

Khairunnisa A. Rahman ^{*a}, Mohamad Zainal Md Yusof ^a, Mohd Najib Md Salleh ^b, Abdul Mutalib Leman ^c

^aFaculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia

^bFaculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia

^cFaculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia

khairunnisa7480@gmail.com

The depleting of energy sources all over the world has made energy efficiency (EE) among the popular strategies to educate the consumer. The implementation of EE Standards and Labelling (S&L) was introduced to help consumers to identify efficient household electrical appliances before purchasing them. EE S&L are commonly used in many countries around the world, including Malaysia. However, the experience with EE S&L varies across different countries. This paper compares the implementation of S&L in Malaysia with similar programs in some Asian countries including Indonesia, Singapore, China and South Korea. It is mostly concerned with the international situation and the other countries' experience with EE S&L especially for the residential sector. Malaysia has adopted the minimum energy performance standard (MEPS), which was developed by the International Energy Agency (IEA) as a method for S&L. Currently, MEPS is only applied for five types of household electrical appliances. The recommendations to improve the implementation of S&L for other household electrical appliances in Malaysia are also discussed. Based on the comparisons and reviews with other country experiences, there are many advantages for Malaysia if S&L programs can be implemented to cater a much wider range of household electrical appliances.

1. Introduction

In this recent decade, many countries are currently facing an unprecedented energy challenge. According to the International Energy Agency (IEA) forecasts, global energy demand will increase by 40 % between the years of 2007 and 2030 (IEA, 2009). Even assuming that all recently introduced energy efficiency policies are implemented with full success, global primary energy demand is still expected to increase to 35 % by the year 2035. This would cause a spectacular impact on energy costs and energy security, including competition for resources, access to energy for societies' poorest people, economic growth and climate change (Tricoire, 2013). The use of energy sources is often proposed as a possible solution to reduce dependence on existing energy sources (Burdová and Vilčeková, 2014). Energy is a necessity for human survival and progress. However, inefficient use of energy or electricity contributes to climate change. In Malaysia, more than 50 % of domestic consumers use less than 200 kWh of electricity monthly (AWER, 2012). According to the National Energy Balance report (2012), the total primary energy supply in Malaysia has increased by 8.49 %, from 76,809 ktoe to 83,939 ktoe, respectively, for the period of 2010 to 2012. Furthermore, in the same years, the total final energy demand has increased by 11.21 %, from 41,476 ktoe to 46,710 ktoe. Hence, Malaysia's total installed electricity generation capacity was 2.095 ktoe in 2010, and 2.506 ktoe in 2012 (Energy Commission, 2012).

EE is one of the methods used to overcome this issue. According to Melissa (2013), more than 70 energy saving companies (ESCO) are working to eliminate energy waste, primarily through improved lighting technologies in Brazil. As a result, the country has set efficiency standards for everything from light bulbs to electric motors, and has decreased its dependence on oil by more than 65 %. EE standards and labels for household appliances are among the most popular strategies to save energy, and educate consumers to use energy wisely. The Malaysian authority (i.e., KeTTHA, Energy Commission and TNB) also aims to implement minimum EE standards for household electrical appliances as a target to reduce energy consumption in the country. Many Asian countries such as Indonesia, Singapore, China, and South Korea, as well as Malaysia, also implement minimum EE standards for electrical appliances. Some other developed countries such as Mexico, the US and Russia applied this minimum EE standard as mandatory (i.e. Regulation) or voluntary (i.e. Agreement with manufacturers)(Mahlia et al., 2004). Many publications have discussed the implementation of EE standards since this program was introduced two decades ago, but relatively little information has been published on the program that Malaysia has adopted. Minimum EE standards are among the most popular approach that has been used in many countries since the year 2000. The S&L program is one of the programs that have been introduced as one of the methods to help consumers purchase efficient electrical appliances. S&L is a widely used policy instrument to improve EE of appliances. This standard set the minimum EE levels of appliances that can be sold in the market. However, Malaysia has adopted the minimum energy performance standard (MEPS), which was introduced by the International Energy Agency (IEA) as a method for standards and labels. MEPS are incorporated in the amendments of the Electricity Regulations (1994), and have been gazette by the Minister of Energy, Green Technology and Water Malaysia on 3rd May 2013. MEPS mandatory has been applied for five types of household electrical appliances (Energy Commission, 2014b). In order to implement an effective MEPS program, this paper aims to compare S&L programs with similar programs that have been implemented by other countries. It is important to acknowledge the potential of this program to be made mandatory, and also to improve existing programmes (MEPS) in Malaysia. Other than that, is of great importance to understand the theories of the law and practical knowledge on the implementation of the S&L program.

2. The Implementation of S&L in Malaysia

According to Mahlia & Saidur (2010), the EE standard refers to the appointed energy performance of a product manufactured. A product that has less than the minimum standard will not be allowed for the market, or be exported. There are four areas are related to the EE program which are energy test procedures, EE standards, energy labels, and incentive programs. Based on the 2012 report by the Association of Water and Energy Research Malaysia (AWER), they were proposed to use the standard labelling and EE labelling for electrical and electronic products. This is because electrical and electronic products always come with various pieces information printed on the labels which does not assist consumers to identify the correct information. Furthermore, AWER also introduced their model label for electrical and electronic products and received a very good response from the public. The basic information that should be printed on a label must be mandatory, and enforced by the Energy Commission of Malaysia (AWER, 2012). Regarding this issue, AWER also has proposed to implement the Minimum Energy Performance Standards (MEPS) for five electrical appliances, including refrigerators, air-conditioners, fans, televisions and lamps.

2.1 Minimum Energy Performance Standards (MEPS)

Aiming to focus on issues related to water, energy and the environment, AWER has published their reports from reviewed case studies. Only a few major economies in the Asia Pacific (Australia, China, Hong Kong, India, Japan, South Korea, and New Zealand), and all ASEAN members, have selected for the purpose of data collection and tabulation to outline a baseline status of EE implementations across these countries. As a conclusion of this study, they found that a combination of mandatory and voluntary labelling coupled with Minimum Energy Performance Standard (MEPS) is important to remove inefficient products from entering the market. MEPS generally requires a particular test procedure that specifies how performance is measured. Only 47 % among 17 countries have implemented MEPS, including Malaysia. South Korea and China are the leading economies in MEPS implementation (Piarapakaran, 2012). Products that have voluntary EE star rating labelling must be upgraded to a mandatory labelling with revised EE rating requirements. The introduction of an EE star rating labelling scheme for a new product must start with voluntary for a 12 month period. After that, it can be upgraded to mandatory labelling. This is how EE rating requirements are implemented internationally. Mandatory labelling is usually imposed for equipment with high energy consumption (i.e., large quantities, or with long hours of usage duration) (Energy Commission, 2014a).

2.2 Energy Star Rating Label

Mahlia et al. (2002) highlighted that the purpose of introducing labels is to convince consumers to purchase an efficient product. It can also convince the manufacturers to produce appliances that fulfil the minimum requirements, or EE standards. A label is a mandatory sticker that is affixed to products or their packaging containing information on the EE or energy consumption of the product. The three types of labels that are currently used in various countries are endorsing, comparison and a combination of both (Energy Commission, 2014a). In Malaysia, with the regulations in place, the five domestic appliances are issued with a Certificate of Approval (COA) by the Energy Commission, Malaysia. The five domestic appliances are domestic fans, domestic lamps, air-conditioners, refrigerators and televisions. The star rating ranges from 2-star to 5-star. A 2-star rating means that the electrical appliances have the minimal efficiency, while the maximum efficiency is shown with a 5-star label. The Electricity Regulation 1994 (Amendments 2013) Regulation 101A (3) stated that: “any equipment that meets all the requirements of efficient use of electricity must be affixed with an efficiency rating label” (Attorney General’s Chambers, 2013). Therefore, all manufacturers and importers of these electrical appliances must affix the EE Label onto the products before they can be sold to customers. Figure 1 shows the energy star rating label in Malaysia.



Figure 1: Energy Star Rating in Malaysia (Energy Commission Malaysia, 2014)

An energy label system is a good way to promote sustainable energy consumption. Energy labels display the accurate energy consumption information on products, which can improve the market’s operation (Harrington and Damnic, 2004). The label contains the information about energy rating, appliance type, appliance energy rating, energy consumption, energy savings compared to the lowest 2-Star rated product, and testing standards used. In China, a great effect has been achieved after a five year energy label system was released. Moreover, there are still some problems with laws and regulations, EE standards, supervision and public awareness (Zhan et al., 2011). With this EE strategy, consumers can make a choice on what household electrical appliances that they want to purchase, especially ones that have a high EE.

3. Standards & Labelling (S & L) for Other Asian Region

S&L programs had been used by many countries throughout the world. This programme could be the most cost-effective EE programme, which needs the minimum cost to deliver the largest quantity of energy savings. S&L regulations bring more benefit for the three major classes, including the environment, government and consumers (Shi, 2014). Implementation of S&L in the Asian region has increased rapidly during the past two decades. Indonesia, Singapore, Hong Kong, China and South Korea are among the countries that have adopted S&L programs for energy efficiency. The reviews on the implementation of S&L programs by those countries are discussed below.

3.1 Indonesia

Indonesia has launched a voluntary energy labelling program in 2008. Compact fluorescents lamp, or CFLs, were the first labelled product. According to its roadmap, the labelling program intends to cover televisions, refrigerators, air conditioners, ballasts, and washing machines in the next several years. Indonesia has some MEPS for electrical appliances based on the Standard National Indonesia (SNI), and other technical standards on energy performance testing standards (EPTS) for electrical appliances. Additional EE standards on electrical appliances are in development in Indonesia (Hathaway and Zhao, 2011). Figure 2 shows the energy label for the S&L program in Indonesia.

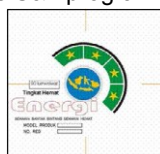


Figure 2: Energy Label for S&L Program in Indonesia

3.2 Singapore

At the beginning of these programs, Singapore introduced the Singapore Green Labelling Scheme (SGLS) as a voluntary labelling scheme under the S&L program. It was launched in May 1992. However, no energy performance information was shown on the Green Label. In 2002, Singapore launched a new voluntary comparative label, called the “Energy Labelling Scheme,” under the SGLS. These programs cover two categories of electrical appliances, including refrigerators and air-conditioners. Currently, the criterion SGL 029 - 030 for domestic refrigerators and air conditioners are no longer enforced for their energy efficiency under the SGLS. Essentially, there is no voluntary energy efficiency labelling scheme in Singapore, although the assessment criterion under the SGLS does include energy efficiency requirements. However, since January 1st, 2008, a “Mandatory Energy Labelling Scheme” was introduced for domestic refrigerators and air conditioners. Figure 3 depicts the Mandatory Energy Labelling Scheme that has been used in Singapore. The Scheme was extended to domestic clothes dryers in April, 2009. The Mandatory Energy Labelling scheme is administered by the National Environment Agency (NEA), and covers household electrical appliances, such as air conditioners, refrigerators and clothes dryers, and is supported by the National Climate Change Committee (NCCC) (Hathaway and Zhao, 2011).



Figure 3: Mandatory Energy Labelling Scheme in Singapore

3.3 Hong Kong, China

Hong Kong introduced a Mandatory EE Labelling Scheme (MEELS) through the Energy Efficiency (Labelling of Products) Ordinance enacted on May 9th, 2008. MEELS covers room air conditioners, refrigerating appliances and compact fluorescent lamps, washing machines and dehumidifiers, and commenced on 19th March 2010 with an 18-month grace period. A Code of Practice on Energy Labelling of Products has been issued to provide practical guidance and technical details with respect to the requirements under the Ordinance. Hong Kong runs a Voluntary Energy Efficiency Labelling Scheme that covers 18 types of household appliances and office equipment, as well as petrol-powered vehicles. The voluntary scheme has two kinds of energy labels, which are grading-type energy labels and recognition-type energy labels. The grading-type energy labels apply to room coolers, household refrigeration appliances, washing machines, electric storage water heaters and electric clothes dryers. Meanwhile, the recognition-type energy labels apply to other appliances and equipment, including non-integrated type compact fluorescent lamps, television sets, liquid crystal display (LCD) monitors, domestic instantaneous gas water heaters, electronic ballasts, and computers. These energy labels that have been used in Hong Kong are shown in Figure 4.



Energy Label

Grading-type Energy Label

Recognition-Type Energy Label
(Verification & Information Label)

Figure 4: Energy Label in Hong Kong

3.4 South Korea

South Korea launched the EE Standards & Labeling Program (included MEPS) in the year of 1992. Currently, the program covers 22 target products, including refrigerators and air conditioners. Appliances with the energy efficiency label are covered with MEPS and an energy efficiency ratio (EER). Figure 5 shows the EE label for refrigerators and fluorescent lamp ballasts that been used in South Korea (Hathaway and Zhao, 2011).

The High-Efficiency Appliance Certification Program has been implemented in South Korea since 1996. A total of 41 target products, including induction motors, boilers, and lighting equipment are involved in this program. It is a voluntary certification scheme that aims to promote the High-efficiency Appliance and

initiative market. Furthermore, Korea has been running another similar energy efficiency program called the E-Standby Program since 1999, but this program aims to reduce standby power of electronic appliances and office equipment. The E-Standby Power Program included 20 products at that time. Additionally, seven products have been changed from a voluntary reporting scheme to a mandatory reporting scheme since August 28th, 2008. Based on a review of these countries, it was found that the S&L program is one of the EE concepts that has been used worldwide, especially in the Asian region. However, the energy label used is different according to the country. It is much easier and practical if a label that has been used has the same standard size for all countries. An overview of S&L program is shown in Table 1.



Figure 5: EE Label for Refrigerator and Fluorescent Lamps Ballast

Table 1: An Overview S&L Program for Electrical Appliances

Year Effective	Country	S&L Program	Legal Status	Appliances
2013	Malaysia	MEPS	Mandatory	F, AC, R, F, TV
2008	Indonesia	Energy Performance Testing Standards (EPTS)	Voluntary	CFL
2008	Singapore	Mandatory Energy Labelling Scheme	Mandatory	AC, R
2008	Hong Kong, China	Mandatory EE Labelling Scheme (MEELS)	Mandatory	AC, R, CFL, WM, D
2008	South Korea	MEPS and Energy Efficiency Ratio (EER).	Mandatory	7 products including R, AC

Notes: Refrigerator (R), Air conditioner (AC), Washing machines (WM), Television (TV), Compact fluorescent (CFL), Dehumidifiers (D), Fan (F) Source: Compiled from references

4. Discussion

Based on the above review, the purpose of implementation of S&L can be predicted. The aim was to convince consumers to buy and manufacturers to produce energy efficient appliances. Purchasing the Energy Star appliances also give more advantages to consumers. Recent studies show that Energy Star appliances can reduce the energy consumption depending on the model and the type of appliances (Mahlia et al., 2002). Martinez-Patino (2014) suggested that by using a certain method use of electricity, the energy consumption of cooling system can be reduced. Furthermore, Energy Star Labelled appliances are very convenient and can perform better than other home appliances that have no EE. These appliances are also eco-environmentally friendly. They have a smaller water consumption and electricity usage. In other hand, to ensure the S&L can be successfully achieved in Malaysia, the incentives should be given to the consumer and the manufacturer. The government utilities should give the incentive to the R&D department of the company to develop the most efficient appliances or to upgrade the appliances to a certain level of efficiency. The high efficiency product usually more expensive than inefficient appliances. Therefore, incentives program for consumers by offering a soft loan to buy efficient appliances in the market can increase the availability and sales of such appliances. Another incentive is to stimulate consumer interest in purchasing high efficiency product by providing campaigns through public media, such as radio, newspaper and television. The authorities (i.e., Energy Commission) can conduct a campaign and briefing to explain the energy label to help consumers make better decisions. Moreover, knowledge about the usage and the importance of the energy label can enhance the awareness among consumers. In order to realize the government's target to provide awareness and good practice among consumers, the authorities have been putting in great effort to advocate various awareness campaigns. This initiative can help consumers to enhance the awareness on the importance of efficient energy use.

5. Conclusions

From the overview on S&L by other countries, it was found that S&L is quickly becoming commonplace throughout the world. The EE standards have been used by over than 50 countries throughout the world. Both mandatory and voluntary approaches are used to address EE across various product categories. Additionally, before EE standards and labels are developed, an appropriate energy test procedure must be

established. In addition, there should also be a review of the star rating in EE labelling product. Therefore, MEPS can be implemented on various electrical appliances. In the case of Malaysia, MEPS is limited to only five types of products, namely, televisions, refrigerators, domestic fans, domestic lamps and air conditioners. For recommendation, the MEPS should be applied for other electrical appliances. EE standards are a set of procedures and regulations that define the energy performance of a manufactured product. EE standards have influenced manufacturers to invest more in designing of high energy efficient products. It will also increase the competition between manufacturers to produce the more valuable products. Consumers can make the choice based on the energy label that is affixed on the product. However, without knowledge and exposure about the energy label, they cannot make the correct choices. Consumers should be educated on how to acquire the correct information from the energy label on electrical appliances before purchasing a product. Finally, this study found that the implementation of this program is necessary and brings many advantages to the country, manufacturers, consumers and environment.

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