THE IMPACT OF MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS) REGULATION ON ELECTRICITY SAVING IN MALAYSIA

Siti Fatihah Salleh¹, Mohd Eqwan Roslan², Aishah Mohd Isa³, Mohd Faizal Basri Nair³ and Siti Syafiqah Salleh¹

¹Institute of Energy Policy and Research (IEPRe), Universiti Tenaga Nasional
²Department of Mechanical Engineering, Universiti Tenaga Nasional
³Department of Electrical Power Engineering, Universiti Tenaga Nasional

Abstract. One of Malaysia’s key strategies to promote efficient energy use in the country is to implement the minimum energy performance standards (MEPS) through the Electricity Regulations (Amendment) 2013. Five selected electrical appliances (refrigerator, air conditioner, television, domestic fans and lamp fittings) must comply with MEPS requirement in order to be sold in Malaysian market. Manufacturers, importers or distributors are issued Certificate of Approval (COA) if products are MEPS-compliant. In 2015, 1,215 COAs were issued but the number of MEPS products in the market is unknown. This work collects sales data from major manufacturers to estimate the annual sales of MEPS appliances and the cumulative electricity consumption and electricity saving. It was found that most products sold have 3-star rating and above. By year 2015, total cumulative electricity savings gained from MEPS implementation is 3,645 GWh, with air conditioner being the highest contributor (30%). In the future, it is recommended that more MEPS products and related incentives be introduced to further improve efficiency of energy use in Malaysia.

1. INTRODUCTION

Energy efficiency has long been identified as one of the key measure to meet our global energy needs. In an effort to promote efficient use of energy in Malaysia, the Electricity Supply Act was enacted in 1990 in order to provide for the regulation of the electricity supply industry and to serve for the establishment of comprehensive control on any electrical installation, plant and equipment. Despite industrial sector being the major consumer of electricity in this country, residential sector continues to consume a significant portion of the final electricity consumption by over one fifth of the total electricity consumption in 2014 [1]. In order to encourage efficient domestic use of electricity, a Voluntary Energy Efficient Appliances and Equipment standards accompanied by a labelling program were implemented from 2009 to 2012. Later in 2013, Malaysia embarked on a regulatory agenda, by adopting the internationally well-known Minimum energy performance standards (MEPS) policy which dictates the minimum energy performance certain household products should meet in order to be marketed [2]. MEPS policy has been adopted in more than 70 countries, with significant economic and environmental benefits [3,4].

The enforcement of Malaysian Standard (MS) to comply with the MEPS requirement falls on five primary household appliances which are air conditioner, refrigerator, fan, television and lamp fitting.
With the regulation set in place, these five domestic appliances will be issued with a Certificate of Approval (COA) by the Energy Commission Malaysia. In order to be issued with a COA, these appliances must satisfy both the safety and performance requirements and must be affixed with an Energy Rating Label (2 to 5 star rating) apart from the safety label. The star rating allows the consumers to compare the energy efficiency and estimate the running costs of an appliance before they buy. More stars simply means more efficient, when compared to products of the same capacity.

After three years of MEPS implementation, the existing standards need to be reviewed in order to learn from best practices. This is the driver for the current research work, on which the main objectives were to evaluate the impacts of MEPS regulation on the domestic appliances market and overall electricity saving. In order to achieve the research goals, sales data of MEPS-compliant products were collected from participating major electrical appliances companies and analyzed systematically.

2. METHODOLOGY
Sales data were collected from 25 major importers, manufacturers, and distributors of electrical appliances in the local market. The collected sales data were then aggregated and analyzed according to appliance category and star rating. Except for refrigerator, the annual electricity consumption (GWh) was calculated based on the individual equipment wattage and average daily consumption (hour). As for refrigerator, the annual electricity consumption was taken from the equipment performance test report, provided by the national development agency, Standard and Industrial Research Institute of Malaysia (SIRIM). The annual electricity saving gained from the use of each MEPS-compliant appliances was also calculated based on SIRIM’s guideline, accomplished by comparing the equipment’s annual electricity consumption with the lowest 2-stars rating model of that equipment’s type.

3. RESULTS AND DISCUSSION
3.1. Sales Volume of MEPS-compliant Household Appliances
The sales volume of MEPS-compliant appliances sold from 2013 to 2015 are shown in Figure 1. For air conditioner and refrigerator, a steady increase on the sales can be observed, starting from over 0.5 million and almost 0.2 million units sold respectively in 2013, to 0.65 million and almost 0.4 million units sold respectively in 2015. Meanwhile, for fan and television, the sales volumes fluctuate within these 3 years. Lamp fitting stands out from the rest, as the highest MEPS appliance category ever sold for the last three years, with the latest record of 6.4 million units sold in 2015.
FIGURE 1: Sales volume of MEPS-compliant appliances sold from 2013 to 2015

Most of the units sold were of 5-star rated for television and fan. In the meantime, over 60% of air conditioners sold are 3 stars and below but the reverse is true for refrigerator. It is likely that the difference in consumer preference to purchase lower rating air-conditioners is influenced by the large price point difference between higher star to lower star rating air conditioners. On the other hand, the price point difference may be lower for televisions, fans and refrigerators. Further study and survey will have to be conducted in order to fully understand the underlying factor for this situation. Unlike the other appliances, lamp fitting does not have any star rating since its performance is rated based on luminous efficacy measured in lumens per watt.

3.2. Annual Electricity consumption of MEPS-compliant Household Appliances

Figure 2 shows the annual electricity consumption of MEPS-compliant appliances from 2013 to 2015. Air conditioner demonstrates the highest annual electricity consumption for all year, reaching 2,050 GWh in 2015. This is explainable because the power input for air conditioner is among the highest compared to other types of home appliances, ranging from 0.6 to 21 kW per unit. The hot tropical weather of Malaysia causes its citizens to use air conditioner 8 hours per day in average throughout the year. The second highest annual electricity consumption in 2015 is by lamp fittings (259 GWh), followed by television (192 GWh), refrigerator (156 GWh), and fan (62 GWh). All of the household appliances electricity consumption increase each year, except for fan and television, mainly due to the fluctuation of its sales in this research database. The total annual electricity consumption combining all MEPS-compliant appliances however increases about 10% every year, reaching 2,220 GWh in 2013, 2,510 GWh in 2014 and 2,720 GWh in 2015.

3.3. Annual Electricity saving of MEPS-compliant Household Appliances

Figure 3 shows the annual electricity saving of MEPS-compliant appliances. In 2015, the highest electricity saving is demonstrated by air conditioner (485 GWh), followed by lamp fitting (442 GWh), television (336 GWh), refrigerator (70 GWh), and fan (62 GWh). The annual electricity saving by air conditioner almost doubled from 210 GWh in 2013 to 401 GWh in 2014. Meanwhile, the annual electricity savings increase steadily for refrigerator and lamp fittings. However, the same trend of annual electricity saving is not demonstrated by fan and television. Again, this is due to the limitation of the research database. Like electricity consumption, the total annual electricity saving achieved increases every year, from 983 GWh in 2013, to 1,270 GWh in 2014 and 1,390 GWh in 2015.
FIGURE 3: Annual electricity saving (GWh) of MEPS-compliant appliances from 2013 to 2015

Based on the analysis on the total amounts of electricity consumption and saving of MEPS-compliant appliances, air conditioner has been found as the highest contributor to both amounts computed compared to the rest of appliances. There are two main types of air conditioner being sold in Malaysia; the inverter and non-inverter type. Only about 5% of the air conditioners sold in 2013 are of the inverter type as shown in Figure 4. However, the number doubled up from 5% to 10% in 2014, and further up to 15% in 2015. Over 78% of the non-inverter type air conditioner sold are 3-star and below. On the other hand, over 96% of the inverter type air conditioner sold are 5-star.

FIGURE 4: Sales volume of air conditioners sold from 2013 to 2015

Figure 5 and Figure 6 show the average electricity consumption and electricity saving by these two types of air conditioners per each unit sold. The inverter types are greatly more efficient in terms of energy use and brought in significant electricity saving compared to the non-inverters or regular ones. This can be contributed to the fact that the inverter type air conditioners are equipped with an innovative technology that allows them to adjust their motor speed and capacity of the compressor. Therefore, the power demand varies based on the periodic cooling requirement of the room. On the other hand, regular air conditioners will have to run at the peak power requirement every time the compressor is running.
4. CONCLUSION AND RECOMMENDATION
The 2013 MEPS regulation has achieved its target to increase the efficiency of household appliances in Malaysia. The electricity consumption, albeit increasing every year due to the increased in population and other factors, has also been accompanied by increasing electricity saving due to adoption of more and more highly efficient products with 3 and above star ratings. The limited existing research database on the sales volume of fan and television, along with increasing trend of more efficient inverter type- air conditioners sales in the local market suggest that there is still a huge potential for electricity saving in the future. More awareness campaign and tax incentive should be allocated to manufacturers of highly energy efficient appliances such as the inverter type- air conditioners in order to induce a healthy market transformation towards more energy efficient products.
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