COMPARISON OF ADOPTION OF ENERGY EFFICIENT HOUSEHOLD APPLIANCES BETWEEN MALAYSIAN AND JAPANESE CONSUMERS

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Introduction

Greenhouse gases (GHGs) particularly Carbon Dioxide (CO_2) has been identified as the main cause of global warming. Fossil fuels provide 82 percent of the world's energy requirement and have been identified as the largest single contributor to increased CO_2 (Intergovernmental Panel on Climate Change IPCC, 2007). It is predicted that the world's demand for energy will increase by 44 percent from 2006 to year 2030 (Energy Information Administration USA EIA, 2009). Similar demand pattern is observed in Malaysia where the requirement for energy has increased in parallel to the national economic growth.

Although Malaysia is a developing nation, she is ranked 26th largest source of greenhouse gases emitter in the world (United Nation Statistics Division, 2007). This position has placed her within the ranks of industrialised nations such as Japan. The country has been experiencing a steady economic growth for the past decades and growth is predicted to be about 6% per annum between 2011 to 2015 (Tenth Malaysia Plan, 2010). Consequently, energy consumption will increase as there is a direct correlation between energy consumption and economic growth (Aqeel & Butt, 2001). Data indicates that the mean monthly income of Malaysians has increased from RM2, 472 (RM1 = JPY25 as of Sep. 2011) in 1999 to RM4, 025 in 2009 (EPU, 2009). With higher disposable income, they are able to purchase various products that enhance their quality of life. Household appliances that are luxuries of the rich in the past have become necessities of the present generation as they become indispensable to the functioning of the modern households (Ventakesh, 1997). This is reflected in the penetration rate of household appliances among Malaysian households. There is a 100% penetration rate of television and refrigerators among Malaysian households (Aini *et al*., 2008). Utilisation of air conditioners among Malaysians have substantially increased from 13, 251 units in 1970 to 253, 399 in 1991 and is projected to be about 1, 511, 276 in the year 2020 (Masjuki *et al*., 2000). The present rate and pattern

of consumption is expected to continue to rise if no intervention strategies are made. This situation will put a strain on the demands for energy which is currently provided mainly by fossil fuel.

In order to address the rising demand for energy and at the same time reducing the carbon footprints, the Government of Malaysia has developed several renewable energy and energy efficiency strategies. Ten strategies for promoting energy efficiency were outlined in the Ninth Malaysia Plan (2006-2010). The Ministry of Energy, Green Technology and Water Malaysia was formed on 9 April 2009 to plan and formulate policies as well as address global issues such as environmental pollution, ozone depletion and global warming. As a signatory to the Kyoto Protocol, Malaysia is committed to reducing carbon dioxide emission and other green house gases. Consequent to the Copenhagen Climate Change Conference, Malaysia has agreed to reduce her carbon emissions up to 40 per cent by the year 2020 compared to the 2005 levels (UNFCC, 2009). The Government of Malaysia reaffirms her commitment to address the issue of climate change by embarking on various strategies in order to reduce her carbon footprint in the Tenth Malaysia Plan (2011-2015). One of the strategies set out in the plan is promoting energy efficiency among all sectors of the society (government, industries and consumers) in order to build an environment that enhances quality of life and preserving the ecosystem.

Literature review

The effects of climate change have to be confronted by undertaking appropriate steps to prepare for and respond to their potential negative consequences to human and environment. However, mitigation strategies are fundamental if we are to reduce, delay and limit the occurrences of climate change. This approach emphasises on reducing the emissions of GHS as they are the main cause of climate change. This realisation has led to many governments in the world particularly the developed countries to implement policies that encourage the adoption of energy efficient in the homes through incentives and regulations (Faiers *et al*., 2007). Engagement of individuals in a low carbon lifestyle is vital as they consume a significant amount of electricity (Semenza *et al.*, 2008). A review by Faiers *et al.,* (2007) indicates that the rate at which they are being adopted is not making a significant impact on the reduction of carbon emissions needed to meet the current targets through the Kyoto Protocols. Kyoto Protocol is an international treaty among 37 countries that commit themselves to a reduction of four greenhouse gases namely carbon dioxide, methane, nitrous oxide and sulphur hexafluoride. It came into force on 16 February 2005.

Energy saving strategy behaviour can be achieved through technical improvements, alternative products use or shifts in consumption behaviour. Studies have indicated that adoption of technology (for example the use of energy efficient bulb) is a more preferred strategy as compared to behavioral change towards energy saving (such as switching off appliances at the mains) (Poortinga *et al*., 2002). Therefore, it is important that effective policies and incentives are put in place in order to entice the consumers towards purchasing energy efficient appliances. Presently, these energy efficient appliances are more expensive than their counterparts. As price is one of the main factors influencing consumer purchasing (Aini *et al*., 2008), the fiscal incentives have to be attractive or the mindsets of the consumers need to be transformed. This is easier said than done as there are numerous internal (individual psychological makeup) and external factors (infrastructures, policies, marketing, culture etc.) that influence one's behaviour (Faiers *et al*., 2007).

About 15-20% of total energy-related CO2 emissions are attributed to households and this share is expected to increase in the future (Biesiot & Noorman, 1999). Households are therefore an important target group for energy conservation. Recognising this fact, the Malaysian government is targeting the household/residential sector to promote the adoption of highly energy-efficient appliances and equipment (APERC, 2010). There are dual prolong strategies developed in order to achieve these objectives: dissemination of information and awareness programme and voluntary energy performance labeling of selected household appliances. Energy efficiency (EE) rating and labeling programme for household appliances in Malaysia was initiated in 2005. Refrigerator was the first appliance to be subjected to the labeling scheme and to date; three more appliances which are domestic electrical fans, air conditioners and televisions are added to the list.

For the local manufacturers, the Malaysian government gives a fiscal for efficient electrical equipment and insulation materials that are produced by them. Those products have to be tested and certified by the Standards & Industrial Research Institute of Malaysia (SIRIM) which will then be endorsed by the Energy Commission on the energy STAR labeling. The energy-efficiency STAR rating varies from 1 STAR which denotes the least efficient to 5 STAR that signifies the most efficient product. For example, energy efficiency of 5-Star rating refrigerators is 25% higher than the efficiency of 3-Star rating ones. A sales tax of 10% exemption incentive is given to high EE locally manufactured refrigerators, air conditioners, televisions and lightings since 2009.

In Japan, the Energy Efficiency and Conservation Division under the Ministry of Economy, Trade and Industry (METI) is responsible for

promoting EE. There are various EE programmes developed for promotion of development, sale and purchase of EE appliances. In order to enhance competitive development of EE products, the Top Runner programme was introduced in 1999 whereby the highest energy efficiency product sets the standard for the industry and penalties are executed for the non-compliances. Subsequently in 2000, a voluntary Energy Saving Labeling Program was introduced to facilitate retailers in promoting highly energy efficient products to the customers by means of providing information on the products' energy performances. With the enforcement of the Revised Energy Conservation Law in April 2006, it prescribes that retailers shall make the effort to promote energy saving through a uniform energy-saving label that has to be attached to the appliances. Manufacturing and sales of EE appliances are further encouraged through establishment of awards, forums and programmes organised by METI (Kodaka, 2008).

The concern for energy saving measures heightened following the aftermath of the March 2011 earthquake and the subsequent tsunami that forced ten of Japan's nuclear reactors to shut down, resulting in a 20% reduction in total electricity generation capacity. It was reported by Cheong *et al.,* (2012) that the senior executive director of the Japan Energy Association praised the forbearance among the Japanese people in the months following the quake by undertaking energy conservation measures both at the office and homes. However, this is only a short-term solution to a long- term problem. Energy conservation is a long-term solution and involves investments in energy reduction technologies, such as switching lights from incandescent to LEDs.

The question remains as to whether these policies and incentives are successful in stimulating the adoption of energy efficiency appliances among the Malaysian consumers. It was reported that legislation may not be the only driver for improvements as the choice to improve EE performance is dependent on the householder (Faiers *et al.,* 2007). Data have indicated that despite incentives given to households in the United Kingdom on loft insulation, the level of insulation varies significantly with 85% of households having less than half the recommended amount of insulation fitted (Mintel, 2005). Promotion of energy efficiency among residential sector in Malaysia was supposed to be carried out between 2006 and 2010 as outlined in the Ninth Malaysia Plan (2006-2010). Accordingly, a study was undertaken to assess the extent of adoption of energy efficient appliances among Malaysian consumers from the view points of retailers. Investigation into the EE regulations and programmes was also carried out. A similar study was conducted in Japan in order to compare the gaps between the developing and developed nation with regards to consumers' adoption of EE household appliances and EE programmes for the public.

Methodology

The study population consisted of the retailers of the electrical stores outlet and the regulators of EE. A survey in Malaysia was conducted among retail electrical stores around the Klang Valley that were located in Kuala Lumpur, Shah Alam, Puchong, Kajang and Bangi. A total of 37 stores were identified using telephone directory and the survey was conducted by visiting these shops directly with no prior appointments made. This approach was taken as our experiences in previous survey among retailers in 2008 found that it was a futile exercise in requesting scheduled time for the survey. The stores comprised of a mixture of chain electrical outlets and independently owned shops. The interview survey period was from January 25 to April 7, 2011. The respondents were the retail managers of the stores. However, due to the time constraint, only four stores located in Tokyo and Ibaraki were surveyed in the month of June 2011. The stores consisted of two chain electrical shops and two independent stores.

The focus of the survey was on four household appliances namely air conditioner, refrigerator, television and lighting. They were selected as these appliances are the top four highly energy consumed household appliances. According to the Agency for Natural Resource and Energy of Japan (2004), energy consumption share was 25.2% for air conditioners, 16.1% for refrigerators, 16.1% for lightings and 9.9% for televisions. Similarly, the Malaysian government had these four appliances embraced in the voluntary national energy star and efficiency rating programme. In addition to these four products, domestic electric fans including ceiling, pedestal, wall and table fans are also included in the national campaign.

There were two sets of questionnaire developed for the study. One set (A) is for survey of the retailers which reflects the supply side while set B is for the EE regulators namely Standards & Industrial Research Institute of Malaysia (SIRIM), Energy Commission of Malaysia (EC) and the Energy Conservation Center Japan (ECCJ). Set A consisted of closed ended questions regarding the sales condition, top selling brands, consumers' purchasing criteria of the four appliances and general awareness of consumers on star rating appliances from the retailers' perspectives. The questions in Set B were developed to examine the accomplishments of the efficiency programmes in Malaysia and Japan. Interview surveys were conducted with the relevant personnel from the Energy Commission (EC, demand side management), testing executive from SIRIM QAS International Sdn. Bhd (SIRIM) of Malaysia and a representative of Energy Conservation Equipment Promotion Division of the Energy Conservation Center Japan

(ECCJ). Data was analysed using Microsoft Office Excel and descriptive statistics were used to describe the findings.

Findings and discussion

The presentation and discussion of the findings will be presented into two separate parts consisting of the survey results of the retailers and the later part with the representatives of the EE regulators (SIRIM, EC and ECCJ).

Survey findings of the retailers

In Malaysia, a total of 22 retailers responded to the survey from a total of 37, yielding a return rate of 60%. The stores consisted of four big chain shops, seven middle chain shops and eleven independent shops. On the other hand, four retailers which were two big chain shops, one middle shop and one small shop responded in Japan.

1. Sales amount of 2010 compared with 2009

The sales amount of the four appliances in 2010 compared with 2009 is as shown in Table 1. All the retailers reported having good sales volume except for 6% of Malaysian retailers reported lower sales of television in 2010 as compared to 2009. The increase in Malaysian demand for these appliances is in tandem with the reported Malaysian GDP growth rate which was +7.2% in 2010.

Table 1: Sales Amount of Appliances in 2010 Compared with 2009

	Air Conditioners		Refrigerators		Televisions		Lightings	
	Malaysia	Japan	Malaysia	Japan	Malaysia	Japan	Malaysia	Japan
Very good	11%	100%	6%	25%	22%	50%	14%	100%
Good	56%	-	72%	75%	61%	25%	57%	-
Same	33%	-	22%	-	11%	25%	29%	-
Bad	-	-	-	-	6%	-	-	-
Very bad	-	-	-	-	-	-	-	-
Total	100%	100%	100%	100%	100%	100%	100%	100%

2. Best selling brand

Table 2 shows the ranking of the top four best selling brands for the different appliances. There are many foreign brands in Malaysia, though there are only Japanese brands in Japan. In Malaysia, Japanese brands seem to dominate the market for refrigerator and air conditioners. However the Korean brand, Samsung has overtaken Japanese brand in television retail market. From the data, Korean brands particularly LG and Samsung are challenging the Japanese brands which have long been dominating the household appliances market in Malaysia. Unfortunately, none of the Malaysian brand names appear in these appliances. The top two most popular brands in Malaysian lighting market are Philips (Dutch brand) and Osram (German brand) where both of them are international brand names. Malaysian local brand, Achiever is in the third position for domestic lighting market.

Table 2: Ranking of Best Selling Brands for the Appliances

Rank	Air Conditioners		Refrigerators		Televisions		Lightings	
	Malaysia	**Japan**	**Malaysia**	**Japan**	**Malaysia**	**Japan**	**Malaysia**	**Japan**
1	Panasonic	Daikin	Toshiba	Panasonic	Samsung	Sharp	Philips	Toshiba
2	Hitachi	Panasonic	Hitachi	Sharp	Sharp	Toshiba	Osram	Panasonic
3	Mitsubishi	Sharp	Panasonic	Hitachi	Toshiba	Panasonic	Achiever	Sharp
4	LG	Mitsubishi	Sharp	Mitsubishi	LG	Sony	GE	Hitachi

3. Purchasing criteria of the appliances

Table 3 shows the opinion of the Malaysian respondents regarding their purchasing criteria of the four appliances. There were altogether 11 factors listed that may influence the acquisition of those appliances. Price is the foremost attribute that influence the purchase decision of the consumers with regards to the three major household appliances comprising of television, air conditioner and refrigerator. This is to a certain extent elucidate the increasing market share of the Korean brands in the market as they are generally cheaper than the Japanese or European brand. Their products are also perceived by consumers to be of comparable quality to the other established brands. Thus, inducement for purchasing of energy efficient appliances can be achieved through lowering of the retail price so that they are competitively priced against the other options available.

Table 3: Ranking of Purchasing Criteria for the Appliances for Malaysians

Criteria	Air Conditioners	Refrigerators	Televisions	Lightings
High Energy Efficiency	2	2	3	5
Low Price	1	1	1	3
Product Safety	2	4	3	1
High Reliability	7	7	8	6
Other Performance	6	6	6	4
Salesman's Recommendation	10	9	7	8
Brand Name	4	3	2	1
Supplier's Advertisement	9	10	10	7
Ergonomics	8	8	9	-
Warranty Condition	5	5	3	-
Payment Condition	11	11	11	-

The criterion of high energy efficiency was highly taken into account by the consumers. It was ranked second among the 11 criteria for air conditioners and refrigerators and was in third place for televisions. The concern for energy efficiency for these major appliances is justified as these appliances are the major user of electricity within a household. Brand name and product safety are also considered rather important by the consumers as reflected in their ranking. The data seems to indicate that salesman and advertisements do not exert much influence on the buyers' purchasing options. Likewise, payment method is the least important criterion for the consumers.

There is a slight difference in the ranking of the purchasing criteria for lightings. The price of lightings is much cheaper as compared to the other three appliances. They are also purchased on a regularly basis and are usually replacement for out of order lights. The criterion of high energy efficiency does not seem to be rather an important attribute for the lightings. This may be due to the fact that the consumers have less purchasing options for lightings as there are only three main types of lights namely incandescent, fluorescent and LED in the market. LED light has the highest energy efficiency but it is not popular yet in Malaysia as it is very pricey. We were informed by SIRIM personnel during the survey interview that the government is phasing out incandescent light from the Malaysian market by

2013. As the result, fluorescent light seems to be the only purchasing option for the consumers if they forsake the LED alternative.

Table 4 shows the opinion of the Japanese respondents. The criterion of high energy efficiency was more important for the Japanese as compared to the Malaysian. Japanese consumers are more energy conscious as compared to Malaysian consumers because the nation imports more than 80% of their energy needs (Cheong *et at.,* 2012). There is also a vast difference in the electricity tariff between the two countries whereby electricity tariff in Malaysia is about 70% cheaper than in Japan due to heavy subsidy by the Malaysian Government.

Table 4: Ranking of Purchasing Criteria for the Appliances for the Japanese

Criteria	Air Conditioners	Refrigerators	Televisions	Lightings
High Energy Efficiency	1	1	4	2
Low Price	2	2	1	7
Product Safety	8	6	10	6
High Reliability	7	6	6	8
Other Performance	2	2	2	5
Salesman's Recommendation	4	6	7	1
Brand Name	6	10	3	4
Supplier's Advertisement	10	5	8	3
Ergonomics	5	4	5	-
Warranty Condition	9	9	9	-
Payment Condition	11	11	11	-

4. Consumers' awareness and understanding of 5-Star rating for appliances and LED light

The level of awareness regarding Star rating of the appliances and LED light is as illustrated in Table 5. Based on the perception of the respondents, the data implies that the Malaysian consumers are familiar with the energy efficiency appliances and the rating system. However, the understanding of

the rating system and its implication in terms of energy saving could further be improved (Table 6).

For the Japanese counterparts, we assess their level of energy concern rather than awareness as Japan has put in place the Energy Conservation Law way back in 1979 in order to promote the initiatives on energy conservation to reduce the total energy demand. This is in stark contrast to Malaysia which initiated the energy efficiency rating and labeling programme only in 2005. It is therefore expected that the Japanese consumers have higher level of concern on energy efficiency of appliances as indicated by the data (Table 7).

Table 5: Malaysian Consumers' Awareness of 5-Star Rating and LED light

Awareness	5-Star Rating			LED light
	Air Conditioners	Refrigerators	Televisions	Lightings
Always	32%	32%	23%	-
Sometimes	63%	68%	65%	86%
Seldom	5%	-	12%	14%
Never	-	-	-	-
Total	100%	100%	100%	100%

Table 6: Malaysian Consumers' Understanding of 5 Star Rating and LED Light

Understanding	5-Star Rating			LED light
	Air Conditioners	Refrigerators	Televisions	Lightings
A lot of	11%	16%	6%	43%
Some	42%	58%	47%	43%
A little	42%	26%	47%	14%
Not at all	5%	-	-	-
Total	100%	100%	100%	100%

Table 7: Japanese Consumers' Concern about Energy Efficiency of Appliances

Concern	Air Conditioners	Refrigerators	Televisions	Lightings
Very high	75%	75%	25%	75%
High	25%	25%	75%	25%
Low	-	-	-	-
Very low	-	-	-	-
Total	100%	100%	100%	100%

5. Sales trend of 5-Star rating appliances and LED light

From the data in Table 8, it can be concluded that there is a steady rate of diffusion of energy saving household appliances in both Malaysian and Japanese markets. However, the degree of adoption varies slightly across appliances. The data shows that a higher percentage of retailers in Malaysia as compared to the Japanese retailers reported the sale of LED lights and five star air conditioners sold better in 2010 than in 2009. This may be due to the higher level of EE products diffusion amongst Japanese consumers as their energy efficiency programmes started as early as 1997 on household appliances. In addition, the figures are not absolute amount as they are rough estimation and relative to the amount of sales compared between the year 2009 and 2010. The true data on the amount of sale of 5-Star appliances could not be compared between Malaysian and Japan as the national sales statistics are not available either in Malaysia or in Japan. A global market intelligence company, GfK, when contacted informed that the company does not gather this type of data just yet. Inquiries made at SIRIM, Energy Commission and ECCJ proved futile too.

Table 8: Sales Trend of 5-Star Appliances and LED Light in 2010 as Compared to 2009

Sales trend	Air Conditioners		Refrigerators		Televisions		LED Light	
	Malaysia	Japan	Malaysia	Japan	Malaysia	Japan	Malaysia	Japan
Sold better	50%	25%	72%	100%	61%	75%	72%	25%
Same	39%	75%	22%	-	33%	25%	14%	75%
Sold bad	11%	-	6%	-	6%	-	14%	-
Total	100%	100%	100%	100%	100%	100%	100%	100%

Survey results of the regulators

The main purpose of the interview survey with the representatives of SIRIM and Energy Commission (EC) was to obtain information regarding existing programmes on energy efficiency (EE), testing protocols, approval procedures, and total number of products tested by SIRIM and the amount approved by EC. On the other hand, information regarding energy saving activities in Japan like the top runner programme, energy saving labeling programme and so on was obtained from the representatives of ECCJ.

1. Energy Saving Activities of Household Appliances

According to the information provided by the Energy Commission, there are four existing EE programmes related to household appliances (Table 9). Regarding EE rating system and labeling, it is a voluntary programme and is currently applied for air conditioners, refrigerators, televisions and domestic fans. The manufacturers have to place their application for energy efficiency testing of their products to SIRIM and the testing fees varies depending on the appliance type. For example, the testing fee for one television model is RM1, 200 but it costs RM3, 600 per model for refrigerators. The testing is normally conducted at SIRIM premises but a request can be made for testing to be done at the manufacturers test facilities. A test report will be issued by SIRIM when the performance test is completed. An applicant then proceeds to EC for STAR ratings endorsement which is free of charge. A 10% sales tax exemption is given to 5-Star rated appliances and high efficiency lightings. For electric lamps, energy performance indicator is efficacy which is expressed in Lumens per Watt (L/W). The minimum efficacy performance of electric lamps for qualification of EE incentives varies for different types of lightings. The detail information regarding performance indicator and testing standards used can be obtained at the EC's website.

According to the information provided by Energy Conservation Center Japan, the top runner programme and energy saving labeling programme are the main existing EE programmes related to household appliances (Table 10). The top runner programme is a unique system because it is a mandatory programme, though Malaysian EE programmes are all voluntary. The concept of the top runner programme is that target value is set higher than the best performance value of each product currently on sale in the market. According to the Japanese government, EE performance of appliances has improved significantly more than expected by this programme.

Table 9: Existing EE Programs in Malaysia

EE Programs for household appliances	Contents of the program	Remarks
EE Rating System and Labeling	Applied for Air Conditioners, Refrigerators, TVs and Domestic Fans	Voluntary programme
10% sales tax exemption promotion	Applied for Air Conditioners, Refrigerators, TVs and high efficiency lamps	Locally manufactured products only
Save Rebate Programme	RM200 rebate for 5-star Refrigerators and RM100 rebate for 5-star Air Conditioners	from July 7, 2011 to Dec. 31, 2011
Education	EE topics in secondary school textbooks, EE campaigns in schools and among public jointly organized by SIRIM/EC with NGO	Ongoing

Table 10: Energy Saving Programmes for Household Appliances in Japan

EE Programs for household appliances	Contents of the programme	Remarks
The Top Runner Programme	Applied for Air Conditioners, Refrigerators, Televisions, and Fluorescent Lamps and so on. EE future target is decided by the best quality appliances in the current market.	Mandatory programme
Energy Saving Labeling Programme	Applied for Air Conditioners, Refrigerators, Televisions, and Fluorescent Lamps and so on. A lot of EE information by retail shops is shown in the label attached to the appliances including expected annual electricity bill.	Voluntary programme
Eco-Point Campaign	Payback system of EE appliances purchased. Applied for Air Conditioners, Refrigerators and Televisions.	From May 2009 to March 2011
Energy Conservation Education Programme	Carried out education to 540 primary schools and 90 middle schools which were selected by the government of Japan	From Apr. 2001 to March 2006

2. EE appliances tested by SIRIM

Data in Table 11 shows the distribution of the four appliances tested by SIRIM in 2009 and 2010. The most number of models tested in both years is the television. It seems that television is the most competitive appliance and the rate of entrance of new television models is rather high as compared to the other appliances. Overall, there is an increase in the total number of appliances testing for EE in 2010 as compared to 2009. This data and the above reported sales trend by the retailers indicate that EE consciousness among suppliers, retailers and consumers have been increasing gradually in recent years. It is expected that this trend will continue in the future if appropriate EE legislations and policies are put in place and that the public campaigns are maintained.

Table 11: EE Products Tested by SIRIM

Appliances	Total number of Products tested by SIRIM	
	Year 2009	Year 2010
Air Conditioners	20	31
Refrigerators	20	20
Televisions	176	233
Lamps	3	3

In Japan, there is no testing body like SIRIM in Malaysia. Manufacturers test the EE performance value of appliances by themselves. If the EE performance meets the target value, manufacturers can declare it is a 5-star appliance and so on. It means that there is no approving body in Japan. The mission of ECCJ is only to prepare the infrastructure like the target EE performance value for the star rating, the design of energy saving label and so on, but not to give the approval to manufacturers. Thus, testing and approving system of star rating is very different between Malaysia and Japan.

3. Drivers for enhancing adoption of EE products in Malaysia

According to SIRIM and EC representatives, voluntary EE rating and labeling programme is not a cost-effective approach in enhancing the sales of EE products. This is due to the high cost incurred by the agencies in updating and upgrading the testing and labeling protocols due to the rapid changes in technology. One of the ways to overcome this is to emulate Japanese practices whereby testing and labeling are conducted by the manufacturers

themselves. A mandatory EE rating system and public education on energy conservation would be able to accelerate the adoption of EE products among the consumers. Japanese mandatory top runner programme would be also a good model for Malaysia. In order to speed up the purchasing of EE appliances, the Japanese government established a payback system named eco-point between May 2009 and March 2011. Basically, the consumers obtained eco-points when they purchased EE appliances and these points could be exchanged to other product/service vouchers during the campaign period. The Malaysian government had just introduced a 'Save Rebate' programme in July 7, 2011. It is a similar system to the Japanese Eco-Point cash back system. However, in order to qualify for the rebate, the household's electricity bill must not exceed 400kWh per month. This restriction may not be justified as those with higher electricity bills are the ones that need to reduce their electricity consumption. The programme was proved successful in Japan but it is yet to be seen if the system would be able to lure Malaysian consumers in purchasing EE products.

Capital and running cost are two major factors that influence usage of EE appliance among consumers. As for the Malaysian consumers, price is the main purchasing attribute and therefore EE products need to be competitively priced. Furthermore, low electricity tariff caused the EE projects to have no major impacts to the consumers. Electricity tariff in Malaysia is currently at RM43.60 (JPY1, 090) / 200kWh and this is about 70% cheaper than in Japan due to heavy subsidy by the government. This will make any effort for energy saving unattractive in Malaysia. If the subsidisation bill is reduced and the budget is instead used for various eco-friendly programmes and activities, it might become a driver for adoption of EE products among Malaysian consumers.

Conclusion

Malaysian consumers via the retailers' views have relatively high energy saving concern though it is lower than their Japanese counterparts for household appliances. It seems that the campaigns initiated by the EC on EE targeting both the consumers and manufacturers since 2005 and the EE tax incentive schemes have advanced the adoption of EE appliances among Malaysian consumers. However, the data may not be able to be generalised nationwide particularly to the rural consumers. The present study only focused on retailers in the urban region where there are differences in the level of income, education, etc of consumers which might influence their choices and options of household appliances. Non-governmental organisations particularly consumer organisations in the country have participated alongside SIRIM, EC and manufacturers on EE campaigns among school children and the public. Malaysian public are found to obtain

environmental information mainly through the mass media such as television, radio and newspaper (Nurizan *et al.*, 2004; Aini *et al*., 2007). As such, mass media in the country could play a more supportive role in raising awareness and educating the public on EE.

In Japan, EE programmes have been initiated way back in the late 1990s and therefore have progressed ahead of Malaysia. One obvious difference in EE programme between the Japanese and the Malaysian is the self regulatory concept adopted by the Japanese manufacturers. The 'Top Runner Program' whereby the product in the market with the highest energy efficiency (the Top Runner), sets the standard and hence triggers competition among the manufacturers. The data from the Ministry of Economy, Trade and Industry (METI) Japan shows that there are altogether 21 products listed under the top runner programmes (Kodaka, 2008). It covers a wide variety of products comprising of vehicles, computers, home entertainment devices, household appliances and others. According to the EC of Malaysia, washing machine, rice cooker and vacuum cleaner would later be added to the list of STAR rating programme. In terms of energy-saving labeling programmes or star rating, Malaysia also lags behind Japan where labeling is applied to four products and 16 products consecutively. In order to enhance adoption of EE products among consumers in Malaysia, four approaches undertaken by the Japanese Government can be embraced. The Japanese Government introduced appropriate sets of laws, regulations and incentives for each of the entity consisting of the consumers, manufacturers and retailers for EE promotion.

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