

# POLICY BRIEF

Institute of Energy Policy and Research

IEPRe | JANUARY 2021

## Continuous Improvement to MEPS Requirements in the Malaysian Electrical Appliance Market: Its Impact on Energy Efficiency

### EXECUTIVE SUMMARY

Minimum Energy Performance Standards (MEPS) are very important standards that can drive the promotion of high efficiency electrical appliances (i.e. 5-Star Rated Appliance) as well as being an effective mechanism for the advancement of energy efficient electrical products produced by industry players. Since MEPS were imposed in 2013, the number of electrical appliances that have met the MEPS requirements and gained energy efficiency labels has steadily increased. As there is a serious need for the mandatory review of MEPS ratings, ST reviewed some requirements in 2018, particularly those relating to the standards used to measure energy consumption and savings and the introduction of new appliances including washing machines.

Therefore, there is a need to study and assess the impact of continuous improvements to MEPS requirements that include: 1) sales volume, 2) market share, 3) total annual electricity consumption and saving, 4) GHG Emission Reduction, and 5) Consumer purchasing behavior relating to MEPS-compliant appliances in the Malaysian market. The research findings provide insights into how to gauge the overall impact of MEPS performance in Malaysia as well determining areas for improvement in MEPS implementation in Malaysia; a move which will prevent Malaysia becoming a dumping ground for inefficient appliances.

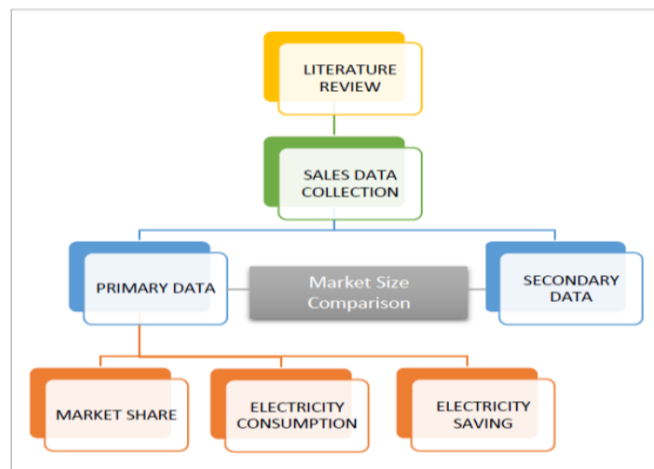
***A quantitative survey was conducted on electrical appliances manufacturers, retailers, importers, and consumers from each part of the country to determine the impact of continuous improvements to MEPS requirement since 2018. The data used in this study is from 2018 to 2020.***

### STUDY OBJECTIVE

- To determine whether continuous improvement to MEPS requirements has a positive effect on the sales volume of the MEPS-compliant appliances.
- To determine whether continuous improvement to MEPS requirements has a positive effect on the market share of the new MEPS-compliant appliances.
- To determine whether the continuous improvement to MEPS requirements has a positive effect on the total annual electricity consumption and savings of the new MEPS-compliant appliances.
- To determine whether the continuous improvement to MEPS requirements has a positive effect on the GHG Emission Reduction.
- To determine whether the continuous improvement to MEPS requirement has a positive effect on consumer purchasing behavior relating to energy efficient appliances.

Continuous improvement to MEPS requirements is needed as it has been recommended that MEPS standards need to be revised every 3-5 years to match the MEPS standards of neighboring countries that have reviewed their ratings. Moreover, previous studies have revealed that the higher performance range cannot exceed the timeframe of 2-3 years and the existing MEPS appliance cannot exceed 25 percent of their market share. The availability of new testing standards and the introduction of new technology also makes revision very important. The details of the improvement to MEPS requirements made by ST are as follows:

Air Conditioner: 1st March 2018  
Refrigerator: 1st March 2018  
Washing Machine: 24th July 2018



Television: 1st May 2019

Figure 1: Flow chart of study's methodology

In order to analyze the impact of the revised MEPS requirements for electrical appliances (e.g. Air-Conditioners, Refrigerators, Fans, TVs, Lamps and Washing Machines) on energy efficiency, sales data of MEPS electrical appliances covering the years 2018-2020 will be gathered from local manufacturers, importers, distributors and retailers, as well as consumers. The data will be cross-matched to the MEPS registration database (COA as issued by the Energy Commission of Malaysia). The sales data includes sales per model and the average price paid per model in each year. The registration database includes all technical details such as the tested energy and energy consumption for each model. Cross-matched model data will then be aggregated into product categories and star ratings. The data will be used to evaluate the impact of the improved MEPS requirements.

The step-by-step approach to evaluate the impact of the improved MEPS requirements, in terms of energy efficiency and savings, starting from 2018, is as follows:

- 1) Obtain the sales data from MEPS-registered brand companies.
- 2) Determine the market share percentage of MEPS appliances in each year with each energy efficiency label.
- 3) Calculate the annual electricity consumption and savings for the original market share based on the continuous improvement to MEPS requirements.
- 4) Evaluate the effect of energy efficiency improvements on GHG emission reduction based on the continuous improvement to MEPS requirements.
- 5) Conduct a survey of consumers to measure the impact of the improvements to MEPS requirements on their Energy Efficiency consumption value and buying behavior.



## KEY FINDINGS OF THE STUDY

### Impact of Continuous Improvement to MEPS Requirements on the Sales Volumes

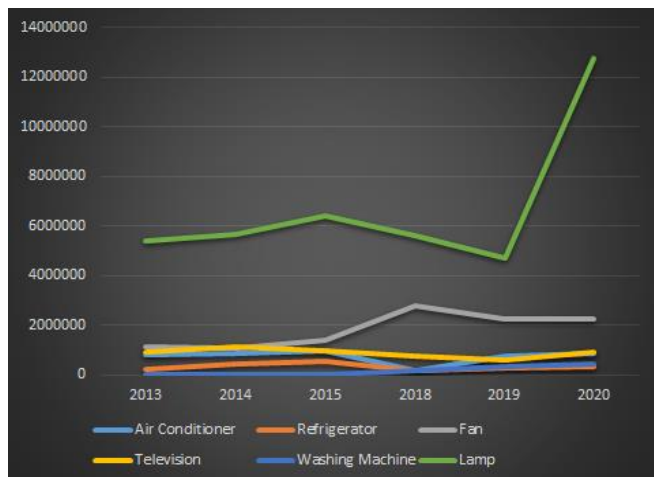


Figure 2: Sales volume of MEPS appliances (2013-2015 vs 2018-2020)

Figure 2 shows the comparison between sales volumes of MEPS appliances in the early phase of MEPS enforcement (2013-2015) and after the improvement was made in 2018. It can be concluded that the sales volume of MEPS appliances are relatively stable except for lamps. This is because the coverage of the recent study is wider than the previous study.

### Impact of Continuous Improvement to MEPS Requirement on the Market Share

MEPS APPLIANCES	Market Share of 2-STAR (%)			Market Share of 5-STAR (%)		
	2013	2014	2015	2013	2014	2015
Air Conditioner	41.69	34.95	33.18	19.71	18.38	21.63
Refrigerator	29.36	19.84	8.80	22.54	39.76	57.30
Fan	0.90	1.28	1.22	93.79	96.90	92.67
Television	0.00133	0.00459	0.00011	99.67595	98.28299	98.63353
MEPS APPLIANCES	Market Share of 2-STAR (%)			Market Share of 5-STAR (%)		
	2018	2019	2020	2018	2019	2020
Air Conditioner	21.73	43.88	33.20	2.34	6.63	5.99
Refrigerator	18.55	24.26	18.34	20.71	17.30	25.38
Fan	0.40	0.16	0.40	91.67	92.18	92.21
Television	0.06	1.35	18.67	99.25	62.18	32.96
Washing Machine	0.00	0.00	1.54	0.00	0.14	7.07
MEPS APPLIANCES	Market Share 50 lm/W			Market Share 85 lm/W		
	2013	2014	2015	2013	2014	2015
Lamp	0.097	0.816	1.029	45.560	32.665	28.527
MEPS APPLIANCES	Market Share 50 lm/W			Market Share 85 lm/W		
	2018	2019	2020	2018	2019	2020
Lamp	83.030	78.971	96.365	20.209	21.029	3.635

Table 1: Market share of MEPS appliances (2013-2015 vs 2018-2020)

Table 1 shows the comparison between market share of MEPS appliances in the early phase of MEPS enforcement (2013-2015) and after the improvements were made in 2018. It can be seen that for air-

conditioning and television appliances, the market share of 5-Star appliances decreased significantly from 2018. This decrease was due to results of the improvements to the testing standards to determine 5 Star rating appliances.

For refrigerators and fans, the market share for 2-Star and 5-Star appliances was relatively stable although there were changes to the calculation of the energy efficiency factor. For the lamp appliances, there were significant changes in the market share of lamp fittings, less than 50 lm/W, and more than 85 lm/W in 2018 when compared to 2013. These results may be due to changing demands in the market. For washing machines, since MEPS became mandatory in 2018, it can be seen that the market share of 5-Star appliances has increased positively from 2018 to 2020.

### Impact of Continuous Improvement to MEPS Requirements on the Annual Electricity Consumption and Saving

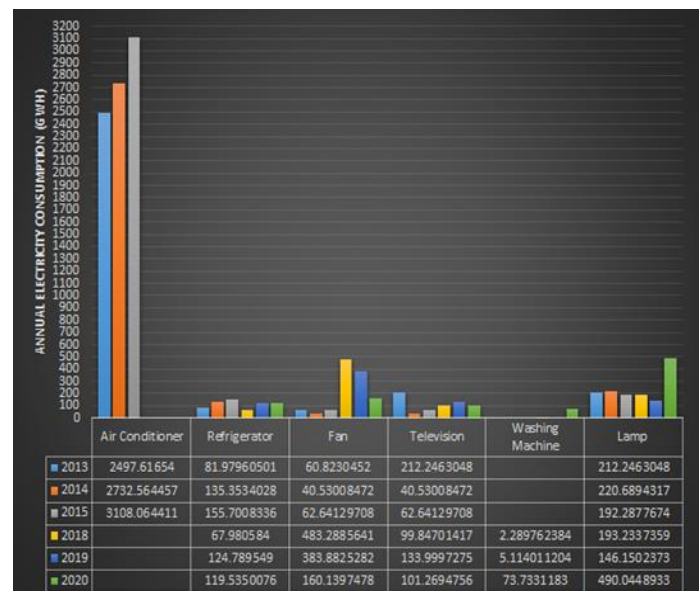


Figure 3: Annual electricity consumption of MEPS appliances (2013-2015 vs 2018-2020)



Figure 4: Annual electricity saving of MEPS appliances (2013-2015 vs 2018-2020)



Figure 3 and Figure 4 shows the comparison between annual electricity and consumption of MEPS appliances in the early phase of MEPS enforcement (2013-2015) and after the improvements had been made in 2018. The calculation of electricity consumption and savings of air-conditioners were excluded as this study needs further data from the manufacturers, distributors, and retailers regarding the Tested CSPF and Tested CSEC. Based on Figure 3, the electricity consumption of fans has shown an increasing pattern. For refrigerators, televisions, and lamp fittings, annual electricity consumption has shown a stable pattern. For washing machines, the electrical consumption associated with MEPS appliances has shown an increasing trend since its enforcement in 2018.

Regarding the electricity savings, as shown in Figure 4, it can be noticed that fan appliances have shown a sizeable improvement compared to the savings during the early phase of MEPS enforcement, 2013-2015. Refrigerators, televisions and lamp fittings have shown a constant energy pattern since the early phase of MEPS enforcement in 2013 and since the revision of MEPS requirements in 2018. For washing machine appliances, since MEPS enforcement in 2018, the potential for energy savings for these appliances is promising. It should be noted that washing machines are one of the appliances that have high potential in energy saving. With the further inclusion of the air-conditioners, it would be expected that washing-machine will contribute to the second highest savings after air-conditioning appliances.

Impact of Continuous Improvement to MEPS Requirements on the Cumulative Electrical Saving, Cost Saving, and GHG Reduction

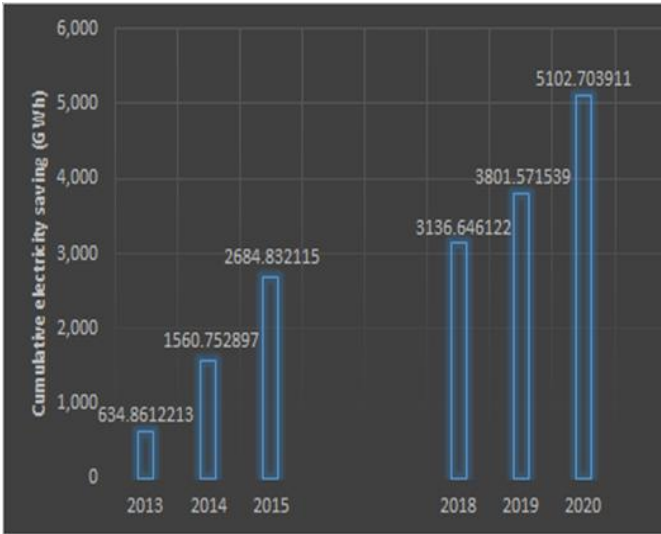


Figure 5: Cumulative electricity saving of MEPS appliances (2013-2015 vs 2018-2020) (Without Air-Conditioner)

Figure 5 shows the comparison between cumulative electricity savings of MEPS appliances in the early phase of MEPS enforcement (2013-2015) and after the improvements had been made in 2018. It can be concluded that the improvement in MEPS requirements have provided a

positive result in the cumulative energy savings of MEPS appliances although without the inclusion of electricity saving from air-conditioning appliances.

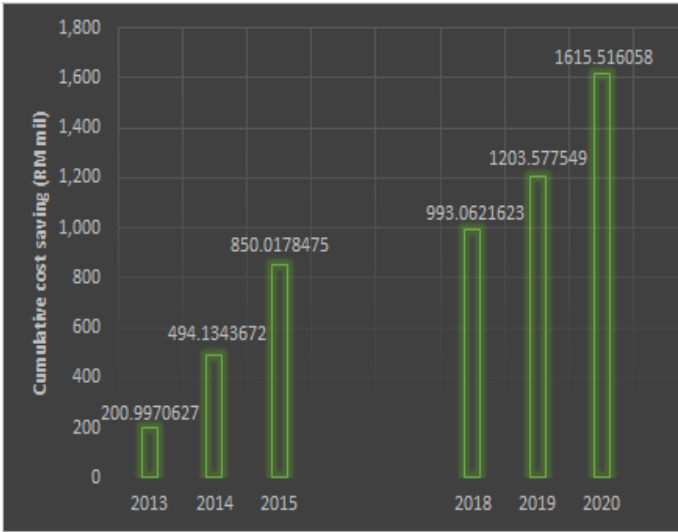


Figure 6: Cumulative cost electricity saving of MEPS appliances (2013-2015 vs 2018-2020) (Without Air-Conditioner)

Figure 6 shows the comparison between the cumulative cost of electricity savings of MEPS appliances in the early phase of MEPS enforcement (2013-2015) and after the improvements had been made in 2018. It would be expected that with the inclusion of energy savings from air-conditioning appliances at a later date, the cost of electricity savings of MEPS appliances will become higher due to the increase in test standards.

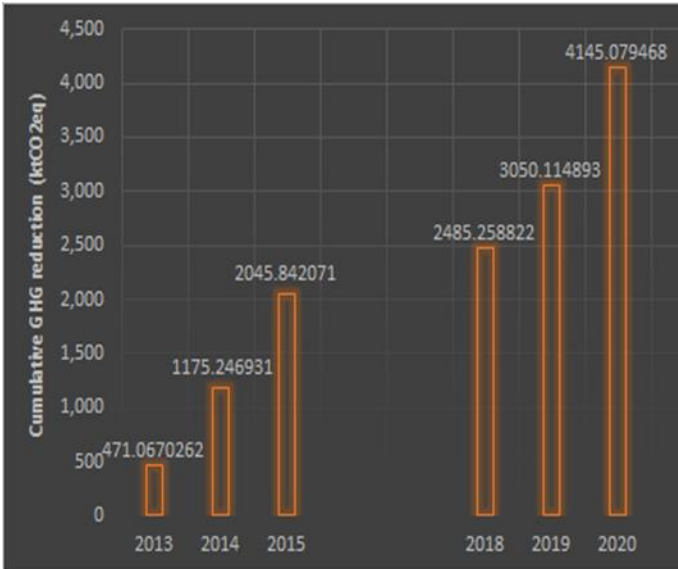


Figure 7: Cumulative GHG reduction of MEPS appliances (2013-2015 vs 2018-2020) (Without Air-Conditioner)

Figure 7 shows the comparison between the cumulative GHG reduction of MEPS appliances in the early phase of MEPS enforcement (2013-2015) and after the improvements had been made in 2018. It can be noticed that the improvements in MEPS requirements have provided a positive result in cumulative GHG reduction savings from 2045.84 ktCO2eq in 2013-2015 to 4145.07 ktCO2eq in 2018-2020.

Impact of Continuous Improvement to MEPS Requirements on the Consumer purchasing behaviour in relation to energy efficient appliances

The number of domestic customers in Peninsular Malaysia and Sabah has increased to more than 8 million in 2019. This number is expected to increase in line with the growth of the economy. Therefore, it is important to gauge the effect of MEPS implementation on consumer purchasing behaviour. A large scale survey was conducted involving 1482 respondents from all states in Malaysia. This survey was conducted via an online platform.

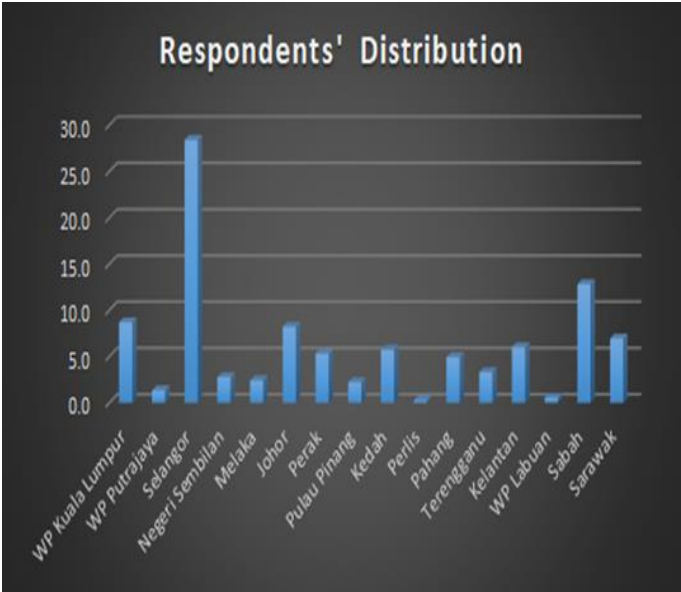


Figure 8: Respondents' Distribution according to State

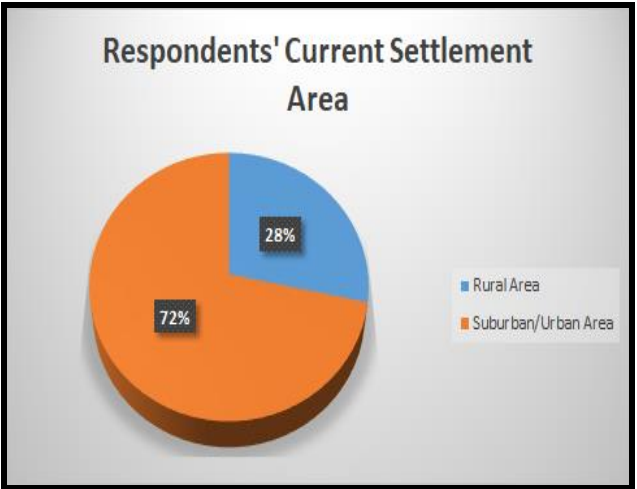
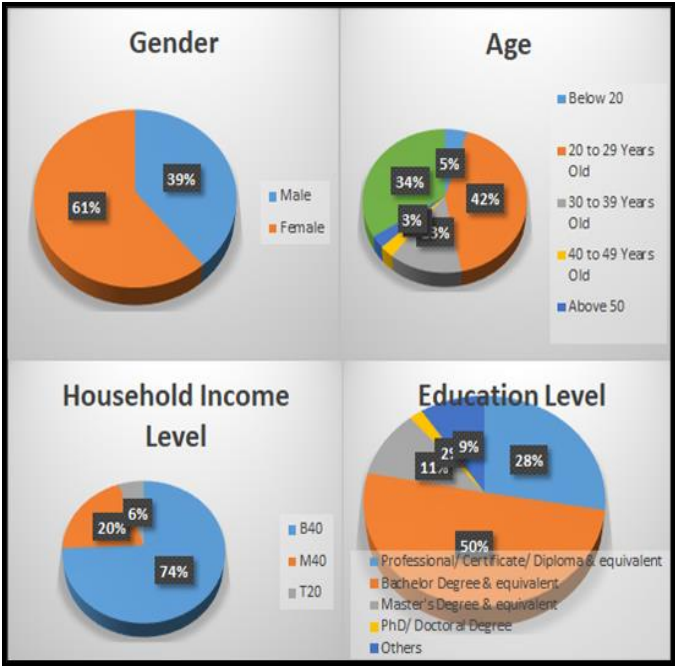


Figure 10: Respondents' Current Settlement Area

Figure 8, Figure 9 and Figure 10 show the respondents' demographic profiles. As seen in Figure 8, the top three percentages of respondents were 28.4 percent from Selangor, 12.8 percent from Sabah and 8.7 percent from Kuala Lumpur. The three lowest respondent populations were, at 1.3 percent, Putrajaya, 0.5 percent, Labuan and 0.3 percent, Perlis. As shown in Figure 9, 39 percent of respondents were male and 61 percent were female. Regarding the age groups, 42 percent of the respondents were 20 to 29 years old, 13.5 percent were 30 to 39 years old and 4.7 percent were below 20. Respondents aged more than 40 years represented 5.4 percent of the study. In terms of income groups, 74 percent were under B40 categories, 20 percent from M40 categories and 6 percent from T20 categories. Regarding the education levels, half of the respondents had Bachelor degree qualifications while only 9 percent had other or informal education. With reference to Figure 10, 72 percent of the respondents were from Suburban/Urban areas and 28 percent from rural areas.

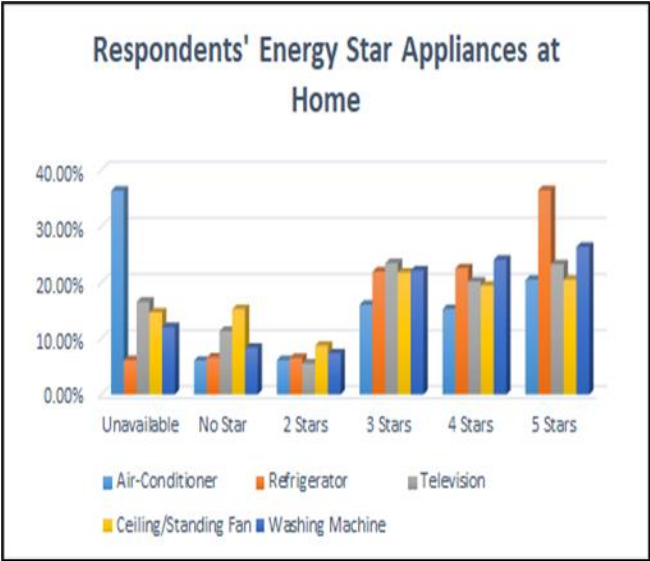


Figure 10: Respondents' Energy Star Appliances at home

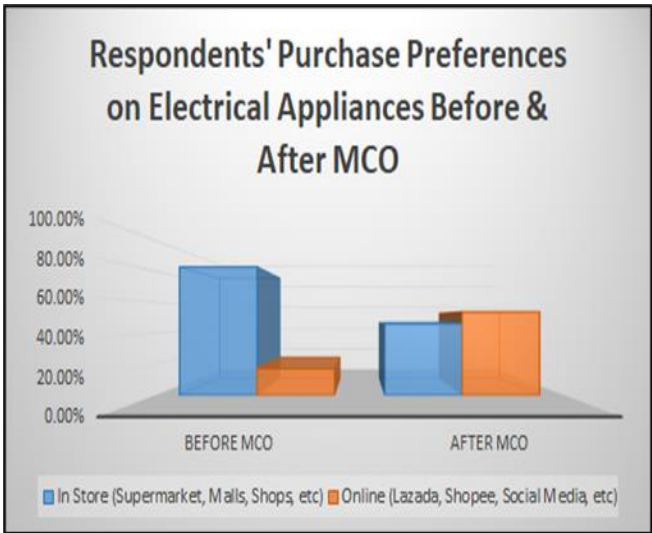


Figure 11: Respondents' Purchase Preferences on Electrical Appliances before & after MCO

Table 2 shows the percentage of respondents in each demographic profile based on their knowledge of MEPS and energy efficient star labelling and the level of consumer purchasing behaviour in relation to energy efficient appliances. Among the demographic elements covered by this analysis were gender, age, income group, highest education level and area of residence. Based on the results in Table 2, the female cohort exhibited the greater knowledge and consumer purchasing behaviour in terms of energy efficient appliances compared to males. The 20-29 age group exhibited the highest level of knowledge and consumer purchasing behaviour when it came to energy efficient appliances.

They were followed by the 30 to 39 age group and the below 20 years of age cohort group. The household group with B40 income (monthly income less than RM 4849 per month) category had the highest level of knowledge and consumer purchasing behaviour for energy efficient appliances, followed by M40 group (monthly income between RM 4850 to RM 10959), and T20 group (monthly income more than RM 10960). In terms of the highest educational level, the Bachelor degree and equivalent group had the highest level of knowledge and consumer purchasing behaviour when it came to energy efficient appliances. This cohort was followed by Professional/ Certificate/ Diploma and

equivalent group and Master's Degree and equivalent group. For location of respondents' residence, respondents from suburban/urban areas had the higher level of knowledge and consumer purchasing behaviour compared to respondents from rural areas.

Regarding the score of consumers purchasing behaviour in relation to energy efficient appliances, the score generated is based on the respondents' answers in Table 3. A score of more than 5 denotes that the respondents exhibited a high level of consumer purchasing behaviour when it came to energy efficient appliances, a score between 4 to 5 indicated moderate behaviour and a score less than 4 indicated a low level of purchasing behaviour. With reference to Figure 10, it can be concluded that more than 73 percent of respondents have electrical appliances with energy star labelling in their homes, with the highest number of appliances being refrigerators, followed by washing machines, televisions and fans. Nevertheless, the level of possession of air-conditioners that have passed MEPS requirements still has room for improvement. Only 50 percent of the respondents have air-conditioning appliances with energy star labelling.

However, with regards to respondents' electrical appliance purchasing preferences, Figure 11 reflects the respondents' purchasing preferences before and after the movement control order (MCO) due to the Covid-19 pandemic. The pandemic has led to changes in consumer purchasing behaviour in the form of a move to online shopping such as Lazada, Shopee etc. It is therefore very important to ensure that the quality and the reliability of MEPS electrical appliances are protected. Overall, the results of the survey of consumer purchasing behaviour in relation to energy efficient appliances indicate that the level of knowledge and purchasing behaviour are very high, particularly in the younger generation aged from 20 to 39 years. It is very important for the cohort of younger consumers to exhibit a good knowledge and behaviour towards energy efficient appliances since they will become the dominant generation in Malaysia's future.





	Knowledge on MEPS and EE Star Labelling		Consumer Purchase Behaviour on EE Appliances		
	Have Knowledge	No Knowledge	Low	Moderate	High
<b>Gender</b>					
Male	35.80%	3.40%	5.00%	3.0%	31.2%
Female	55.20%	5.50%	5.10%	5.8%	49.9%
Total	91.10%	9.00%	10.10%	8.8%	81.1%
<b>Age</b>					
Below 20	4.3%	0.5%	0.8%	0.2%	3.7%
20 to 29	38.5%	3.8%	4.3%	4.0%	33.9%
30 to 39	12.4%	1.1%	0.9%	0.80%	11.80%
40 to 49	2.4%	0.3%	0.4%	0.10%	2.20%
Above 50	2.5%	0.2%	0.3%	0.20%	2.30%
No Information	31.0%	3.1%	3.4%	3.50%	27.20%
Total	91%	9.00%	10.10%	8.8%	81.1%
<b>Income Group</b>					
B40	67.40%	7%	8.2%	6.6%	59.6%
M40	18.60%	1.40%	1.50%	1.50%	17.10%
T20	5.10%	0.50%	0.40%	0.70%	4.40%
Total	91%	9.00%	10.10%	8.8%	81.1%
<b>Highest Education Level</b>					
Professional/ Certificate/ Diploma & equivalent	25.40%	2.40%	3.70%	2.0%	21.90%
Bachelor Degree & equivalent	46.20%	4.20%	4.30%	4.50%	41.50%
Master's Degree & equivalent	9.60%	1%	0.9%	1.10%	8.70%
PhD/ Doctoral Degree	1.80%	0.10%	0.1%	0.20%	1.70%
Others	8.00%	1.30%	1.10%	1.0%	7.30%
Total	91%	9.00%	10.10%	8.8%	81.1%
<b>Area of Residence</b>					
Rural Area	26%	2.40%	3.0%	2.8%	22.60%
Suburban/Urban Area	65.10%	6.50%	7.10%	6.0%	58.50%
Total	91%	9.00%	10.10%	8.8%	81.10%

Table 2: Percentage of Respondents in Each Demographic Profiles Based on the Knowledge on MEPS and Energy Efficient Star Labelling and Level of Consumer Purchase Behavior on Energy Efficient Appliances

Respondent's Purchase Behaviour of Energy Efficient Appliances						
Behaviour	Not at All	Very Unlikely	Unlikely	Undecided	Likely	Very Likely
I am concerned with the efficiency of the electrical appliances I purchase	2.20%	1.70%	5.30%	4.30%	13.40%	14.00%
I look for Energy Efficiency Star Labels every time I purchase electrical appliances	2.50%	2.20%	5.50%	7.10%	12.90%	17.10%
I find ways to replace old electrical appliances with new and energy efficient ones	2.80%	2.50%	6.10%	9.10%	16.40%	16.80%
Even if they cost more than conventional products, I would still purchase energy efficient products.	2.60%	2.80%	5.90%	10.40%	17.70%	20.00%
I think about my electric bills every time I purchase electronics appliances.	3.00%	2.40%	6.70%	7.20%	13.80%	15.90%

Table 3: Percentage of Respondents' Purchase Behavior of Energy Efficient Appliances



## POLICY IMPLICATIONS

- (1) Continuous improvements to MEPS requirements will **increase the cumulative electricity saving, cost of electricity saving and reduce GHG emission**.
- (2) Continuous improvement to MEPS requirements will **stabilize the market share of MEPS appliances** by gradually phasing out the appliances that have below international standards.
- (3) Continuous improvement to MEPS regulations will **create positive synergies to manufacturers of electrical appliances to produce energy efficient appliances on a par with international standards and stabilize electrical appliances' prices**.
- (4) The government needs to give full support and provide **incentives to younger generations (of which the majority are in the B40 level income group)** in terms of subsidies to purchase energy efficient appliances.

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## Impact of the study

This study provides important insights into ST by measuring the overall performance of the MEPS program, determining areas for improvement, and producing outcomes that prevent Malaysia from becoming a dumping ground for inefficient appliances. For the nation, this project provides important knowledge and mechanisms for the journey towards an energy efficient society which subsequently supports the National Energy Efficiency Action Plan (NEEAP).

## Limitations of the Study and the Action plan to improve it.

This project has several limitations which could affect the findings. Firstly, there is a lack of participants from the manufacturing, retailing, and distributing sectors providing data concerning the number of products sold in the market. Secondly, the data provided by the manufacturers, retailers and distributors is not complete in terms of the number of units sold, the star rating labelling and technical details of the models. Thirdly, there is a possibility that the data provided by the manufactures/distributors was overlapped by the data provided by the retailers.

With regards to the action plan to improve these limitations, the researchers, with the assistance of ST, will re-contact additional manufacturers, retailers and distributors to participate in the survey and provide the missing data needed for this study. To settle the data overlapping issues this study will double-check the list from the ST database.

## ACKNOWLEDGEMENT

This work is funded by Chair in Energy Economics of Energy Commission at UNITEN (2020005KETST). The authors wish to thank Ms HafizaYob of Energy Commission of Malaysia for her guidance and insights on the project. The authors also wish to acknowledge the support of Ministry of Higher Education of Malaysia, Special Research Grant Post COVID-19 (2020101COVID) for conducting surveys.

## FURTHER INFORMATION

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