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THE AWARENESS AND PRACTICE OF ENERGY SAVING TIPS AMONG MALAYSIAN RESIDENTIAL SECTOR

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Abstract

There is a growing interest in reducing energy consumption in every sector of the economy. As compared to other sectors, the residential sector is a substantial consumer of energy in every country, and therefore a focus for energy consumption efforts. This study aims to compare through ranking procedure of awareness and current practice of energy saving tips in two separate regions (Eastern and Central) in Malaysia. The study has incorporated eight energy saving tips that are regularly exposed and practiced in many nations. A total of 648 respondents from both regions were participated in this study. The results have indicate that the level of awareness for energy saving tips are similar for both regions, but opposite results are found for practicing the energy saving tips in both locations. This study will help the households to practically implement the energy saving tips which will save electricity bills and facilitate supports the green initiatives promoted by the government.

Keywords: Energy efficiency, energy conservation, residential sector, Malaysia.

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1. Introduction

In relation to the rising of world energy demand, few highlighted issues like high power prices, fossil fuel reduction and excessive of emission have led the scholars to explore the study in the area of efficient energy use and energy conservation. To mitigate the climate change, the energy users must practically reduce or efficiently consumed the energy. Due to this, scholars, practitioners and policymakers had identified the energy conservation as one of integrated element in energy policies to address the above mentioned issues. Even though many sectors are consuming the energy, this study would like to focus on residential sector because in general, energy consumption of the residential sector accounts for 16 percent to 50 percent of that consumed by all sectors and averages approximately 30 percent worldwide (Swan &Ugursul, 2009; Subbiah et al., 2017).

The residential sector is selected because to view an effort of households to promote conservation and efficiency use of energy through their level of awareness and practice of energy saving tips. This sector also can play a major role to support government green initiatives particularly in facilitating Ministry of Energy, Green Technology and Water (KeTTHA) sustainability achieved via energy efficiency (SAVE) rebate program. Besides SAVE program, the Malaysian government carried out multi energy policies to manage and educate the energy consumption among the household users. Among the policies are tiered electricity tariffs structure, electricity bills rebate, suria 1000 program and goods and services tax. However, most of households are not alert on how to use energy efficiently in their routine life (Rahman et al., 2017). The study on energy efficiency is currently emerged and many scholars have focused on this area (see for examples Abdullah Chik et al., 2012; Bhavani & Mohan, 2014; Nejad Moghadam et al., 2014; Azlina et al., 2015; Zaid & Graham, 2015; Rahman et al., 2016; Gyamfi et al., 2017; Geng et al., 2017).

Malaysia Energy Information Hub (2017) reported that the used of energy among residential sector in Malaysia has increased from the year 2000 to 2015. For instance, the energy consumption by residential sector in 2015 is 2,435 ktoe, increased of 89 ktoe from 2014. The energy consumption for residential sector will keep growing in the future because increase of the new residential area development projects across Malaysia. Table 01 summaries the final energy consumption by residential sector from year 2000 to 2015. The energy costs for electricity, gas and other fuels products are importance items in the monthly total expenditure of Malaysian household. For an example in 2014, Malaysian households spent 23.9 percent of their total expenditure on housing, water, electricity, gas and other fuels (Department of Statistics Malaysia, 2015). In the future the utility providers cannot sustain the tariff charged to this sector due to high cost and therefore, getting awareness and practice the energy saving tips will make sure this sector to pay lower or moderate electricity bills. Besides, the energy demand and consumption for residential sector will keep growing in the future because increase of the number of residential area development projects across Malaysia.

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Table 01. Final Energy Consumption by Sector (ktoe) 2000-2015

Year	Residential (ktoe)
2000	975
2001	1,081
2002	1,161
2003	1,248
2004	1,319
2005	1,395
2006	1,514
2007	1,598
2008	1,668
2009	1,792
2010	1,937
2011	1,974
2012	2,126
2013	2,262
2014	2,346
2015	2,435

Source: Malaysia Energy Information Hub (2017)

In the next section, the paper explains the problem statement. Section 3 and 4 will discusses the research question and purpose of the study. Next, section 5 will describes research methodology adopted in this study. The following section presents findings and conclusion.

2. Problem Statement

According to Rahman et al., (2017) electricity can be saved through conserving or improving efficiency of energy. Conserving energy means performing fewer activities that use electricity. In details, the energy conservation refers to effort made by energy users to reduce energy consumption. The energy conservation is becoming one of today's main issues in energy markets. Oikonomou et al., (2009) explained that the reduction in energy consumption can be achieved with consumer's behaviour through the incremental use of energy efficient. The research of energy conservation has started in 1970s because of major concerns over a potential reduction of fossil fuels and prices hike of oil and gas (Abrahamse & Steg, 2009). In addition, the establishment of acts and policies as well as universal environment concern motivated the researchers to focus on this area especially for developing countries like Malaysia.

The other concept of saving the energy is by improving energy efficiency. This approach is about choosing the right appliances which use less energy for the same tasks. In Malaysia, the energy efficiency label for electrical appliances were issued by the Energy Commission to manufacturer who comply the standards and requirements of the energy performance test for a star rating established by the Energy Commission. As explained by Energy Commission (2014), the star rating ranges from 2-star to 5-star, with 2-star explaining minimal efficiency and 5-star representing maximum efficiency. Despite of this effort, the awareness level among residential sector towards energy efficiency is still low (Rahman et al., 2017).

Starting from 1st January 2014, Tenaga Nasional Berhad's tariff remained unchanged at 21.8 cents/kWh for the first 200kWh of consumption per month. As reported by Tenaga Nasional Berhad (2017), nearly 50.4 per cent (or 3.25 million) of all domestic users are paying RM43.60 or less for monthly utility

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bill. The details of tariff rates are explained in Table 02. In Malaysia, the electricity tariff revision for Peninsular Malaysia was made twice a year. A latest announcement from KeTTHA, the government agreed to maintain the power tariff rebate of 1.52 cent/kWh from July 1 to Dec 30 2017. The next announcement of a new power tariff rebate is scheduled in the late December 2017. In the future, the tariff of energy cannot be sustained at a lower price due to high costs account for energy suppliers. Moreover, as identified by Azlina et al., (2015), residential sector in Malaysia is greatly dependent on electric product with 77 percent of the total consumption. Among the electrical appliances that are mostly used are fridges, washing machine, air-cooling system, water heater, lighting and entertainment products. One of the ways to decrease energy consumption among household is through the awareness and practices the energy saving tips.

Table 02. Electricity tariff for domestic households

Tariff Category	Unit	Current Rate (1 Jan 2014)-MYR
Tariff A - Domestic Tariff		
For the first 200 kWh (1-200 kWh) per month	cent/kWh	21.8
For the next 100 kWh (201-300 kWh) per month	cent/kWh	33.4
For the next 300 kWh (301-600 kWh) per month	cent/kWh	51.6
For the next 300 kWh (601-900 kWh) per month	cent/kWh	54.6
For the next kWh (901 kWh onwards) per month	cent/kWh	57.1
The minimum monthly charge is RM3.00		

Source: Tenaga Nasional Berhad (2017)

3. Research Questions

The research question for this study is;

Does the residential sector of energy users are aware and practice the energy saving tips?

4. Purpose of the Study

This paper aims to contribute to an immature area in the literature related to energy saver community in the context of Malaysia. Explicitly, the research objective is to examine the level of awareness and practice of energy saving tips among residential users in two selected regions in Malaysia. This study will benefit the practitioners or policymakers to increase the awareness and educate the residential users to conserve and improve energy efficiency. The results of their actions will support the green initiative promoted by the government.

5. Research Methods

A total of 648 energy users from residential sector were involved in this study. The numbers are representing two regions in Malaysia namely Central region (343 respondents) and Eastern region (305 respondents). All of them are convenience selected using mall-intercept approach. This study has occupied 1 month to distribute the survey questions. The questionnaire was structured in two distinctive parts. The first part is about the awareness and practice of energy saving tips, which consists of 8 items. The majority of energy saving tips is penetrating on to conserve energy and only one of the saving tips is for energy efficiency. All items were adapted from Department of Energy (2012). The second part, consisting of 9

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items (for instances gender, ethnicity, age, educational level, job, monthly income, marital status, monthly electricity bills and type of house) captures the characteristic of respondents. To validate the questions, experts' opinion (from Tenaga Nasional Berhad) and pre-test procedures have been executed. The data then was analyzed using IBM Statistical Package of Social Science (SPSS) for Windows, Version 24.0. Descriptive and frequency analyses are the two main analysis used in this study.

6. Findings

Table 03 shows the sample characteristics of the energy users from residential sector in Malaysia. A total of 648 respondents were participated in this study. In specific, 343 respondents were from Central region and 305 energy users were from Eastern region. With regard to gender, majority of respondents (more than 56 percent) in both regions were female. In addition, Malay ethnic has represented the largest respondents in this study, followed by Chinese and Indian for both regions. Malay community has represented more than 65 percent of the ethnic group in this study. In term of age, majority (more than 39 percent) of them were 31 to 40 years old and only small percentage (11.4 percent and 5.2 percent respectively) of respondents were 51 years old and above. Moreover, quite a number of respondents have a degree with 162 and 141 (more than 46 percent) respondents respectively. In addition, many respondents from both locations were working as professionals and followed by middle management and clerk.

Table 03 also illustrated that majority of respondents (more than 44 percent) received a monthly salary of RM 2,001 to RM 4,000 and less than 16 percent of respondents earned a monthly salary of more than RM 6,001. Furthermore, majority of respondents in both regions were married with more than 74 percent. Next, the majority of respondents (more than 60 percent) paid RM 78 to RM 400 for monthly electricity bill and less than 6 percent of them paid more than RM 401. Finally, majority of respondents in Central region were living in condominium and terrace house with the percentage of 47.2 percent and 39.1 percent respectively. While, in Eastern region, most respondents were staying in terrace house (51.8 percent) and followed by semidetached with 20.3 percent.

Table 03. Sample characteristics

		Central Region (N=343)		**Eastern Region (N=305)**	
		Frequency	**Percent**	**Frequency**	**Percent**
Gender	Female	193	56.3	191	62.6
	Male	150	43.7	114	37.4
Ethnicity	Malay	232	67.6	199	65.2
	Chinese	74	21.6	73	23.9
	Indian	36	10.5	32	10.5
	Others	1	0.3	1	0.3
Age	30 years old and below	82	23.9	94	30.8
	31 to 40 years old	135	39.4	146	47.9
	41 to 50 years old	87	25.4	49	16.1
	51 years old and above	39	11.4	16	5.2
Education level	SPM or STPM	54	15.7	26	8.5
	Diploma	71	20.7	38	12.5
	Bachelor's Degree	162	47.2	141	46.2

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	Master's or PhD	55	16	98	32.1
	Others	1	0.3	2	0.7
Job	Professional	158	46.1	203	66.6
	Top Management	14	4.1	5	1.6
	Middle Management	61	17.8	31	10.2
	Supervisory	13	3.8	3	1
	Administrative or Clerk	49	14.3	29	9.5
	Technical	27	7.9	12	3.9
	Others	21	6.1	22	7.2
Monthly income	Less than RM2,000	39	11.4	40	13.1
	RM2,001 to RM 4,000	152	44.3	145	47.5
	RM 4,001 to RM 6,000	97	28.3	83	27.2
	RM6,001 or more	55	16	37	12.1
Marital status	Single	86	25.1	63	20.7
	Married	257	74.9	242	79.3
Monthly electricity bills	RM77 and below	115	33.5	117	38.4
	RM78 to RM400	209	60.9	184	60.3
	RM401 and above	19	5.5	4	1.3
Type of house	Terrace	134	39.1	158	51.8
	Semi D	15	4.4	62	20.3
	Bungalow	14	4.1	37	12.1
	Condominium or Apartment	162	47.2	24	7.9
	Country house	18	5.2	24	7.9

Table 04 shows the awareness of energy saving tips among residential energy users from both regions. It can be concluded that both regions have a similar ranked of awareness energy saving tips. From Table 04, the majority of domestic households have greater awareness of "switching off lights once leaving the house" and has been ranked in the first place with 26.2 percent and 23.7 percent respectively. Then, it was followed by "switching off electrical appliances (TV, radio, hifi) when not in use" with 26.0 percent (Central region) and 23.4 percent (eastern region). The third awareness of energy saving tips is refer to "switching off all your lights except security lights in home when not in use". The two least awareness of energy saving tips is referring to "increasing the temperature of air-condition's thermostat" and "using the infrequent and oven as infrequent as possible because electric stoves consume a lot of electricity". These two saving tips have a similar ranking in both regions.

Table 04. Awareness of energy saving tips

No	**Energy Saving Tips**	**Awareness (Central Region)**			**Awareness (Eastern Region)**		
		Frequency	**%**	**Rank**	**Frequency**	**%**	**Rank**
1	Switching off your lights when you leave your house	317	26.2	1	244	23.7	1
2	Switching off appliances (TV, radio, hifi) when not in use	314	26.0	2	241	23.4	2
3	Switching off all your lights except security lights in home when not in use	236	19.5	3	177	17.2	3

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4	Boiling only as much water as needed	159	13.1	4	125	12.1	4
5	Washing clothes at full load	102	8.4	5	119	11.5	5
6	Buying and using energy-efficient appliances	61	5.0	6	74	7.2	6
7	Increasing the temperature of air-condition's thermostat	15	1.2	7	27	2.6	7
8	Using the plates and oven as infrequent as possible because electric stoves consume a lot of electricity	6	0.5	8	24	2.3	8
	Total	1210	100.0		1031	100.0	

Table 05 displays the actual practice of energy saving tips among residential users in the chosen areas. The results shown in Table 05 indicate a slightly different ranked between the two regions. For an example, second ranked to fifth ranked are differs with the two regions. However, the two regions shared the same ranked of actual practice of energy saving tips and this can be referred to tips number one (switching off lights when leave the house), tips number six (buying and using energy-efficient appliances), tips number seven (increasing the temperature of air-condition's thermostat) and tips number eight (using the plates and oven as infrequent as possible because electric stoves consume a lot of electricity). In short, Table 05 summaries the actual practice of energy saving tips among residential users in both locations**.**

Table 05. Practice of energy saving tips

No	**Energy Saving Tips**	**Practice (Central Region)**			**Practice (Eastern Region)**		
		Frequency	**%**	**Rank**	**Frequency**	**%**	**Rank**
1	Switching off your lights when you leave your house	321	24.9	1	235	25.5	1
2	Switching off appliances (TV, radio, hifi) when not in use	235	18.2	4	228	24.7	2
3	Switching off all your lights except security lights in home when not in use	294	22.8	2	157	17.0	3
4	Boiling only as much water as needed	245	19.0	3	112	12.1	5
5	Washing clothes at full load	109	8.5	5	119	12.9	4
6	Buying and using energy-efficient appliances	50	3.9	6	40	4.3	6
7	Increasing the temperature of air-condition's thermostat	21	1.6	7	26	2.8	7
8	Using the plates and oven as infrequent as possible because electric stoves consume a lot of electricity	14	1.1	8	5	0.5	8
	Total	1289	100.0		922	100.0	

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7. Conclusion

The awareness level of energy saving tips awareness among residential areas for both Central and Eastern region in Malaysia shows no different. However in term of practicing the energy saving tips, both locations show a slightly difference results. The awareness and practice of energy saving among residential users are mostly contributed by the policies and campaigns set up by the government. Among the policies and campaign carried out by Malaysian government as to promote energy conservation and energy efficiency are the revisions of Electricity Supply Regulations 1994, sustainability achieved via energy efficiency (SAVE) rebate program, tiered electricity tariffs structure, electricity bills rebate, suria 1000 program and goods and services tax.

In country like Malaysia, the household is the dominance users of energy in residential sector and the demand for electricity in this sector will expand rapidly in the future due to urbanization and diverse urban growth, therefore the government and policymakers should encourage energy efficient movement as part of to reduce high dependent on electricity based fuels. To further encourage the energy conservation among residential sector, the government and policymakers should continue to provide information in the form of facts and figures, energy saving demonstration, proposing free energy saving products, giving feedbacks, offering rewards, financial support, legislation and to promote renewable energy resources to this sector.

References

Abdulah Chik, N., Abdul Rahim, K., Shaari, M.Y., & Alias, E.F. (2012). Changes in consumer energy intensity in Malaysia. *International Journal of Economies and Management*, *6*(2), 221-240.

Abrahamse, W., & Steg, L. (2009). How do socio-demographic and psychological factors relate to households' direct and indirect energy use and savings? *Journal of Economic Psychology*, *30*, 711-720.

Azlina, A.A., Engku Abdullah, E.S.Z., Kamaludin, M., & Radam, A. (2015). Energy conservation of residential sector in Malaysia. *Journal of Business and Social Development*, *3*(2), 51-62.

Bhavani, R.G., & Mohan, M. (2014). *Awareness on lighting energy saving and user satisfaction in residential and office buildings.* Paper is presented at International Conference on Biological, Civil and Environmental Engineering.

Department of Energy. (2012). A survey of energy-related behavior and perceptions in South Africa: The residential sector 2012. Department of Energy, Republic of South Africa. Retrieved from www.energy.gov.za

Department of Statistics Malaysia. (2015). Report on household expenditure 2014. Retrieved from www.dosm.gov.my.

Energy Commission. (2014). Retrieved from http://www.st.gov.my/

Geng, Y., Chen, W., Liu, Z., Chiu, A.S.F., Han, W., Liu , Z., Zhong, S., Qian, Y., You, W., & Cui, X. (2017). A bibliometric review energy consumption and greenhouse gas emissions in the residential sector. *Journal of Cleaner Production*, *159*, 301-316.

Gyamfi, S., Diawuo, F.A., Kumi, E.N., Sika, F., & Modjinou, M. (2017). The energy efficiency situation in Ghana. *Renewable and Sustainable Energy Reviews,* Retrieved from http://dx.doi.org/10.1016/j.rser.2017.05.007

Malaysia Energy Information Hub. (2017). Final energy consumption by sector. Retrieved from http://meih.st.gov.my/

Nejad Moghadam, M.H., Baharum, F., & Md. Ulang, N. (2014). Influence of energy efficient elements on energy saving in residential buildings: Case study of three apartments in Penang. Paper presented at the MATEC Web of Conferences, 17, 01019.

Oikonomou, V., Becchis, F., Steg, L., & Russolillo, D. (2009). Energy saving and energy efficiency concepts for policy making, *Energy Policy*, *37*, 4787-4796.

Rahman, K. A., Leman, A. M., & Salleh, M. M. N. (2016). *Consumer awareness in energy efficiency for residential houses in peninsular Malaysia*. Paper presented at the MATEC Web of Conferences, 78, 01010.

Rahman, K. A., Leman, A. M., Mubin, M. F., Yusof, M. Z. M., Hariri, A., & Salleh, M. M. N. (2017). *Energy consumption analysis based on energy efficiency approach: A case of suburban area*. Paper presented at the MATEC Web of Conferences, 87, 02003.

Subbiah, R., Pal, A., Nordberg, E. K., Marathe, A., & Marathe, M.V. (2017). Energy demand model for residential sector: a first principles approach. *IEEE Transactions on Sustainable Energy*, *8*(3), 1215-1224.

Swan, L.G., & Ugursal, V.I. (2009). Modelling of end-user energy consumption in the residential sector: A review of modelling techniques. *Renewable and Sustainable Energy Reviews*, *13*, 1819-1835.

Tenaga Nasional Berhad. (2017).Tariff rates. Retrieved from https://www.tnb.com.my/residential/pricing-tariffs

Zaid, S.M., & Graham, P. (2015). Rising residential energy consumption and GHG emissions in Malaysia: A case study of public low-cost housing projects in Kuala Lumpur. *Indoor and Built Environment*, *26*(3), 375-391.