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"SUSTAINABLE ENVIRONMENT, RESILIENCE AND SOCIAL WELL-BEING"

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THE INFLUENCE OF MALAYSIA'S COVID-19 MOVEMENT CONTROL ORDER (MCO) ON ENERGY CONSUMPTION FOR RESIDENTIAL AREAS IN PENINSULAR MALAYSIA

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Abstract

Malaysia is currently experiencing the global COVID-19 pandemic which has impacted the Government to initiate the Movement Control Order (MCO). This order has commenced for several months (since March 2020) as a safety measure for the people in eliminating the spread of the virus. During this time, all sectors in Malaysia have been obligated to shut-down their operations and people were strictly advised to remain in their houses. Nevertheless, this enforcement has led to higher energy demands during the lock-down since people are staying at home 24-hours per day. Consequently, this paper investigates the pattern of energy consumption for residential areas by collecting information from over 100 families throughout Peninsular Malaysia. Selected households were chosen from each state in Peninsular Malaysia through random sampling and empirical analysis were obtained based on types of appliances and duration of use. The results showed that the level of energy consumption hikes by 20% to 50% since people used their domestic electrical appliances more than usual. This study has proven that energy consumption levels have significantly increased during the MCO

Keywords: *energy consumption; movement control order; peninsular malaysia; residential areas*

1.0 INTRODUCTION

Malaysian Movement Control Order (MCO) started on 18th March 2020 (Bunyan, 2020) due to the numbers of increasing cases of COVID-19 in Malaysia. In order to curb the spread of the virus, many sectors, including government institutions, schools and universities, were obligated by the Malaysian Government to hold down their operation immediately in order to stop the spread of the virus (Charles, 2020). Due to this scenario, many people have been staying inside their homes doing many sorts of activities by using electrical appliances, a new revolution of work concept known as Work From Home (WFH) was introduced and face-to-face classes have been replaced with virtual classes (NST, 2020). Eventually, all of these activities lead to the increasing demand of electricity in domestic sectors and many homes have experienced increasing electricity bills (TNB, 2020). This is supported by the Tenaga Nasional Berhad (TNB) CEO, that has reported the hikes of energy production for domestic sectors from 20% per capita to 50% per capita during the duration of MCO (TNB, 2020). Therefore, this research obtains an empirical study that compiled the pattern of electricity consumption for residential homes throughout Peninsular Malaysia during the MCO's period.

2.0 ENERGY CONSUMPTION: THE CASE OF MALAYSIA

Energy is essential to all human activities and indeed is critical to social and economic development. However, during MCO, the consumption of energy has increased since people have been staying at home 24-hours every day (NST, 2020) leading to an overdependence on electrical appliances, for instance computers, television, air-conditioning system and cooking appliances. This is influenced from the activities performed in the residentials. In addition, the

increased consumption of electricity is an indication of the increased energy production from fossil fuels resources (TNB, 2020). This will lead to an extreme usage of national energy resources that may affect the government's fiscal energy sector (Ahmed, et al., 2017).

Government of Malaysia has taken some initiative to curb this issue as continuous demand of electricity during MCO and post-MCO period may deplete the country's resources. Since the residential sector is the third largest energy consumer in Malaysia (TNB, 2020), the Government Transformation Master Plan (GTMP) has promoted productive use of energy consumption to promote energy efficiency in the built environment (KeTTHA, n.d.). Energy saving is an initiative to reduce the energy consumption at home by using less energy, minimising the application of electrical devices or reducing the amount of services used in a house (Hassan, et al., 2014). By improving the way of energy usage in a house, it could lead to energy efficiency and resulting in reduced utility bills (Nino & Mario, 2019).

Ultimately, building consumers need to know in detail about the level of energy consumption in the house, the amount of electricity used, the duration of usage and the tariff rate (per KWh) that impacted the monthly electricity bills. With adequate knowledge and awareness, energy can be saved during critical times, like in MCO and utility bills can be reduced.

3.0 RESEARCH METHODOLOGY

The aim of this research is to identify the pattern of electricity consumption in residential areas in Peninsular Malaysia during MCO. The methodology used is based on a random sampling process that involves 100 respondents from families living in 4 zones of Peninsular Malaysia, namely (i) North Zone, (ii) South Zone, (iii) East Zone and (iv) West Zone. Data were gathered and compiled through an online survey that involves the compilation of (i) types of appliances in every home and (ii) the duration of usage of these appliances. Then, an analytical analysis was obtained by identifying the level of consumption rate (W/h) for every hour in these homes with a power load table. Finally, the patterns of electricity consumption were compiled and presented through bar charts that indicate the level of consumption of families from these 4 zones (see Figure 1).

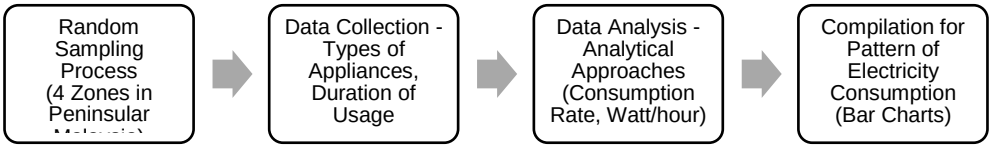

Figure 1: The methodology process of the research

4.0 DATA COLLECTION

From the survey obtained from March to May 2020, it was found that the electrical appliances were used from 6 am in the morning, but extensive electricity consumption was found between (i) 8 am to 5 pm during the day, and (ii) between 8 pm to 10 pm at night. Apart from these two periods, the consumption of electricity decreased and was inactive. In most homes, significant electrical appliances such as kitchen appliances (e.g.: electric kettle, rice cookers), water dispenser and washing machine were extensively used in the morning. Later in the day (after 9 am onwards), appliances such as television, air-conditioning system, hand phone chargers, computers and printers were used extensively. This is possibly due to the Work From Home and Online Classes session during MCO. At night time, light bulbs, television, fans, air-conditioning system and night lamps were used extensively (refer Table 1).

Table 1: Duration of usage for electrical appliances at Malaysian homes (during MCO)

No	Electrical Appliances	Duration of usage	Percentage (%)*	Overall (kW)/home*
1	Kitchen Appliances (Electric Kettle, Rice Cooker, etc)	6 am – 8 am, 12 pm – 2 pm, 6 pm – 8 pm	90	>4.00
2	Washing Machine, Water Dispenser	6 am – 8 am	76	1.200
3	Air-conditioning System, Fans	9 am – 5 pm, 8 pm – 3 am	64	>4.00
4	Television	9 am – 5 pm, 8 pm – 10 pm	89	0.800
5	Hand phone Chargers	5 pm – 12 pm	57	0.510
6	Computers and Printers	9 am – 5 pm	78	2.254
7	Light bulbs	8 pm – 6 am	97	2.288
8	Night Lamps	10 pm – 6 am	51	0.360

*From the survey of 100 families in Peninsular Malaysia

An analytical analysis was conducted in order to identify the level of consumption rate (W/h) for every hour in these homes using a power load table (see Figure 2) for the 4 zones in Peninsular Malaysia, (i) North Zone (Perak, Kedah, Penang and Perlis), (ii) South Zone (Negeri Sembilan, Malacca and Johor), (iii) East Zone (Pahang, Kelantan and Terengganu) and (iv) West Zone (Selangor and Kuala Lumpur). The data were compiled for 100 families of each zone by using random sampling and are presented by using bar charts.

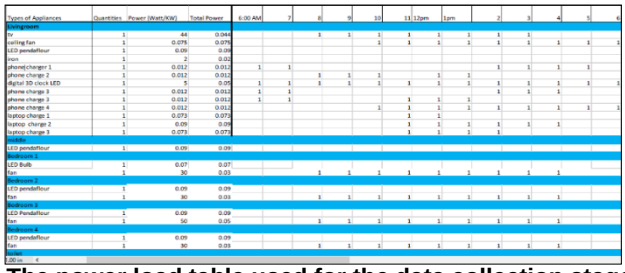

Figure 2: The power load table used for the data collection stage

(i) North Zone

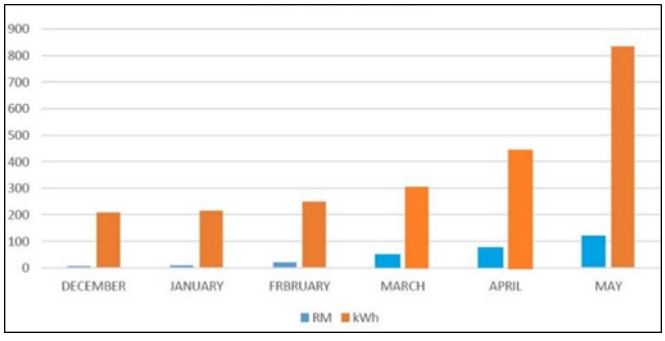

Figure 3: The electricity consumption for North Zone of Peninsular Malaysia

According to Figure 3, electricity consumption statistics for 100 families before MCO period (December to February) for the North zone states were the lowest electricity consumption statistics per month from the rest of the recorded months which, averaging between 200 to 250 kWh with utility bills between MYR 10 to MYR 30 only. However, during the MCO months (March to May), the electricity consumption increased between 300 to 820 kWh with utility bills hike between MYR 50 to MYR 150, resulting in a 50% increase of the overall electricity consumption for these families.

(ii) South Zone

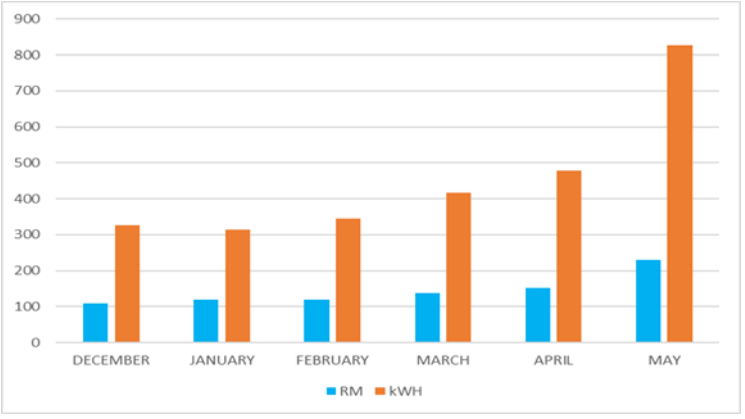

Figure 4: The electricity consumption for South Zone of Peninsular Malaysia

According to Figure 4, electricity consumption statistics for 100 families before MCO period (December to February) for the South zone states were the lowest electricity consumption statistics per month from the rest of the recorded months averaging between 300 to 340 kWh with utility bills between MYR 100 to MYR 130 only. However, during the MCO months (March to May), the electricity consumption statistics increased between 400 to 830 kWh with utility bills hikes between MYR 150 to MYR 230, resulting in a 40% increase of the overall electricity consumption for these families.

(iii) East Zone

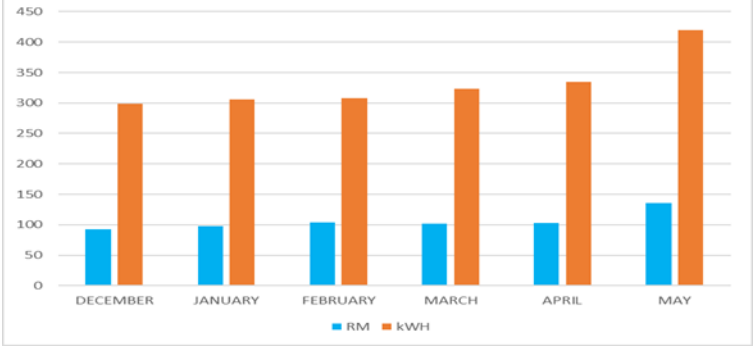

Figure 5: The electricity consumption for East Zone of Peninsular Malaysia

According to Figure 5, electricity consumption statistics for 100 families before MCO period (December to February) for the East zone states were the lowest electricity consumption statistics per month from the rest of the recorded months, averaging between 280 to 310 kWh with utility bills between MYR 90 to MYR 110 only. However, during the MCO months (March to May), the electricity consumption statistics increased between 320 to 420 kWh with utility bills hikes between MYR 120 to MYR 140, resulting in a 20% increase of the overall electricity consumption for these families.

(iv) West Zone

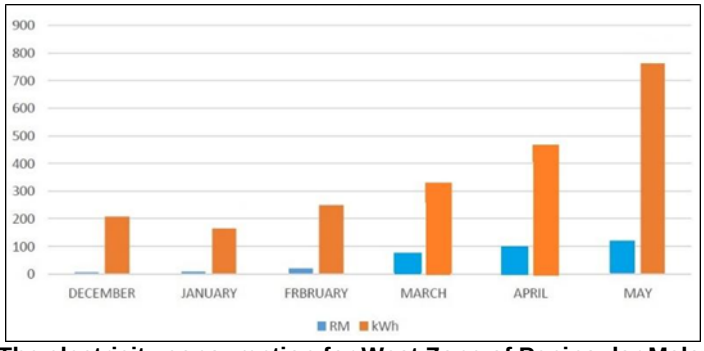

Figure 6: The electricity consumption for West Zone of Peninsular Malaysia

According to Figure 6, electricity consumption statistics for 100 families before MCO period (December to February) for the West zone states were the lowest electricity consumption statistics per month from the rest of the recorded months averaging between 200 to 250 kWh with utility bills between MYR 10 to MYR 30 only. However, during the MCO months (March to May), the electricity consumption statistics increased between 310 to 780 kWh with utility bills hikes between MYR 50 to MYR 110, resulting in a 50% increase of the overall electricity consumption for these families.

5.0 THE DISCUSSION

The results from Figure 3 to Figure 6 show that electricity consumption for the 4 zones in Peninsular Malaysia most likely increased during the implementation of MCO, demonstrating a 50% higher electricity consumption for the three zones, which are North, South and West zones. Meanwhile, for the East zone, the electricity consumption increased about 20%. Analytical analysis for the data collection stage lists out all electrical appliances used in a house of 100 families and users in the east zone used less than other families in the North, South, and West zone (see Figure 5). One of the factors contributing to this trend is due to the majority of B40 income earners for the East zone respondents. According to the Department of Statistics Malaysia (Shariman, 2020), Kelantan, Terengganu and Pahang states in the East zone have high B40 income earners with the rate of 32.6%, 29.4% and 26.7% respectively. It significantly influenced the electricity consumption pattern since the lower income groups do not have many electrical appliances in their houses. Therefore, the electricity consumption in the East Zone is slightly lower than the other zones. However, the reading is still increasing during MCO.

6.0 CONCLUSION

According to the results discussed in Section 5 and 6, it is proven that during MCO, the consumption of electricity in the residential areas for Peninsular Malaysia increased from 20% to 50% throughout the country and has affected the electricity bills to increase as well. Most of the people are working from home and have extensively used all electrical appliances in the house. The use of low efficiency or inefficient electrical appliances in a longer duration gives a significant impact on energy consumption thus making the electricity bill higher.

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