

# SAVE ENERGY, SAVE THE ENVIRONMENT FOR THE FUTURE

Guide to Efficient Use of Electricity at Home

2017 EDITION

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# GUIDE

## TO EFFICIENT USE OF ELECTRICITY AT HOME



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# 1.0 INTRODUCTION



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Electricity is the main energy source at home. The electricity that we use is generated mainly from fossil fuels. Smart and efficient use of electricity will help preserve the environment while reducing electricity bills. Would you like to pay low electricity bill while contributing to the preservation of the environment?

Follow these steps.

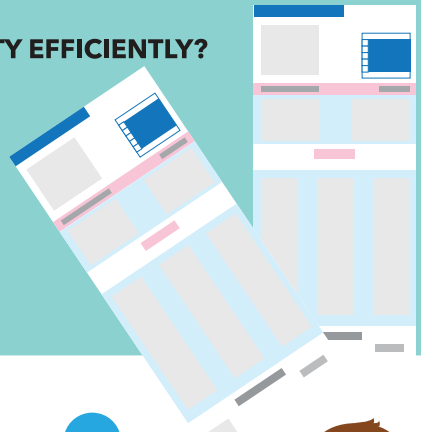


## 1.1 WHAT IS ENERGY EFFICIENCY

Energy efficiency means minimal electricity consumption to accomplish the same work without compromising the comfort of the user. This means you will be able to reduce the consumption of electricity while enjoying the same facilities.

## 1.2 WHY DO WE NEED TO USE ELECTRICITY EFFICIENTLY?

- To reduce dependency on fossil fuel because:
  - The supply is depleting.
  - The operating cost is increasing.
  - The greenhouse effect from carbon emission.
- To preserve the environment.
- To reduce the household expenses.



# 1.3 WHAT DO YOU UNDERSTAND ABOUT YOUR ELECTRICITY BILL?

## 1.3.1 Calculating Energy Usage

Energy consumption in a home depends on the size of the family, lifestyle, age of equipment and fittings that are available in the house.

You can calculate the approximate energy consumption at home by using this simple formula:

$$\text{Energy Usage (kWh)} = \frac{\text{Power Rating of Equipment (Watt)} \times \text{Usage (hour)}}{1,000}$$

While the formula for calculating energy costs is:

$$\text{Energy Cost (RM)} = \text{Energy Usage (kWh)} \times \text{Electricity Tariff (RM/kWh)}$$

What is the information required?

- i. The power rating of the equipment (normally found on the equipment nameplate).
- ii. Equipment usage in the unit of hour.
- iii. Latest electricity tariff.

## 1.3.2 Rate Of Electricity Tariff

Starting 1 January 2014, electricity tariff have been revised as below.








NO.	TARIFF CATEGORY - DOMESTIC	TARIFF (sen/kWh)
1.	For the first 200 kWh (1 - 200 kWh) per month	21.80
2.	For the next 100 kWh (201 - 300 kWh) per month	33.40
3.	For the next 300 kWh (301 - 600 kWh) per month	51.60
4.	For the next 300 kWh (601 - 900 kWh) per month	54.60
5.	For the next kWh (901 kWh onwards) per month	57.10

\* The minimum monthly charge is RM3.00



### 1.3.3 Electricity Usage At Home

You can estimate your monthly electricity bill to help you carry out austerity measures. Example of the use of electricity in a residence, regardless of the austerity measures is as below.

Equipment	Power (Watt) [a]	Daily Usage (hour) [b]	Total per day (Wh) [a] x [b]
 Refrigerator (1 unit)	700	24	16,800
 Air Conditioner (1.5 hp 1 unit, 1 hp 1 unit)	1,864	8	14,912
 Television (1 unit)	120	4	480
 Iron (1 unit)	1,500	0.5	750
 Fan (1 unit)	75	8	600
<b>Total</b>			<b>33,542</b>

\*1 hp equivalents to 745.7 Watt

Overall, the total daily energy consumption at home can be estimated through the formula on page 6.

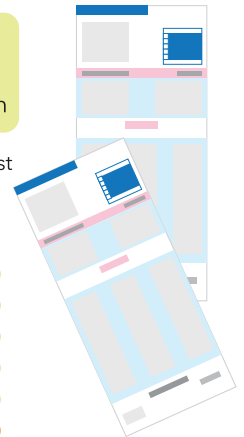
$$\text{Energy Usage} = 33,542 \text{ Wj}$$

1 kilowatt=1,000 Watt. Thus, the total energy consumption in kWh is:

$$\begin{aligned} \text{Energy Usage (kWh)} &= (33,542 \text{ Wj}) / 1,000 \\ \text{Energy Usage} &= 33.5 \text{ kWh per day} \\ &\text{or } 33.5 \text{ kWj} \times 30 \text{ days} = 1,005 \text{ kWh per month} \end{aligned}$$

By using electricity tariffs on page 6, it can be concluded that the energy cost for a month is:

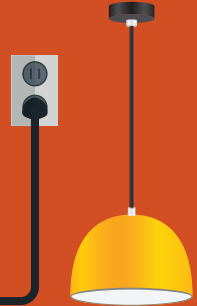
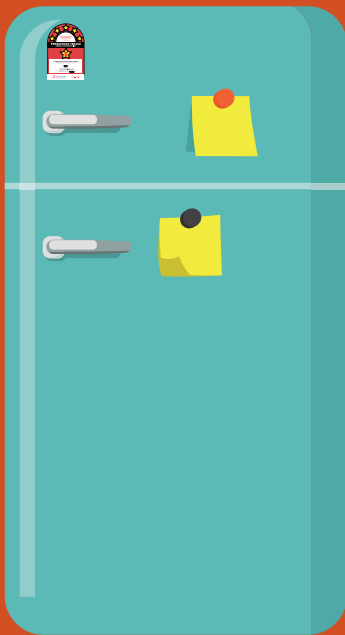
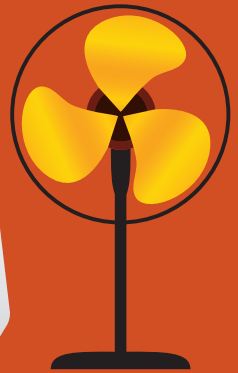
Energy Usage (kWj) [a]	Tariff Rate (sen/kWj) [b]	Total (RM) [a] x [b]
0 – 200 (200)	21.80	43.60
201 – 300 (100)	33.40	33.40
301 – 600 (300)	51.60	154.80
601 – 900 (300)	54.60	163.80
901 – 1,005 (105)	57.10	59.95
<b>TOTAL</b>		<b>455.55</b>



With this energy consumption trend, the user will pay RM455.55 a month or RM5,466.60 per year. The next chapter will discuss ways to choose energy efficient appliances and how to ensure this appliances operate at optimum level.

# 2.0 ENERGY EFFICIENT ELECTRICAL EQUIPMENT

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When purchasing an equipment you should also consider the cost of electricity it uses. An energy efficient equipment may cost more but in the long run it is more energy saving.

**Table 4: Comparison of Energy Savings Between Different Types of Lamps (Bulb Type)**

Types of Lamp	Lifetime (Hour)	Light Efficacy (Lum/W)	Purchase Cost (RM)*	Usage Cost (RM)**	Total Cost (RM)	Saving (RM)
Incandescent Bulb (60W)	1,000	12	15 unit x 6.25 =93.75	190.97	284.72	-
Compact Fluorescent Light (CFL) (18W)	10,000	67	2 unit x 15.90 =31.80	57.29	89.09	195.63
LED Downlight (4.7W)	15,000	74	1 unit x 31.80 =31.80	14.96	46.86	237.86

\*Purchase cost calculated based on the assumption for a 14,600-hour lifetime.

\*\*Usage cost calculated based on the assumption that the lights will be used 8 hours a day for 365 days a year for 5 years (14,600 hours).

Table 4 shows a comparison of the cost saving between different types of bulbs. CFL energy saving lamps can save around RM195.63 while the LED Downlight can save up to RM237.86. In addition, LED Downlights are expected to last up to 5 years, while the CFL must be changed 2 times and incandescent bulbs have to be changed 15 times to equal the lifespan of the LED Downlights.

Besides looking at the cost savings, we also have to consider the efficacy of the light for each lamp. The higher the value of the light efficacy, the higher the radiation output for each watt used by the lamp. With this, we can reduce the number of lamps to be used. Referring to Table 4, the incandescent bulbs can produce 12 lumens per watt compared to 67 lumens per watt for CFL and 75 lumens per watt for LED Downlight. This means, for one LED Downlight, nearly 7 units of incandescent bulbs needed to produce the same radiation.

**Table 5: Comparison of Energy Savings Between Different Types of Lamps (Tube Type)**

Types of Lamp	Lifetime (Hour)	Light Efficacy (Lum/W)	Purchase Cost (RM)*	Usage Cost (RM)**	Total Cost (RM)	Saving (RM)
Fluorescent T8 (36W)	5,000	69	3 unit x 7.00 =21.00	117.72	138.72	-
Fluorescent T5 (28W)	19,000	93	1 unit x 15.00 =15.00	91.56	106.56	32.16
LED (16W)	50,000	125	1 unit x 39.00 =39.00	52.32	91.32	47.40

A similar comparison can be made for other electrical equipment. The use of LED can save up to RM47.40 compared to the 36 watt T8 fluorescent lamps. In addition, LED lights also have the efficacy of up to 125 lumens per watt and have a lifespan of up to 50,000 hours. Therefore, it is important to choose appliances based on the total cost of the purchase of equipment and its usage for the best 'value for money'.

## 2.1 ENERGY EFFICIENCY LABEL

When buying electrical appliances, the easiest way to identify energy efficient equipment is to observe its energy efficiency label. The energy efficiency label symbolises the energy performance of electrical appliances.

In Malaysia, the Minimum Energy Performance Standards (MEPS) regulations for standards and labelling was enforced by the Energy Commission in May 2013 on domestic electrical appliances as follows:

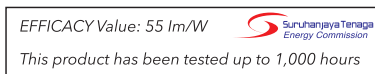
- Refrigerator
- Air conditioner
- Television
- Fan

The labelling scheme is conducted in collaboration with SIRIM. Refer to label as follows:

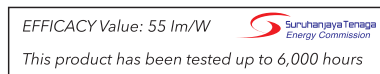


Meanwhile for lamp, the label to be affixed is as follows:

i.) After completing first 1,000 hours test



ii.) After completing first 6,000 hours test



The following are energy efficiency label from other countries:

**United States  
of America  
(USA)**



Energy Star Label

**European  
Union (EU)**



Colour coded bar  
A++++-D (A++++ is the  
most efficient while D  
is the least efficient)

**Australia**



Star Ranking (Higher  
number of stars indicate  
lower energy consumption)

**Singapore**



Number of ticks (1 for  
low and 5 for excellent)

Energy efficiency labels will provide information about the energy consumption and help the consumer decide when buying electrical appliances.

## 2.2 ENERGY PERFORMANCE OF THE ELECTRICAL EQUIPMENT

To ensure appliances are energy efficient, observe the energy efficiency labels which are affixed on them. For example, when you want to buy an air conditioner, take a look at the star rating given. In Malaysia, the minimum energy performance standard is 2 stars. This means that the equipment that has 1 star is not allowed to be sold in Malaysia. This is because the electrical appliance is not energy efficient.

When comparing the electrical equipment, make sure the equipment is in the same category. For example, to compare two different types of air conditioners, make sure both are rated with the same rating. After ensuring that the equipment has the same rating, observe the annual energy consumption (kWh per year). Compare between the two and choose the one that uses the least energy.



# 3.0 ENERGY SAVING TIPS FOR ELECTRICAL APPLIANCES



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## 3.1 REFRIGERATOR

### 3.1.1 Position

- Ensure the location of the refrigerator is not near any source of heat, exposed directly to the sunlight or too close to the gas stove.
- Provide adequate space around the refrigerator for air ventilation.

### 3.1.2 Temperature

- Check the temperature of the freezer
  - Adjust the temperature according to the load.
  - Recommended temperature is  $-18^{\circ}\text{C}$
- Check the temperature of the refrigerator
  - Recommended temperature is  $5^{\circ}\text{C}$  at the coldest area.
  - Adjust the thermostat according to your need.

### 3.1.3 Door gasket

- Make sure the door gasket works well
  - Put a piece of paper between the door and the refrigerator
  - Close the door and pull the paper out gently.
  - If the paper is easily pulled out, it means the door gasket is damaged and must be replaced.

### 3.1.4 Frost

- If the refrigerator is not a frost-free model
  - Check the frost in the freezer.
  - Ensure the thickness is not more than 6mm.
  - Switch off to defrost.
  - Clean the refrigerator and remove melted frost before switching it on again.

### 3.1.5 Load

- Check arrangement in the refrigerator
  - Arrange and ensure there are gaps between foods for ventilation.

### 3.1.6 Refrigerator Coil

- For older models, ensure the coil behind the refrigerator is clean.



## 3.2 OVEN/ MICROWAVE OVEN

### 3.2.1 Door gasket

- Always check for the door gasket
  - Be wary for the sign of wear and tear.
- Check the door hinges
  - Make sure there is no damage.
- If there is damage to the gasket and hinges, do contact the customer service to repair or replace them immediately.



## 3.3 AIR CONDITIONER

### 3.3.1 Installation

- Make sure the air conditioner is installed away from direct sunlight.
- Make sure the air conditioner capacity (horsepower) corresponds to the size of the room

### 3.3.2 Operation Temperature

- Check and set the thermostat to 24 – 26 °C

### 3.3.3 Maintenance

- Make sure:
  - The outer fin coil is cleared twice a year
  - The internal coil is cleared once a year
- Check:
  - The thermostat is adjusted to a comfortable temperature.
  - The coolant level once a year.

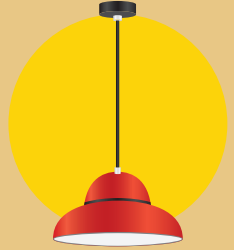
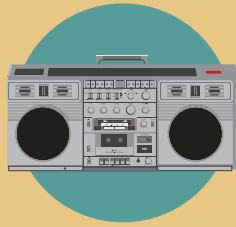


### 3.4 TELEVISION, COMPUTER AND RADIO

- Make sure to switch off when not in use as standby mode still consumes electricity.
- Make sure the computer power-saving function is activated.

### 3.5 LAMP

- Make sure the lights are energy efficient, either LED or CFL.
- Turn off the lights when not in use.



# 4.0 GUIDE TO BUYING ELECTRICAL EQUIPMENT

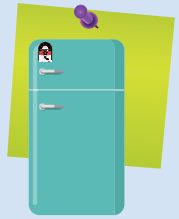
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## 4.1 REFRIGERATOR

- Select the size according to the family needs. A 550W refrigerator consumes RM22.50 per month. Avoid buying oversized equipment as it will consume more electricity.
- Do not forget to observe the energy efficiency labels. The higher the number of stars the more efficient the refrigerator is.
- Refrigerator with inverter technology uses lower electricity compared to conventional ones because of its motor ability to control the speed based on the existing load at any time.



## 4.2 FREEZER

- An upright freezer uses more energy than a chest freezer. The average cost of electricity consumption for upright freezer and chest freezer respectively are RM14.00 and RM10.00 a month.



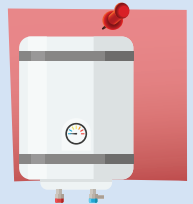
## 4.3 OVEN/MICROWAVE OVEN

- Microwave oven is preferred because it uses lower energy and cook faster than the electric oven. It also can save electricity by 10 - 25%.
- A microwave oven saves 75% of energy compared to electric oven because of lower power demand and less cooking time.



## 4.4 WATER HEATER

- Instant water heaters use less electricity than storage water heaters.
- If you need a storage type, choose the appropriate size. For example, heating water catchment of 23 - 27 litres is suitable for a family of 4-5.
- Solar water heaters do not use electricity, but they are relatively expensive compared to the ordinary water heater.



## 4.5 WASHING MACHINE

- Select washer to suit family needs.
- Top load automatic washing machine uses less energy than front load automatic machine.



## 4.6 IRON

- A steam iron uses more electricity than the ordinary iron.
- Use lighter iron because it warms up and uses less energy. Heavy iron takes longer to warm up before it can be used.



## 4.7 AIR CONDITIONER

- Select the size of the unit that suits your needs. As a guide, the following are the suitable size of the air conditioner according to the size of the room.

Table 6: Recommended Size of Air Conditioner According to the Room Size

Room size (ft.)	Capacity of the air conditioner (hp)
12 x 12	< 1
14 x 14	1 - 1.5
14 x 16	1.5
15 x 16	1.5 - 2.0
18 x 18	2.0 - 2.5
21 x 21	2.5 - 3.0

Source: CETREE, Panduan Kecekapan Tenaga Di Rumah, February 2006

- Refer the energy efficiency label for the unit. The higher the number of stars, the more efficient the unit (maximum 5 stars).
- Check also the airflow rate (in cfm/min). The higher the rate, the cooling effect is faster and the air ventilation is better.

## 4.8 FAN

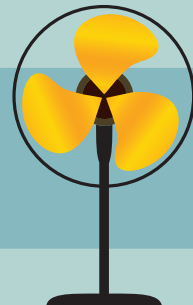
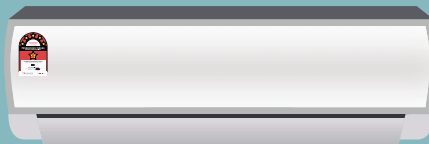
- Note the Coefficient of Performance (COP) of the fan, which is in as m<sup>3</sup>/min/W.
- The following are the average COP for different types of fan:

Table 7: Average COP for Different Types of Fan

Types of fan	Centre Line and COP
Ceiling Fan	48-60 inch diameter - 3.5 m <sup>3</sup> /min/W
Fan - Upright, Table, Wall	10-16 inch diameter - 1.0 m <sup>3</sup> /min/W
Box Fan	10-14 inch diameter - 0.5 m <sup>3</sup> /min/W

Source: CETREE, Panduan Kecekapan Tenaga Di Rumah, February 2006

- For an 80W fan, the usage cost is about RM7.00 a month. Choose an efficient fan because the amount of electricity consumed is high due to the long period of use.




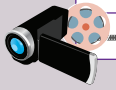




## 4.9 ENTERTAINMENT EQUIPMENT AT HOME

- Home entertainment appliances is already quite efficient. Different supplier sometimes set different power requirement for the same types of appliances.

Table 8: Energy Consumption for Entertainment Equipment

Appliances	Standby Mode (W)	Yearly Electricity Consumption (kWh)
 Stereo	1 - 25	7 - 185
 TV-15 inch	3 - 9	21 - 65
 TV-28 inch	0.1 - 14	1 - 100
 Video	1 - 17	9 - 149

Source: CETREE, Panduan Kecekapan Tenaga Di Rumah, February 2006

## 4.10 COMPUTER

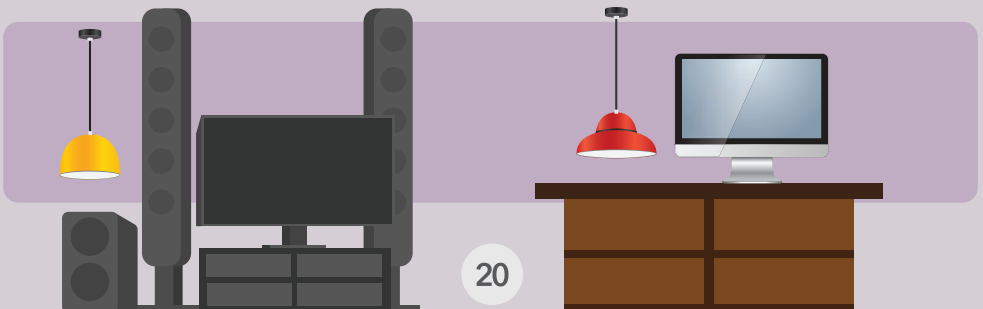
- Make sure your computer has a sleep mode function.
- Flat screen monitors are more efficient than cathode tube monitors.
- A laptop uses 30% less energy than a desktops.
- Below is the energy consumption by Mode of Operation for computers:

Table 9: Energy Consumption by Mode of Operation

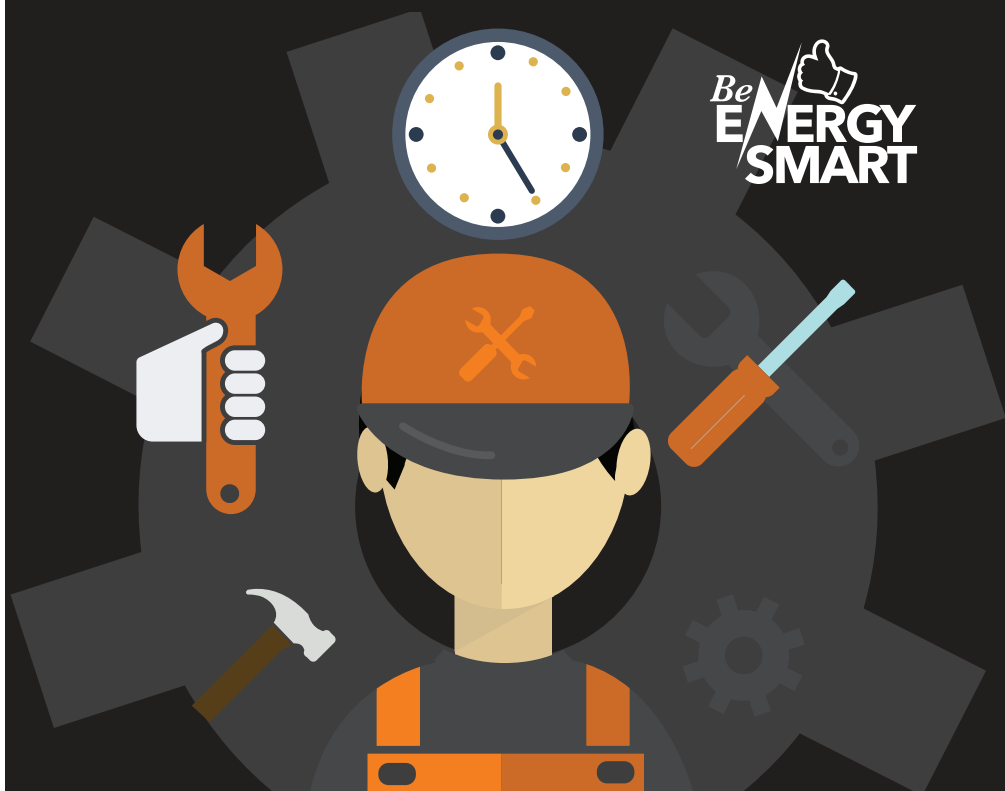
Mode/System	Off	Standby	Screen Saver	Normal Operation
Processor	3W	10W	20W	25W
Screen Monitor	3W	10W	80W	90W
Total	6W	20W	100W	115W

## 4.11 LAMP

- Buy energy efficient lights and you may save energy up to 80% in the long run.
- Although prices for energy efficient LED is a bit more expensive, it will provide more saving due to low electricity consumption.
- Use appropriate lighting needs. For example, use brighter lights when reading and dim the lights while watching TV.
- Use photoelectric switches, dimmers and timers for further savings.



# 5.0 GUIDE TO OPERATING AND MAINTAINING ELECTRICAL EQUIPMENT



## 5.1 REFRIGERATOR

- When going away for a long time, empty and clean the refrigerator. Switch off and leave the door open.
- Make sure the condenser coils are cleaned. Dusting the dirt on the condenser coils will reduce the efficiency of the refrigerator.
- Arrange the food in the fridge so that there is space around it to allow ventilation.
- Avoid frequent opening or deliberately letting the refrigerator door open.

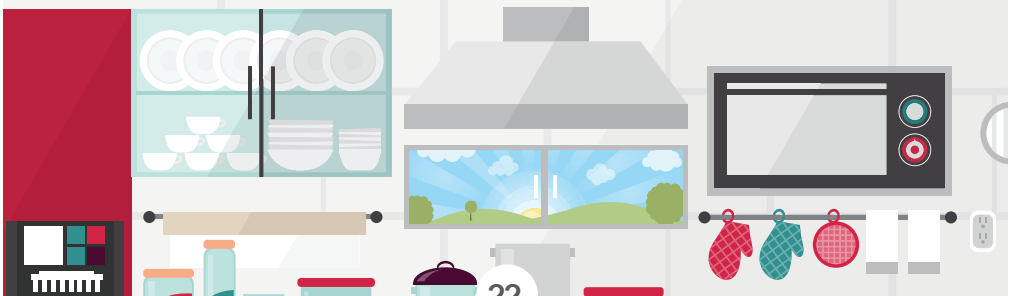
## 5.2 FREEZER

- It is best practice to keep the freezer full to prevent frosting and to ensure the freezer is working efficiently:
  - Use container and sealed plastic to store food to prevent it from drying.
  - Identify food to be removed from the freezer before opening the door. Opening freezer repeatedly will lead to energy wastage.
  - Defrost the freezer when there is frosting of more than 6 mm (0.24 inch).

## 5.3 OVEN/ MICROWAVE OVEN

### 5.3.1 Oven

- Avoid heating the oven before cooking. The oven can be switched off 5-10 minutes before cooking time limit to use the heat that is already stored in an oven. It can save up to 10 - 25% of electricity.
- Make sure the oven door is always closed. If you need to check the dishes, check through the glass door/opening.
- Before cooking, defrost frozen food in advance. It is possible to save energy needed to thaw the food.
- Plan to cook several dishes at once. This will save electricity up to 60%.



### 5.3.2 Microwave Oven

- Avoid using the oven when it is empty as this can damage the magnetron.
- Avoid using metal containers.
- The food in the microwave will continue to be cooked or heated when oven is switched off.

### 5.4 WATER HEATER

- Use shower for bathing instead of dip bathing as shower uses less hot water.
- Set the water flow to slow settings to save water.
- Repair leaking pipes / taps as soon as possible.
- Use the plug in the bathtub to prevent hot water flowing out into the drain.
- After using the water heater, switch off the power point.

### 5.5 WASHING MACHINE

- Electricity and water will be wasted when the machine only wash at half load.  
Wash at full load because the electricity consumption is almost the same.
- Avoid using the washing machine more than it can handle.
- Select correct washing cycle.
- Avoid using the pre-wash program.
- Use the optimum temperature settings and avoid using hot water wash.
- In buying a washing machine, select washers that offer the ability to choose the amount of water based on the load used.



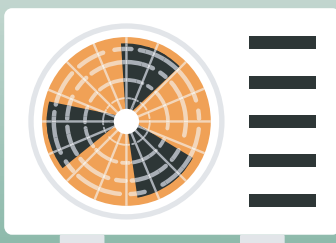
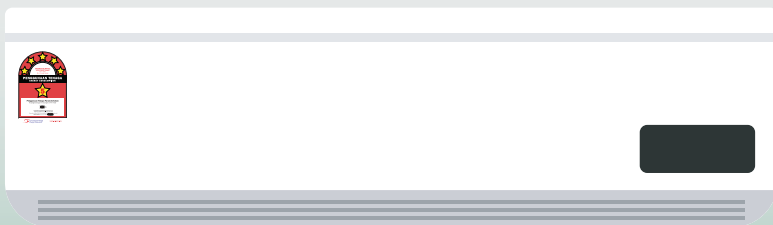
## 5.6 IRON

- Iron the fabric that requires low temperature first in order to reduce the heating time. Switch off the iron before ironing the final clothes.
- Heating iron consumes electricity. Therefore, collect and iron clothes in large quantities at a time.
- Switch off the iron if interrupted with other work.
- Fold washed items carefully in order to avoid the need for ironing.



## 5.7 AIR CONDITIONER

- Do not block the air flow of the unit with curtains or furniture.
- Keep windows and doors closed to keep the air cool.
- Use insulated roof or ceiling and seal gaps under doors to minimise cold air leaking through.
- Insulation will prevent hot air from getting into the room and reduce the cooling load of the air conditioner unit.
- Tint the windows. Some tint films are capable of reflecting heat radiation and reduce electricity bills up to 40%.
- Switch on the air conditioner early if the temperature is expected to increase, to reduce the load on air conditioner.
- On a hot day, use curtains to block out the sun.
- Perform maintenance of the air conditioner unit on a regular basis, including cleaning the filter and heat exchange coil, to ensure optimal functioning of the unit.
- Plant a shrub tree around the house to provide cooling effect.
- Shade screen or windows awning is another way to reduce heat absorption.



## 5.8 FAN

- Make sure the back of the fan is not blocked because airflow obstruction will degrade performance or cause it to operate with excessive burdens.
- Switch off the fan when not needed. Automated systems such as automatic sensor switch can avoid waste when the fan is not required.
- A fan only circulates air and should be used to allow for cool air to flow from outside.

## 5.9 ENTERTAINMENT EQUIPMENT AT HOME

- Dim the living room lights while watching television or videos.
- Switch off television, radio and other equipment when not in use.
- Avoid leaving the appliances in standby mode.

## 5.10 COMPUTER

- Avoid leaving your computer in standby mode. Refer to Table 9 to learn about the energy consumption of computers in various modes.
- Make sure the computer is properly shutdown and not on sleep mode, as the processor and the monitor still use 1-30W of electricity.



## 5.11 LAMP

### • Bedroom

- Use dim lighting from the ceiling for general lighting.
- Use bedside lamps for reading.
- Use natural light. Place a table near the window.

### • Living room

- Use dim lights to lit the atmosphere.
- Ensure that no light reflection on television for the comfort of the audience.
- Switch the lights off when not in use.

### • Kitchen

- Ensure the work area has adequate lighting. To effectively spread the lighting:
  - i. Put lights on the workspace.
  - ii. Put lights on the pantry door.

### • Toilet and Storage Room

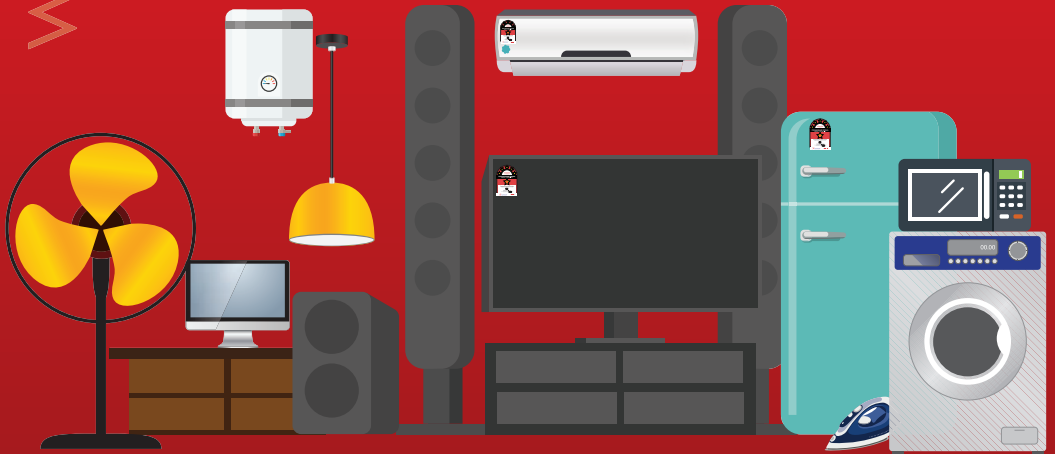
- Put the lights on top of the mirror.
- Install ceiling lights for a large bathroom.
- Install low-power lighting for pathway and storage room
- Clean the dust on the bulbs and lampshades every one or two months as it will enhance the illumination.











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