

Lighting and appliances lever

In 2016, lighting contributed to more than 10% of total building energy demand. Majority of the lighting in Malaysia was still compact fluorescent lamps (CFL). The lighting energy demand can be reduced through the implementation of several strategies. For example, optimising the daylight through energy-efficient building designs helps to minimise the amount of artificial light and reduces the electricity demand. In addition to that, increase adoption of high-quality and energy-efficient lighting as well as improvements in behavior and lifestyle, for example, turn off lights when not in use will reduce the building's energy demand significantly.

The energy consumption of the appliances and other use in 2016 contributed to more than 30% of total building energy demand. Continually improving standards of living will have a major impact on appliance energy consumption as many more households will be able to afford electrical appliances.

Level 1

Level 1 assumes that by 2050, the energy demand per person in 2050 is expected to doubled from the base year 2016. The main share of lighting technology remained as CFL and it is assumed that number of lighting and appliances ownership increasing.

Level 2

Level 2 assumes that by 2050, the energy demand per person reducing as more energy efficient lighting and appliances been used. The energy efficient lighting and appliances are extended from the current and planned MEPS initiatives.

Level 3

Level 3 assumes that by 2050, the expansion of the Minimum Energy Performance Standard (MEPS) for more electrical appliances has reduced further the demand for lighting and appliances per person.

Level 4

Level 4 assumes that by 2050 , 90% of the CFL and inefficient appliances have been replaced with more energy efficient lighting and appliances. Behavioral changes and choices has lead to greater reduction of the demand for lighting and electrical appliances.

		2050	2050	2050	2050
	2016	Level 1	Level 2	Level 3	Level 4
LIGHTING					
Demand Index (Domestic)	1.00	1.50	1.00	0.85	0.70
Demand Index (Commercial)	1.00	1.30	1.00	0.75	0.50
Energy Intensity Index (Domestic)	1.00	0.78	0.33	0.33	0.25
Energy Intensity Index (Commercial)	1.00	0.79	0.5	0.5	0.4
APPLIANCES					
Demand Index (Domestic)	1.00	1.50	1.00	0.75	0.50
Demand Index (Commercial)	1.00	1.30	1.00	0.90	0.80
Energy Intensity Index (Domestic)	1.00	0.90	0.77	0.63	0.50
Energy Intensity Index (Commercial)	1.00	0.90	0.77	0.63	0.50

Space Cooling

Energy demand for space cooling has been increasing average growth 4% since 2014 to 2016. Space cooling was responsible for more than 20% of total final energy consumption in 2016. The air-conditioner ownership in Malaysian household has increased from 43% in 2014 to more than 70% of households in 2017.

As incomes rise and populations grow, the share of air conditioners is becoming increasingly common. The hotter weather in Malaysia also has affected the share of ownership and further increased the frequency of usage for cooling the building.

Level 1

Level 1 assumes that without action to address energy efficiency, energy demand for space cooling will more than double by 2050 as the no. of ownership increasing to 100%. Most of air-conditioners available in market have an average energy performance at SEER 3.5.

Level 2

Level 2 assumes that by 2050, 95% of households would have access to cooling, The energy efficiency of new air conditioner continues to improve steadily over the projection period, driven by current and planned policies, including MEPS, and by continuous technological advances. The energy demand for space cooling remain same as in the base year regardless increasing of population and floor areas.

Level 3

Level 3 assumes that by 2050, 90% of households would have access to cooling. Share of cooling demand can be reduced up to 40% as MEPS have been tightened progressively to more efficient models.

Level 4

Level 4 assumes that by 2050, 80% of households would have access to cooling. Share of cooling demand can be reduced to 50%. The average energy performance of the air-conditioners, as measured by the SEER, more than doubles between 2016 and 2050 to around 7.5. Other measures such as building envelope improvements leading to even greater savings.

		2050	2050	2050	2050
	2016	Level 1	Level 2	Level 3	Level 4
DEMAND					
Homes with AC (Domestic)	67%	100%	95%	90%	80%
Cooling Demand / Area (Commercial)	1.00	2.33	2.03	0.93	0.88
COOLING					
Energy Intensity Index (Domestic)	1.00	0.90	0.77	0.63	0.50
Energy Intensity Index (Commercial)	1.00	0.90	0.77	0.63	0.50

Hot Water

In the residential sector, the growth of water heater is estimated to be corresponding to the growth of the number of household in Malaysia. Today most of the water heaters installed in the residential sector are Electric Instantaneous Water Heater.

Whereas, the water heater for the commercial sector are mainly for hotels and hospitals and the growth will directly correspond to the number of new hotels and hospitals built. Most of the centralized systems are using heat pumps while decentralized systems are using storage or instantaneous water heater.

Water heating contributes to an estimated 2% of energy consumption in 2016.

Level 1

Level 1 assumes that solar water heater installed at residential sector, remained as the current trends. In 2050, more than 95% are electric instant water heater. Whereas, for commercial sector, most of water heater installed in commercial sector comprises of electric storage water heater. The energy efficiency of water heater is assumed to remain the same as the base year. The demand for hot water is expected to increase by 50% - 80% in domestic and commercial sector respectively.

Level 2

Level 2 assumes that by 2050, the installation of solar water heater at the residential sector increasing which contributes to 5% of water heater installed. However, electric instant water heater are main choice of the household. More than 50% heat pumps water heater been installed at commercial sector to replace storage water heater.

Level 3

Level 3 assumes that the share of solar water heater at the residential sector increasing to 7%. In commercial sector, the heat pumps dominated the share of water heater technology with higher efficiency. The hot water demand in both sectors are assume same as in the base year.

Level 4

Level 4 assumes that the share of solar water heater at the residential sector increasing to 10%. Heat pumps dominated the share of water heater technology with higher efficiency in commercial sector. Level 4 also shows behaviour improvement of reducing water temperatures which leads to an decrease in hot water demand.

		2050	2050	2050	2050
	2016	Level 1	Level 2	Level 3	Level 4
Hot Water					
Demand Index (Domestic)	1.00	1.58	1.29	1.00	0.50
Demand Index (Commercial)	1.00	1.87	1.18	1.00	0.95

Cooking

In Malaysia, usually there are two choices of cooking between liquified petrol gas (LPG) and electricity. In 2016, 90% of cooking were from LPG and remaining 10% of cooking were being electrified. Two factors that have affected the GHG emissions which are efficiency of the cooking appliances and source of energy whether using fossil fuel based or electricity.

Level 1

Level 1 assumes 20% of fossil fuel energy for cooking is switched to electricity. No improvement of the energy efficiency of the cooking appliances available in the market.

Level 2

Level 2 assumes that 40% of fossil fuel energy for cooking is switched to electricity. In addition to that, the cooking appliances are more energy efficient than the base year.

Level 3

Level 3 assumes 60% of fossil fuel energy for cooking is switched to electricity. Cooking appliances adherence to the Minimum Energy Performance Standard (MEPS) is constantly being updated.

Level 4

Level 4 assumes 85% of fossil fuel energy for cooking is switched to electricity. New cooking appliances are required to be certified with more stringent current minimum energy performance requirements (MEPS).

		2050	2050	2050	2050
	2016	Level 1	Level 2	Level 3	Level 4
Cooking					
Fossil-fuel Based	90%	70%	50%	30%	5%
Electricity	10%	30%	50%	70%	95%