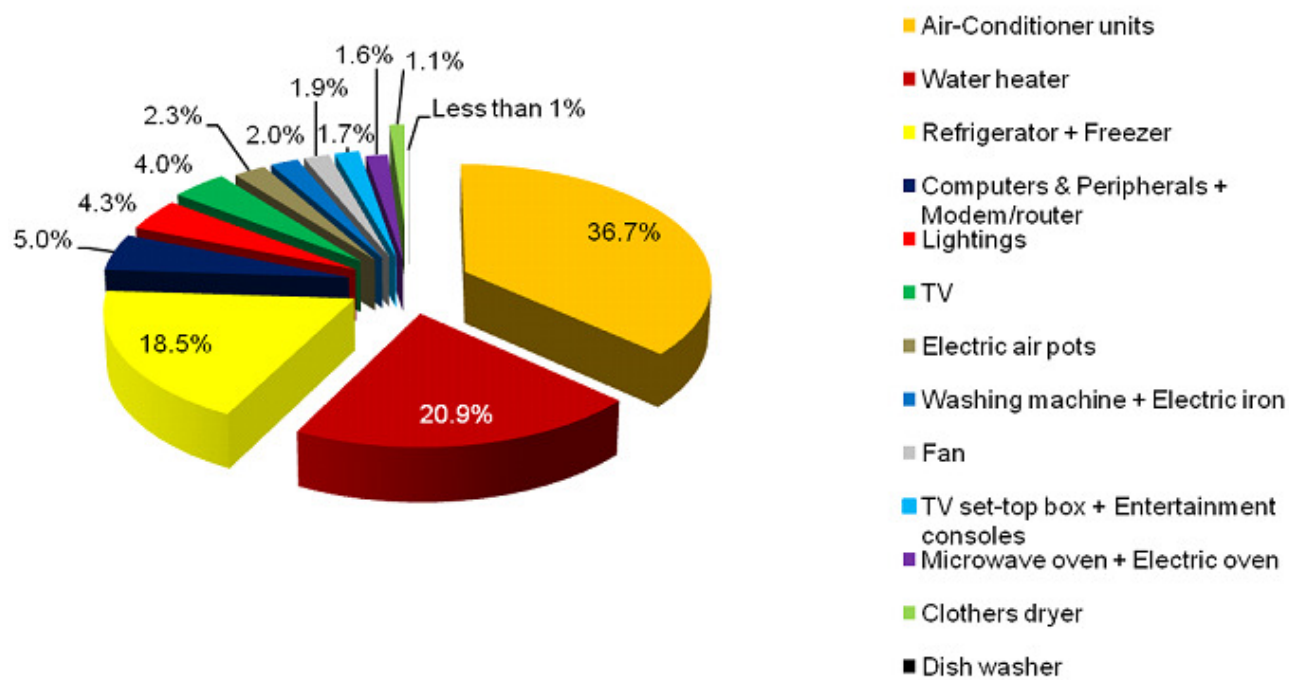


### Breakdown of Household Energy Consumption Across All Housing Types



Source: Household Energy Consumption Study 2012

### Power Consumption of Different Lamp Types According to Lumen Output

Lumen Output	Lamps			
	Inefficient	Moderately Efficient	Energy Efficient	
	Incandescent (Tungsten filament)	Incandescent (Tungsten halogen)	CFLi	Non-directional LED Lamp
	Power Rating			
200 lm	25W	18W	5W	3W
400 lm	40W	28W	8W	6W
640 lm	60W	42W	12W	9W
1260 lm	100W	70W	20W	15W

### Ownership Costs of Different Lamp Types of Equivalent Lumen Output

Type of Lamp		Inefficient Lamp	Moderately Efficient Replacement Lamp	Energy Efficient Replacement Lamps	
		Incandescent (Tungsten filament)	Incandescent (Tungsten halogen)	CFLi	Non-directional LED Lamp
Upfront Cost	Retail Price	\$1.00	\$4.25	\$5.50	\$17
	Lifespan	1,000hr	2,000hr	7,500hr	23,000hr
	Cost per 1,000hr* of operation [A]	\$1.00	\$2.10	\$0.70	\$0.75
Operating Cost	Power Rating**	60W	42W	12W	9W
	Electricity Tariff***	\$0.27/kWh			
	Operating cost [B] (per 1,000hr of operation)	\$16.20	\$11.40	\$3.30	\$2.50
Total Cost	Total cost [A+B] (per 1,000hr of operation)	\$17.20	\$13.50	\$4.00	\$3.25

\* 1,000 hours of operation is approximately equivalent to a year of operation assuming 3 hours of usage daily.

\*\* The lumen output of a 9W non-directional LED lamp, 12W CFLi and 42W tungsten halogen lamp are about the same as that of a 60W Edison-type tungsten filament lamp.

\*\*\* 2009 - 2013 average electricity tariff, including 7% GST

**Lamps Not Covered**

Lamps that will not be covered under the proposed MELS and MEPS regulations are listed below:-

- Tubular lamps
- Directional lamps (e.g. reflector and showcase lamps)
- Lamps having a luminous flux less than 130 lumens (e.g. Nightlight)
- Special purpose lamps that are intended for use in special applications because of its technical parameters which are not necessary for general lighting purposes (e.g. lamps supplied as part of an appliance such as oven, refrigerator and sewing machine; lamps for medical applications, chemical and biological processes, image capture and projection, signalling, and heating; coloured lamps).

## MEPS Levels for Incandescent, CFLi &amp; Non-directional LED lamps

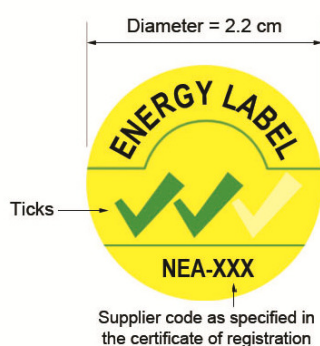
Type of Lamps*	Wattage (W)	Proposed MEPS Cut-off Levels
Incandescent	25 - 200	$P_{\max incandescent} = 0.8 \times (0.88\sqrt{\phi} + 0.049\phi)$
Compact fluorescent lamps with integrated ballast (CFLi)	$\leq 60$	$P_{\max bare\ CFLi} = 0.24\sqrt{\phi} + 0.0103\phi$
Covered CFLi		$P_{\max covered\ CFLi} = P_{\max bare\ CFLi} / 0.95$
LED		$P_{\max LED} = 0.24\sqrt{\phi} + 0.0103\phi$

\* Lamps with Edison screw and bayonet lamp caps, which are designed to be connected directly to the 230V A.C. mains by means of a socket or connector

where  $P_{\max|(type\ of\ lamp)}$  is maximum allowable power consumption  
 $\phi$  is light output in lumen

## Proposed Energy Label and Energy Rating System for Lamps

Proposed energy label for lamps (to be affixed or printed on each lamp packaging)



Proposed energy rating system for lamps

	<b>Incandescent Lamps, CFLi &amp; Non-directional LED Lamps</b>
Tick Rating	Power Consumption (P) in Watts
3-tick	$P \leq 0.17 \times (0.88\sqrt{\phi} + 0.049\phi)$
2-tick	$0.17 \times (0.88\sqrt{\phi} + 0.049\phi) < P \leq 0.24\sqrt{\phi} + 0.0103\phi$
1-tick	$0.24\sqrt{\phi} + 0.0103\phi < P \leq 0.8 \times (0.88\sqrt{\phi} + 0.049\phi)$

where P is the rated power consumption of incandescent lamps, bare CFLi or non-directional LED lamps

$P_{\text{covered CFLi}}$  is power consumption of covered CFLi

$\phi$  is light output in lumen

For covered CFLi,  $P = P_{\text{covered CFLi}} \times 0.95$