Appliances Guide

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Energy efficient Lightings

Country

China

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1 Subtypes and markets

There are three major lighting technologies on Chinese market, incandescent, fluorescent and LED (Light Emitting Diode) technology. Incandescent lamps are classified as traditional non-efficient technology, but they are widely deployed. China has implemented a phase-out roadmap for incandescent lamps[1], which will be adopted by 2016. Fluorescent lamps are more energy efficient than incandescent lamps and recognized as substitutes for incandescent bulbs. Although LED is more efficient compared to both Fluorescent and Incandescent, it is relatively new technology. For this reason, the energy efficiency standards and energy labels do not yet cover this product. Due to the current data availability, this report focuses on compact fluorescent lamps (CFL). Moreover, they are regulated by energy efficiency standards and labels.

Typical size

The size of lamps is regulated by its rated power. The following figure shows the distribution of CFL based on their rated power.

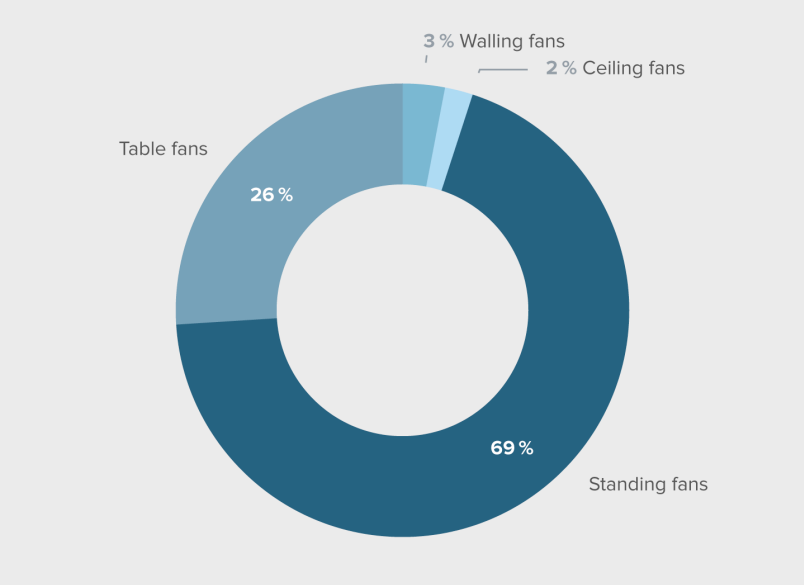

Figure1: Rated power distribution of CFL

The lamps with a power range between 3 and 20 W take majority market share with 72%.

The productivity of CFLs was about 3.34 billion in 2012, and the domestic sales of CFLs reached 1.33 billion in the same year. Due to the phase-out roadmap of incandescent lamps, the market stock of CFL increased dramatically from 2007 and the domestic stock reached about 4.11 billion by the end of 2012.

According to the white paper on the energy efficiency status of energy consuming products in China, which was published by CNIS, the domestic electricity of CFL reached 257 TWh in 2012.

2 Efficiency range and user savings

The following table gives a comparison between a typical inefficient appliance and the best available technology.

Level	Typical Inefficient appliance. If MEPS is implemented: Appliance just complying to minimum requirement (MEPS)	Typical appliance purchased (BAU – Business As Usual)	Best Available Technology (BAT)	Typical appliance in the stock (over all appliances in use)	Expected future BAT (Best not yet Available Technology)
Typical Capacity / Size	15W				
Category	**CFL**	**CFL**	**CFL**	**CFL**	
Type	RR	RN	RD	RR	
Lifetime (hours)	5000	5000	5000	5000	
Qualitative classification of the provided service (e.g.: washing performance /etc.)	☐ Poor ☐ Low ☑ Average ☐ Good ☐ Excellent ☐ No information	☐ Poor ☐ Low ☑ Average ☐ Good ☐ Excellent ☐ No information	☐ Poor ☐ Low ☐ Average ☑ Good ☐ Excellent ☐ No information	☐ Poor ☐ Low ☑ Average ☐ Good ☐ Excellent ☐ No information	☐ Poor ☐ Low ☐ Average ☐ Good ☐ Excellent ☐ No information

Yearly energy consumption ***Please precise the energy considered (electricity, gas,...): kWh***	66	66	66	66	
Purchase cost in (currency) RMB	16	20	25	15	
Labelling class (for the aforementioned labels)	Tier 3	Tier 3	Tier 2	Tier3	

3 Performance and information requirements

Mandatory requirements

The first Energy Efficiency Standard (EES) for CFLs was released in 2003 and entitled <GB 19044-2003 Limited values of energy efficiency and rating criteria of self-ballasted fluorescent for general lighting service>. It was revised in 2013 and the new version was implemented from October 2013.

<GB 19044-2003> defines three energy efficiency tiers. Tier 3 defines the requirements of MEPS and tier 1 defines the requirements for the most energy efficient products. The following table shows the initial luminous efficiency requirements for different tiers in <GB 19044-2003>.

Table 1: Initial luminous efficiency requirements in <GB 19044-2003>

Rated power/W	**Initial luminous efficiency requirements (lm/W)**					
	Energy efficiency tiers (Colour temperature: RR, RZ)			**Energy efficiency tiers (Colour temperature: RL, RB, RN, RD)**		
	1	2	3	1	2	3
5-8	54	46	36	58	50	40
9-14	62	54	44	66	58	48
15-24	69	61	51	73	65	55
25-60	75	67	57	78	70	60

For all the tiers, the luminous maintenance rate should not be smaller than 80% after 2,000 hours of lighting.

Compared to the old version, <GB 19044-2013> expanded the power range from 5W-60W to 3W-60W, defined the energy efficiency requirement for each level of power consumption and raised the energy efficiency requirements as well as the luminous maintenance rate. The following table presents the detailed energy efficiency requirements in <GB 19044-2013>.

Table 2: Energy efficiency requirements of self-ballasted fluorescent required in <GB 19044-2013>

Rated power/W	Initial luminous efficiency requirements (lm/W)					
	Colour temperature (RR, RZ)			Colour temperature (RL, RN, RD)		
	1	2	3	1	2	3
3	54	46	33	57	48	34
5	58	51	40	61	54	42
7	61	55	45	64	57	47
8	62	56	47	65	59	49
9	63	57	48	66	60	51
10	63	58	50	66	61	52
11	64	59	51	67	62	53
13	65	60	53	68	63	55
14	65	61	53	68	64	56
15	65	61	54	69	64	57
18	66	62	56	70	65	59
20	67	63	57	70	66	60
23	67	63	58	71	67	61
24	67	64	58	71	67	61
25	68	64	58	71	67	61
26	68	64	59	71	67	61
28	68	64	59	71	68	62
30	68	65	60	72	68	63
32	68	65	60	72	68	63
35	68	65	60	72	68	63
36	69	65	60	72	68	64
40	69	65	61	72	69	64
42	69	65	61	72	69	64

45	69	65	61	72	69	64
50	69	65	62	72	69	65
55	69	65	62	72	69	65
60	69	65	62	72	69	65

Mandatory labelling

The energy labelling for CFL started in 2008 by making it mandatory to label all the products in the market. The energy label displays the information of energy efficiency tier, initial luminous efficiency, rated power and colour temperature of the lamp, intending to guide the consumers to make an informed choice.

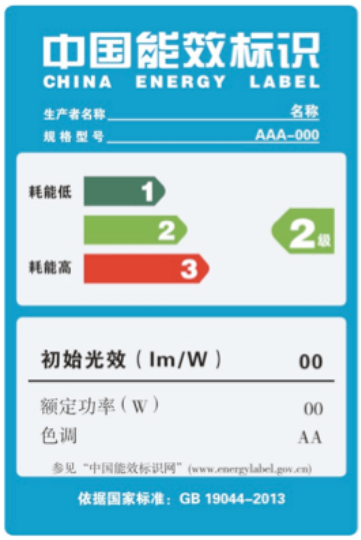

Figure 2: Energy label sample for CFL

According to a market research of Top10, tier 1 CFLs are hardly represented on the market. Tier 2 CFL have 66% market share, while tier 3 lamps have 34% market share, which is shown in following figure.

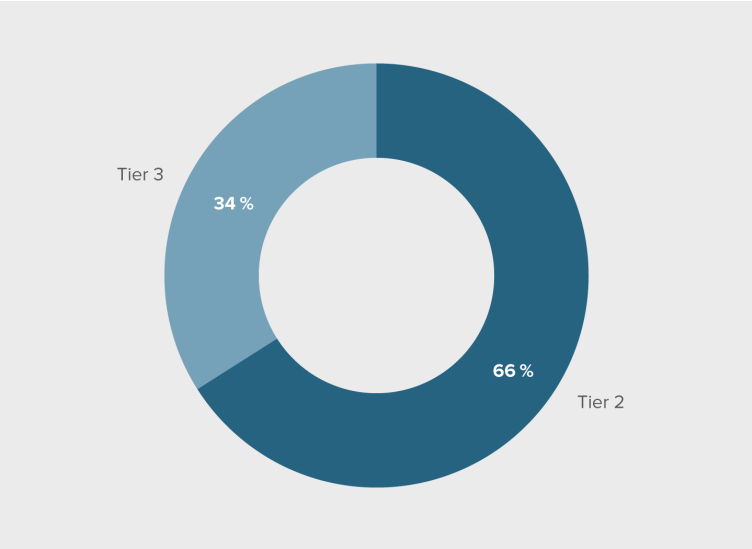

Figure 3: Energy efficiency tiers distribution of CFL

Voluntary requirements

The voluntary energy conservation certification of CFL started in 2009, which is based on the EES. Energy efficiency tier 2 sets the threshold for energy conservation certification for the CFL. Certified lamps can be verified with the following endorsement label:

Figure 4: Energy conservation label sample

To improve the energy efficiency of lightings, Chinese government released the <Phase-out roadmap of incandescent lamps > in 2011 which is based on < Law of the People's Republic of China on Energy Conservation>. The roadmap bans the importing and sale of general incandescent lamps.

The roadmap sets the five phases below:

Phase 1: From 1st November, 2011 to 30th September, 2012. Transition period, prepare for the phasing out.

Phase 2: From 1st October, 2012, ban the importing and sale of incandescent lamps with the power of 100W or above 100W.

Phase 3: From 1st October, 2014, ban the importing and sale of incandescent lamps with the power of 60W or above 60W.

Phase 4: From 1st October 2015 to 30th September 2016, interim policy evaluation and revision period.

Phase 5: From 1st October, 2016, ban the importing and sale of incandescent lamps with the rated power of 15 W and above. Or follow the policy change of phase 4.

There are lamps exempted which are not included in the roadmap: incandescent reflector lamps and lamps for science research, medicine, vehicles and household appliances.

Besides the policy of <Phase-out roadmap of incandescent lamps> China Ministry of Finance (MOF) and National Development and Reform Commission (NDRC) announced the <Financial Subsidy fund management Measurement for Promoting High Energy Efficient Lighting Products> in 2007. For bulk purchasing of high-efficient lighting products, buyers may be eligible for a subsidy of 30%. Household purchasers may receive a 50% subsidy. The subsidized lighting products included CFL, three-color double end fluorescent lamps (T8, T5), sodium lamps, LED lamps and ballasts.

5 Test procedures and standards

The test method of CFL was introduced in <GB/T 17263-2003 self-ballasted fluorescent lamps for general lighting service-performance requirements>. The new version <GB/T 17263-2013> was implemented from November 2014. <GB/T 17263-2013> regulates the testing of flux after 300 hours of lighting.

The energy efficiency standard of CFL <GB 19044-2013> defines the following formula to calculate the initial luminous efficiency of the self-ballasted lamps, which is the main efficiency indicator.

$$\eta = -A[\lg(P)]^3 + B[\lg(P)]^2 + C\lg P + D$$

η: initial luminous efficiency, unit: lm/W

P: rated power, unit: W

The values of A, B, C, D are given out in following table.

Table 3: A, B, C, D values for initial luminous efficiency calculation

	Colour temperature (RR, RZ)*			**Colour temperature (RL, RB, RN, RD)***		
	Tier 1	**Tier 2**	**Tier 3**	**Tier 1**	**Tier 2**	**Tier 3**
A	2.40	3.40	4.20	2.35	3.52	4.31
B	0.60	0.30	0.55	0.01	0.15	0.10
C	20.00	29.00	39.00	21.7	30.6	41.65
D	45.00	32.00	14.30	47.02	33.58	14.73

* Represent different color temperature of the lamps.

6 References

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