

# 我国白炽灯淘汰计划的节能影响评价

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## THE IMPACT ENERGY SAVING OF CHINA'S PHASE OUT INCANDESCENT LAMP

### Abstract

This paper was aimed to analysis the impact on electricity energy saving if Chinese government plans to carry out phasing out incandescent program before 2020. The major results show the electricity saving potential for the program would be reached to 41.2 billion kilowatt-hours in 2020, the electricity saving rate of that year would be as high as 11% correspondently.

**Keywords:** Phase out incandescent, energy saving, China

### 1、 Background

China is one of the biggest countries of producing and consuming Incandescent lamp in the world, its production of incandescent of China was 3.2 billion units in 2007 which account for one third of world production in total. The products are mainly for domestic using. It is estimated that the current stock of existing using incandescent is above 2.0 billion units. In order to facilitated China's Green Lights Program which was launched in 1996, and to realize its ambitious target of energy saving and reducing CO<sub>2</sub> emission, Chinese government has put great efforts on promoting CFLs in its 11th five-year plan(2006-2008) period by using national financial substances, and is now underway to formulate China's framework of phasing out incandescent program. This study is attempted to analysis the energy saving impact if China planned to phase out incandescent program before 2020.

### 2、 Methodology of Analysis

#### 2.1 The current production stock of incandescent lamp in China

According to the production and sales data of lighting products in 2008 provided by experts from lighting industrial, the electric light source products totaled around 15.4 billion units, including 3.2 billion general incandescent lamps, 3.99 billion fluorescent lamps (690 million tube-shaped fluorescent lamps and 3.3 billion compact fluorescent lamps), which accounted for 36% of total production of electric light source products, 67 million HID lamps, 1 billion

low-voltage light bulbs, and 2.7 billion special-use small lamps. Subtract export amount from the total production, we can get the domestic sales volume of light source by types. Among the domestic sales volume, one part is the updated products as replacement, the second part is the increase of existing volume, and the third part is the increasing use for new building .etc. Based on the features of different lamps and investigation we classified the volume of stock of lamps in different buildings, shown in Table 2-1.

Table 2-1 The stock of existing use lighting products of China in 2008 Unit: 100 Million

	Residential I Urban	Residential Rural	Industrials	Commercial	Public and Others	Total
<b>Incandescent</b>	<b>6.00</b>	<b>11.00</b>	<b>2.26</b>	<b>1.10</b>	<b>0.64</b>	<b>21.00</b>
T5	0.00	0.00	0.07	0.51	0.03	0.61
T8	3.34	2.59	1.84	5.23	1.44	14.44
CFL	5.00	3.70	1.61	3.14	0.55	14.00
Metal Halide			0.45	0.08	0.03	0.56
High Pres. Sodium			0.46	0.09	0.05	0.60
Mercury			0.43	0.04	0.03	0.50
Total	14.34	17.29	7.13	10.18	2.77	51.71

From Table2-1, we can see that the total existing stock of incandescent lamp is 2.1 billion units. And it's shares in residential, commercial, industrial, and other sector are 81%, 5%, 2%, 11%, 3% respectively. In terms of amounts of lighting product units, the incandescent lamp is account for 41% of total stock of existing using lamps in China.

## 2.2 The forecast of China's lighting demand

With the assumptions of future development of buildings areas by types, the efficacy and average wattages by lamps, lamp mixture, and lighting-hours at various places and sites. we have worked out that the total lumen demand of China will increase from 17,347 trillion lumen hours in 2008 to 23,683 trillion lumen hours in 2010 and 29,861 trillion lumen hours in 2020. The lighting demand in 2020 will increase by 70% over 2008. The annual growth rate will be about 4.6% averagely (see Table 2-2).

Table 2-2 The forecast of lighting lumen demand by sectors. Unit: Trillion lumen-hours

Year	2008		2010		2020	
Residential Urban	1917.1	11.3%	3087.5	11.3%	5425.8	18.5%
Residential Rural	1648.7	9.8%	2536.8	8.5%	1366.4	5.4%
Commercial	7912.2	22.1%	11097.3	23.9%	12258.3	25.6%
Industrial	4277.4	47.8%	5204.1	47.6%	8081.8	41.8%
Public and Others	1591.8	9.0%	1757.4	8.7%	2729.2	8.7%
Total	17347.2		23683.1		29861.5	

### 2.3 The Scenarios of road map of China's phase out incandescent lamp

By sorting out the all the lumen output from different lamps according to the amount of existing stocks and their efficacy, we got each lamp market contribution rate among the country's lumen demand in 2008(see Table 2-2.) The data indicates that incandescent lamp accounts for about 50% contribution share of country's total lumen demand in high color rendering components.

In this study, we supposed China's phase out incandescent lamp program will be completed by 2020, In order to analysis the impact incandescent phase out program of electricity saving; we set two scenarios to predict the future development of China's lighting market. Those two scenarios are defined as follows:

1. **Reference scenario**, Reference scenario mainly considers the natural development of lighting technology and the changes of the market. It is often defined as a scenario that is most likely to happen in the future. The future development is mainly extrapolated according to historic data. In the reference scenario, it is assumed that the traditional lamps will still exist for some time.
2. **Phase out incandescent in 2020 Scenario**, Compared with the reference scenario, this scenario assumes that incandescent lamp will be mandated to phase out in 2020 in China, the alternative lamps are mainly CFLs.

So we have assumed two set of visions for future light source mixture in Table 2-3.

Table 2-3 The assumption of contribution rate to lumen demand by lamps in 2008-2020

Item		2008	2010		2020	
			Ref.	Phase out	Ref.	Phase out
High CRI	LED	0%	3%	<b>3%</b>	10%	<b>10%</b>
	Incandescent	50%	40%	<b>25%</b>	15%	<b>0%</b>
	CFL	40%	47%	<b>62%</b>	65%	<b>80%</b>
	T5	10%	10%	<b>10%</b>	10%	<b>10%</b>
Medium CRI	LED	0%	3%	<b>3%</b>	10%	<b>10%</b>
	Tube Florescent	62%	57%	<b>57%</b>	50%	<b>50%</b>
	Metal Haled	38%	40%	<b>40%</b>	40%	<b>40%</b>
Low CRI	LED	0%	3%	<b>3%</b>	10%	<b>10%</b>
	High Pressure Sodium	71%	72%	<b>72%</b>	70%	<b>70%</b>
	Mercury	29%	26%	<b>25%</b>	10%	<b>20%</b>

### 2.4 Electricity saving potential by phase out incandescent lamp

According to lumen demands and mixture of contribution rates of different lamps, we can calculate and forecast relevant electricity consumption for above two scenarios, In reference scenario, the result of electricity consumption of lighting in 2008 was 302.1 billion kilowatt-hours. The consumption of lighting in 2010 and 2020 are 355.2 and 391.0 billion

kilowatt-hours, along with an annual growth rate of 2.2% in 2008-2020. In phase out scenario, the consumption of lighting in 2010 and 2020 are 345.6 and 349.6 kilowatt-hours respectively, the annual growth rate from 2008 to 2020 is only at 1.2% which seem to be quite small. Table 2-4 shows the results of electricity saving potential of phasing out incandescent program from 2008 to 2020. The potential in 2010 and 2020 will be 9.6 Twh and 41.2 Twh respectively, The total energy saving rate by phase out incandescent program in 2020 is expected to reach at 11% comparing to the reference scenarios.

Table 2-4 The electricity saving potentials of program from 2008 to 2020 Unit: Twh

Year	2008	2009	2010	2015	2020
Phase out Incandescent v.s. .Ref	0.0	4.8	9.6	24.3	41.2

### 3、 Conclusions

1) The total demand of China's building lighting will increase from 17,347 trillion lumen hours in 2008 to 23,683 trillion lumen hours in 2010 and 29,861 trillion lumen hours in 2020. The lighting demand in 2020 will increase more than 70% over 2008. The annual growth rate of lighting demand will be about 4.6% averagely.

2) In reference scenarios, the electricity consumption of lighting in 2008 was 302.1 billion kilowatt-hours. The consumption of year 2010 and 2020 are 355.2 and 391.0 billion kilowatt-hours, with an annual growth rate of 2.2% in 2008-2020. In phase out seniors, the electricity consumption of 2010 and 2020 are 345.6 and 349.6 kilowatt-hours, the annual growth rate from 2008 to 2020 in phase out seniors is at 1.2%.

3) If China's Phase out Incandescent action completed before 2020, Comparing to the reference scenario, the annual electricity saving potential of 2010 and 2020 will be 9.6 and 41.2 Twh respectively. The electricity saving rate in 2020 can reach to 11%.

### References

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