Appliances Guide

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Energy efficient monitors

Country

China

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1 Subtypes and markets

The development of monitors goes hand in hand with that of computer technologies. As the most important output device of computer, the monitor is one of the biggest energy consumption components of computer.

Technical types

There are two main kinds of monitors: cathode ray tube (CRT) and liquid crystal display (LCD) monitors. According to the market research of Top10, CRT monitors have disappeared and LCD monitors are the mainstream in recent years. Still, these two kinds of monitors are both included in China energy efficiency standard of monitor <GB 21520 Minimum allowable values of energy efficiency and energy efficiency grades for computer monitors>. Energy efficiency requirements are set separately for CRT and LCD monitors.

For LCD monitors, there are two kinds of back lighting technologies: Cold-Cathode Compact Fluorescent Lighting (CCFL) and light emitting diode (LED). Due to developments in technology and manufacturing, the cost of LED monitors is decreasing significantly while their market share keeps increasing in last years. In 2013, the market share of LED monitors covers even more than 80%, accounting for the majority of production.

Size distribution

Top10 collected information about 700 products of monitors on the Chinese market in December 2013, whose screen size ranges between 15 and 82 inch. The screen size distribution is show in figure 1. About 59% of the monitors' screen size ranges between 20 and 30 inch and 29% of the monitors' size are smaller than 20 inch. Furthermore, about 10 % of the products are bigger than 30 inch and are usually used in commercial or hospitality occasions.

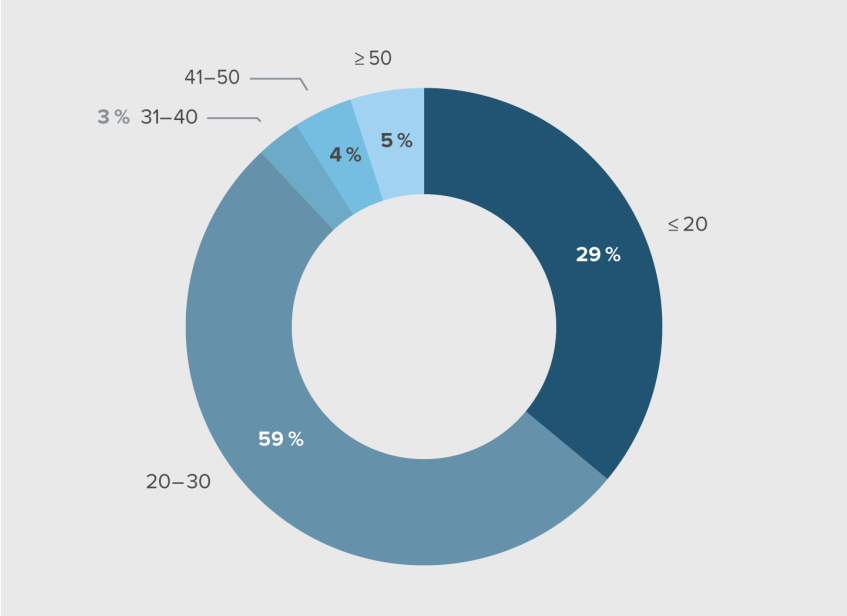

Figure 1: Monitor size distribution

According to the investigation of electronic equipment and household appliance using habits in China, conducted by the Collaborative Labelling and Appliance Standard Program (CLASP) in 2014, the average daily using time of computers is 3.2 hours. The study included 140 desktops and 106 laptops. About 54% of the families use the sleep-mode, and the average daily sleeping time is about 1.1 hours. About 55% of the users cut off the power after using[1].

Current numbers for stock and market volumes

It is estimated that about 120 million monitors were produced in China in 2011, decreasing about 51% compared with 2010. The domestic sale of monitor in 2011 is about 36 million, which reduced about 9.6% compared with 2010. The market population of monitors accounted for 147 million in 2011, which increased about 10% compared with 2010[2].

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	16 inch	22 inch			
Category	LCD	**LCD**	**LCD**	**LCD**	**LCD**
Type	CCFL	LED	LED	LED	LED
Lifetime (years)	5	10	10	10	10
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 ***(electricity): kWh***	84	63	60	63	
If applicable: yearly energy consumption for further energy carriers (which one?)	No	No	No	No	
If applicable: yearly water consumption	No	No	No	No	No
Purchase cost in (currency) RMB	729	839	810	839	
Operation & Maintenance cost	36 RMB	42 RMB	41 RMB	42 RMB	No information
Labelling class (for the aforementioned labels)	2	1	1	1	1

3 Performance and information requirements

Mandatory requirements

The energy efficiency standard defines energy efficiency (EEF) and off-mode power as the parameters to measure the energy efficiency tiers of monitors. The EEF is calculated by the following formula:

EEF= *(luminance*screen size)/ power consumed by the unit*

<GB 21250-2008> defines three tiers to describe the energy efficiency performance of monitors. Grade 1 is the most energy efficient, while Grade 3 requires only minimum energy performance (MEP). The MEPR threshold has changed to grade 2 requirements since November 2011. The energy efficiency requirement is shown in table 1.

Table 1: Energy efficiency requirement of monitor in <GB 21250-2008>

	Energy efficiency tiers					
	Tier 1		**Tier 2**		**Tier 3**	
Types	EEF (cd/W)	Standby (W)	EEF (cd/W)	Standby (W)	EEF (cd/W)	Standby (W)
CRT	0.18	1	0.16	3	0.14	5
LCD	1.05	0.5	0.85	1	0.60	2

The revision of <GB 21250-2008> has been launched by the China National Institute of Standardization (CNIS). The draft for comments has been published in December 2013. The requirements for CRT monitors have been removed from the new draft, which follows market development trends. A new monitor type named enhanced-performance display is introduced and given separate energy efficiency requirements. The enhanced-performance display meets the following criteria: horizontal viewing angle is wider than 85 degree (at the contrast ratio of 60:1); resolution is higher than 2.3 mega pixels and the colour space is larger than 110% colour space of sRGB. Table 2 shows the new requirements in the draft which includes the requirement for enhanced-performance displays [4].

Table 2: New energy efficiency requirement of monitor

Monitor types		Energy efficiency tiers								
		Tier 1			Tier 2			Tier 3		
		EEF (cd/W)	Off-mode power(W)	Sleep-mode power(W)	EEF (cd/W)	Off-mode power(W)	Sleep-mode power(W)	EEF (cd/W)	Off-mode power(W)	Sleep-mode power(W)
Ordinary		2.0	0.50	0.50	1.5	0.50	0.50	1.0	0.50	0.50
Enhanced-performance	<27	1.5			1.1			0.7		
	≥27	1.0			0.8			0.6		

Minimum Energy Performance Standards (MEPS)

<GB21250-2008> sets energy efficiency grade 3 as the threshold of MEPS from 2008-2011. The threshold has been boosted to grade 2 from November 2011. Consequently, only grade 1 and grade 2 products are allowed on the market since 2012. Figure 2 shows the current tiers distribution on the monitor market.

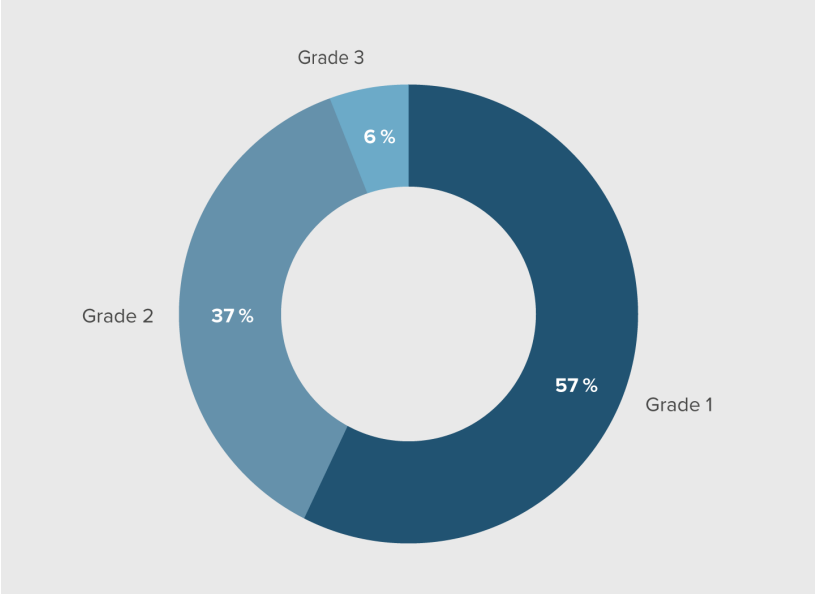

Figure 2: Tiers distribution of monitor

Although the EES has kicked off grade 3 monitors from the market, there are still 6% of grade 3 monitors. There are three reasons for this phenomenon: (1) <GB 21250-2008> only set the threshold changing and the starting time, but did not set aclause of the time when grade 3 monitors should disappear from the market; (2) Manufacturers do not care or are not fully informed about the EES changes; (3) The market supervision is not sufficient so consumers can buy a grade 3 monitor which actually should be eliminated from market.

Normally, the market share of grade 1 should not be bigger than 25%. Figure 3 shows that 57% of the monitors on the market are grade 1, and grade 2 monitors have 37% market share, respectively. The current energy efficiency classification scheme for monitor is far below the market development for consumers and manufacturers. That is one of the biggest reasons of revising the standard.

Mandatory comparative labelling

China has started the mandatory labelling scheme for monitor in 2009, which is based on <GB 21250-2008>. Monitors on the market must bear energy efficiency labels. Figure 3 shows the energy label sample of monitor, which includes the information of energy efficiency grades, EEF, off-mode power consumption, manufacturer and model of the product. However, this label does not provide the daily or annual electricity consumption, which can be easily understood by most consumers. Most of them do not have technical background to fully understand the technical terms such as EEF and calculate energy saving benefits brought by high efficient monitors. Although the threshold of MEPS has been upgraded to the grade 2 since November 2011, there is no change of the label, which means grade 3 products should have been kicked out of the market, but there is still grade 3 showed in the label. That might mislead consumers.

EES and energy label play an important role in promoting energy efficient products. The new draft considers the following items: (1) boosting the energy efficiency grades requirement according to the market situation (the new standard should make every grade reasonable market share). (2) Improving the threshold of MEPS. It still sets 3 grades. (3) Including the estimated daily or annually electricity consumption and stand-by mode power on the energy label.

Figure 3: Energy efficiency label sample of monitor

Voluntary requirements

China has started the voluntary certification of monitor in 2003, which is managed by the China Quality Certification Centre (CQC) now. The technical requirement of the monitor energy conservation certification was released in November 2003, <Technical specifications for energy conservation product certification for monitors> [5]. The scope of the energy conservation monitors includes CRT and LCD. The specification defines the evaluating values of energy conservation which means the maximum allowable energy consumption of the monitor on off-mode and sleep-mode. It also defines the default time to sleep mode which means the time monitor turns into sleep-mode automatically.

To satisfy the energy conservation requirement, the off-mode energy consumption should not be bigger than 2W, the sleep-mode energy consumption should not be bigger than 4W, and default time to sleep mode should be no longer than 15 minutes. The following figure is the energy conservation certification sample of monitor. This label only indicates that the certified products have better energy performance than average, but it shows no detailed performance information of the products.

Since <GB 21250 – 2008> was put into force, monitors meeting the requirements of grade 2 and 1 are qualified for energy conservation certificates. As indicated above, now almost all the products on market are grade 1 and 2, which means the certification scheme should be revised. As the label has no further information, consumers might be misled by the label.

Figure 4: Energy conservation certification sample

4 Test procedures and standards

Chinese government released the energy efficiency standard (EES) of monitor <Minimum allowable values of energy efficiency and energy efficiency grades for computer monitors> in 2008, named <GB21250-2008>, [3] which includes the energy efficiency requirement but also the test method of monitors. The test method defines the method for measuring screen area, luminance, on mode power and off mode and standby power.

Luminance is measured at the centre point of a static white display (candela – cd).

On-mode power is the average power consumption during the luminance test in Watts (W).

(Off-mode) Standby power is the average power consumption in Watts (W) of the monitor when connected to the power source but with the power switch on and the monitor switched off.

5 References

[1] CLASP (2014): Investigation on consumers' recognition of energy label and household appliances using patterns.

[2] CNIS (2012): China National Institute of standardization: White paper for the energy efficiency status of China energy-use products.

[3] <GB21250-2008 Minimum allowable values of energy efficiency and energy efficiency grades for computer monitors>.

[4] The draft revision of <GB21250-2008>: Online:

http://www.energylabel.gov.cn/UserFiles/files/显示器能效限定值及能效等级%20 征求意见稿(1).pdf

[5] CNIS (2003): Technical specifications for energy conservation product certification for monitors.

[6] CNIS (2012): China National Institute of Standardization. Online: http://www.energylabel.gov.cn.

[7] ETAO (2015): Online: http://www.etao.com.