Appliances Guide
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Energy efficient Panel-TVs

Country

China

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1 Subtypes and markets

Typical size

The Top10 market research on Chinese TV market revealed in January 2014 that TVs with screen sizes between 30 and 60 inches account for 89% market share while other TV sizes comprise the remaining 11%. With rising living standards and changes in consumption patterns, there is evidence showing that Chinese families prefer increasingly larger TVs, which often offsets the improvements in energy efficiency.

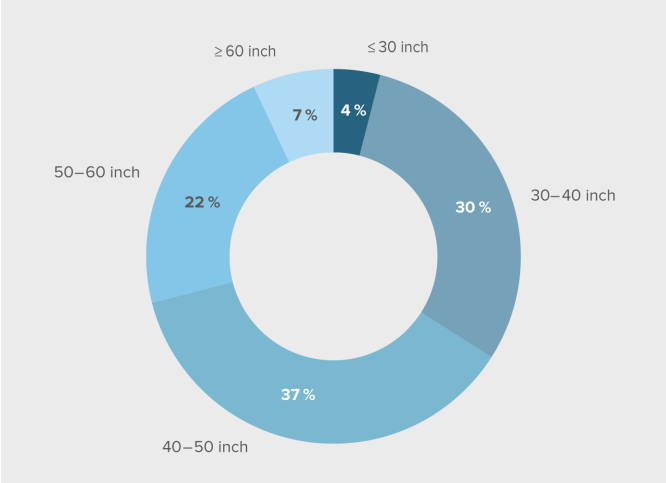


Figure 1: Size distribution of panel-TVs

Main technologies

There are two types of flat panel technologies on the TV market: PDP (plasma display panels) and LCD (liquid crystal displays).

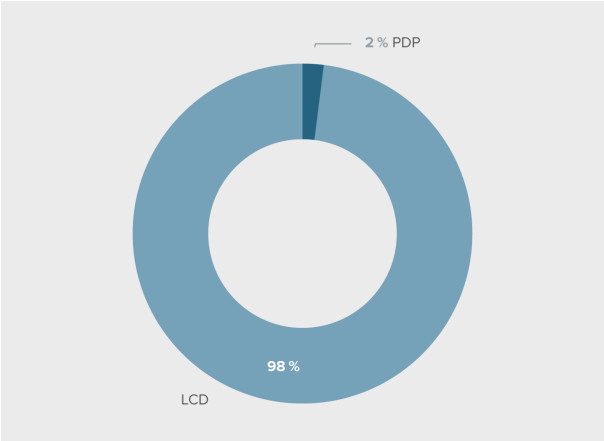


Figure 2: Market share of PDPs and LCDs

Although PDP TVs can still be found in the market, they make up a very small market share of 2%. LCD TVs have become the mainstream technology. LCD TVs are illuminated either by LEDs (light emitting diodes) or CCFL (cold cathode fluorescent lamps), depending on the different backlight technologies. Compared with CCFL technology, LED TVs are more energy efficient and safer.

Typical usage patterns and relevant parameters

According to a Chinese household appliances usage pattern investigation conducted by CLASP in 2014, the average Chinese household watches 4 hours of TV per day. The majority of 66% unplugs the power cable after watching, 25% of them never cut the power supply, and the rest cut it occasionally. About 82% of the consumers watch TV based on out-of box configuration, 16% adjust TV configuration such as brightness and contrast levels often, and the rest do the configuration occasionally. There is also a recognizable trend of young people turning away from traditional TVs in favour of computers for watching video contents online. Consequently, older people are the main users of TVs in China. The average computer usage time is 3.2 hours per day, which corresponds to the average TV watching time.

Current numbers for stock and market volumes

According to People's Daily Online (2013), the sales number of TVs in China was reported to be around 43 million units in 2012, showing an increase of 1.8% compared to 2011. The 'per hundred households' penetration rate of panel-TVs in rural areas was about 115.5 units in 2011 and then increased to 116.9 units in 2012, while in urban areas the TV 'per hundred households' penetration rate was about 117.1 in 2011 and then increased to 118.3 in 2012[1]. Since 2012, the demand from rural areas is bigger than the demand from urban areas, with a rate of about 51:49. It is estimated that rural areas will become even more important markets for TV sales in the next few years.

It is estimated that 9 million families will be purchasing a TV for the first time from 2014 to 2019. Demand for second TVs is estimated at 12 million and the demand for the replacement of old TVs will be around

25 million in the same time period. Sales of LCD TVs will keep increasing (including 3D and smart TVs) and the sales of PDP TVs will continue to decrease dramatically [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	42 inch				
Category	**PDP**	**LCD**	**LCD**	**LCD**	**LCD**
Type	-	LED	LED	LED	LED
Lifetime (years)	9	9	9	9	9
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***	106	94	71	00	50
Purchase cost in (currency) RMB	2600	3000	3200	3100	5000
Operation & Maintenance cost	130	150	160	155	200
Labelling class (for the aforementioned labels)	3	2	1	2	1

3 Performance and information requirements

Mandatory requirements

<GB 24580> defines three energy efficiency levels for panel TVs based on EEI and passive standby mode power consumption, whereby standby consumption should be below 0.5W. Grade 1 is the most energy efficient and grade 3 is the minimum energy efficiency requirement for market access (MEPS). Table 2 shows the requirement changes of <GB 24580-2013> compared to <GB24580-2010>.

Table 1: EEI requirement changes of EES

Grade	EEI of LCDs		EEI of PDPs	
	GB 24580-2010	GB 24580-2013	GB 24580-2010	GB 24580-2013
1	1.4	2.7	1.2	2.0
2	1.0	2.0	1.0	1.6
3	0.6	1.3	0.6	1.2

According to the new and stricter energy efficiency requirements for panel-TVs in <GB 24580-2013>, the old <GB 24580-2010> grade 3 LCD panel-TVs as well as the old grade 2 and grade 3 PDP panel-TVs will be banned from the market. The project "Market Analysis of China Energy Efficient Products"（MACEEP）finished by Top10 in 2013, analyzed the panel-TV market in China. It concludes that in 2012 about 80.9% of LCD panel TVs on the market were grade 1, 14.7% grade 2 and 4.4% grade 3 (Grades according to the old <GB 24580-2010> revision). For PDP TVs, 71.6% of the products were grade 1, 25% grade 2 and 3.4% grade 3. Thus, about 28% of the PDP panel-TVs available on the market in 2012 were banned by the stricter requirements for market access as defined in the new <GB 24580-2013>.

The latest Top10 China market research in February 2014 shows that, based on the new <GB 24580-2013>, 46% of panel-TVs are grade 3, and grade 1 takes only 10% market share as shown in figure 5.

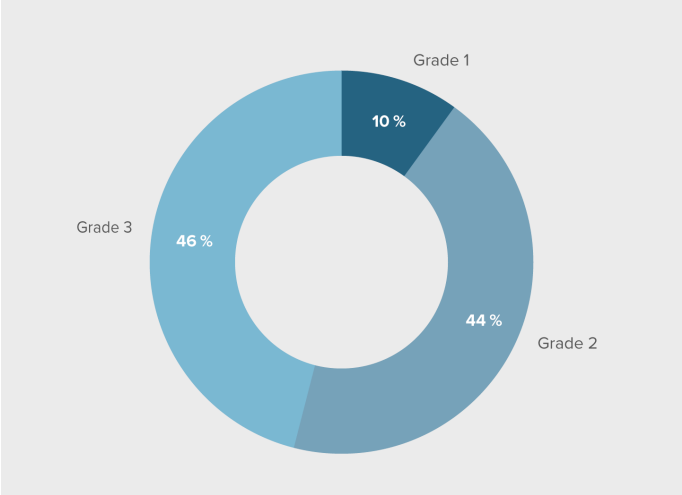
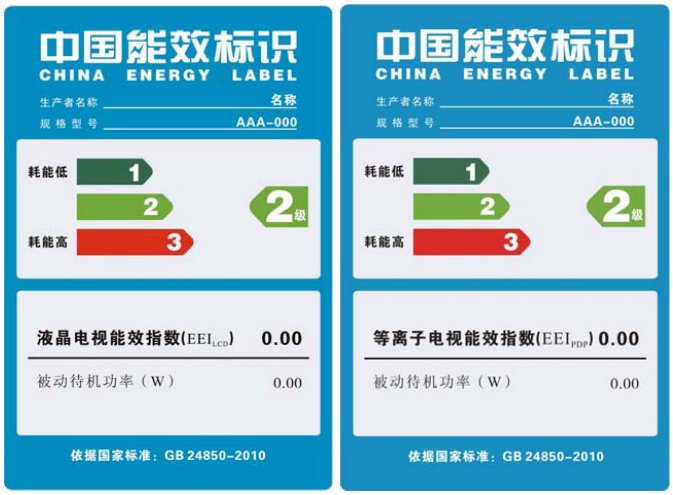


Figure 3: Grades distribution of panel-TVs, per <GB 24580-2013>

Mandatory labelling

The mandatory labelling for panel TVs started in China in 2010 and plays an important role for energy efficiency improvements. The Chinese energy label contains information on EEI and passive standby mode power consumption, which is a different approach compared to labels in other world regions, which commonly include the information related to on-mode energy consumption. As suggested in MACEEP (Market Analysis of China Energy Efficient Products), the Chinese label should also present the annual energy consumption or the on-mode power consumption, which are values much easier to understand for consumers.



Figures 4-5: The label sample of panel-TV

Voluntary requirements

Besides mandatory requirements, <GB 24580-2013> also defines voluntary requirements for energy efficient products. Panel-TVs above grade 2 with standby mode power consumption below 0.5W are eligible for the voluntary energy conservation label, after successful application to the China Qualification Centre (CQC). Figure 7 shows a sample of the energy conservation label.

Figure 6: Energy conservation label sample

4 Test procedures and standards

Applicable measurement standards

The Chinese government released the first energy efficiency standard for flat-panel TVs (GB24850-2010) in 2010. <GB 24850-2010> not only included energy efficiency requirements but also the respective applicable test methods [3]. <GB24850-2010> defined the energy efficiency index (EEI) as the parameter to measure the energy efficiency performance of TVs. EEI is calculated based on the on-mode power consumption and screen brightness [4]. The EEI calculation method is different for LCDs and PDPs.

Formula to calculate EEI for LCD TVs:

$$EEI_{LCD}=Eff/Eff_{LCD,ref}$$

Eff: Energy efficiency of panel TVs, cd/W.

$Eff_{LCD,ref}$: The reference base value of energy efficiency for LCD TVs, the value is 1.1.

Formula to calculate EEI for PDP TVs:

$$EEI_{PDP}=Eff/Eff_{PDP,ref}$$

Eff: Energy efficiency of panel TVs, cd/W.

$Eff_{PDP,ref}$: The reference base value of energy efficiency for PDP TVs. The value is 0.320 if the horizontal resolution is 1920 or higher and the vertical resolution is 1080 or higher. The value 0.45 applies for other situations.

The formula to calculate Eff for TVs is:

$$Eff=(L*S)/(P_K-P_S)$$

Eff: The energy efficiency of TVs, cd/W.

L: Average brightness of the screen, cd/m^2.

S: Screen size, m^2.

P_K: The on mode power consumption, W.

P_s: The power consumption to process signals, W. P_S has different values when the interface is different.

Eff is the ratio between brightness and on-mode power consumption. It is the basis for the EEI calculation. EEI is the ratio between Eff and the reference Eff. Reference Eff values are different for LCD and PDP TVs, which are shown in the formulas. Different reference values can result in unfair classifications for different technologies. PDPs consume significantly more energy, but they can achieve the same or even better EEI levels than LCDs. To allow for an appropriate performance classification, technological neutrality should be the principal of energy efficiency standards. However, this situation is different in other world regions like in the USA (Energy Star) and Europe (EU Ecodesign and Energy Label). In those two regions, the same methodology is used to measure the performance of all products.

In the 2010 version of the standard, the on-mode power consumption is only tested for dynamic signals. In October 2013, the new version of <GB 24850> (GB 24850-2013) was implemented. Compared to the old standard, the new version not only boosted the energy efficiency requirements significantly but it featured a new testing method. According to the new standard, the on-mode power consumption of panel-TVs is determined for static as well as dynamic signals, in order to reflect real-life operation more realistically.

For comparison, the Energy labeling in the EU also sets an EEI as the index to measure the energy efficiency level of the product, but the manufacturers have also to provide a value for the annual energy consumption. The calculation of EEI in Europe and the US differs from the method applied in China.

The following formulas show how the EEI is defined in the EU:

$$EI=P/P_{ref}$$

$$P_{ref}=P_{basic}+A*4.3224$$

(P_{basic} is the basic power which is determined by the hardware and the LNB (low noise block) of the TV.)

$$E_{annual}=1.46*P$$

The Energy Star in the USA takes maximum power uptake as the parameter to measure the energy efficiency performance of the TV, and gives out the maximum allowable power consumption based on different visible screen sizes. The following table shows the requirements of Energy Star [5].

Table 2: The maximum allowable power requirement of Energy Star

Visible size (A) square inch	**P_{max} in Watt**
A<275.0	(0.130*A)+5.0
275.0≤A≤1068.0	(0.084*A)+18.0
A>1068.0	108.0

Applicable test procedures

The current Chinese flat panel television test method was first introduced in December 2010 as part of <GB 24850-2010>. This standard requires TVs to be set to a standard viewing condition by adjusting brightness and contrast based on an eight-level grey pattern in a dark room. This pattern is an image consisting of different levels of brightness, with two rows of eight grey levels against a background of 50% grey level, as shown below.

Figure 7: Eight-level grey pattern used in Chinese TV test method

The first row consists of four levels: 0% (absolutely black), 5%, 10% and 15%. The second row contains 85%, 90%, 95%, and 100% (absolutely white). At first, brightness should be adjusted to the point when the two neighboring levels of 0% and 5% grey in the first row could be just differentiated by the test personnel. Then the contrast is adjusted from 100% to a lower level where the 95% and 100% levels in the second row could be just differentiated by the test personnel. Test personnel should repeat the adjustment procedure until both neighboring groups (0%-5% and 95%-100%) could be exactly distinguished at the same time. At that point, the brightness and contrast levels are deemed to have been set, and are used for the rest of the testing procedures. The test method also indicates, if such a condition cannot be achieved, the image has to be adjusted to the best quality possible while recording the brightness and contrast levels. However, there is no further description of how “best quality” is defined.

Once adjustment is complete, the luminance of the screen is calculated based on the average of nine values measured at points (P0 to P8) spaced across the screen, in a pattern dependent upon the screen size and shape. The IEC standard “test clip” is then played, and the power consumed by the television is measured during the broadcast. The energy efficiency of the television is calculated as the average measured luminance multiplied by screen size divided by total power consumed [6]. In the new 2013 version of <GB 24850>, nine-point layer and eight level grey images are combined into one integrated image.

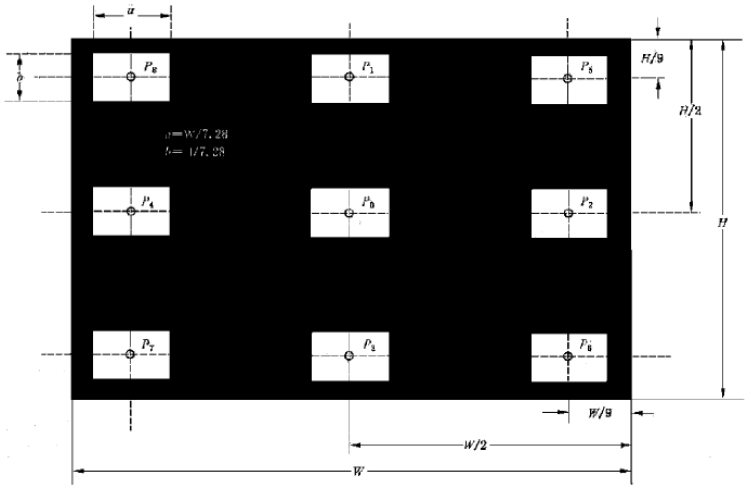


Figure 8: Nine-point layer used in Chinese TV test method in <GB 24850-2010>

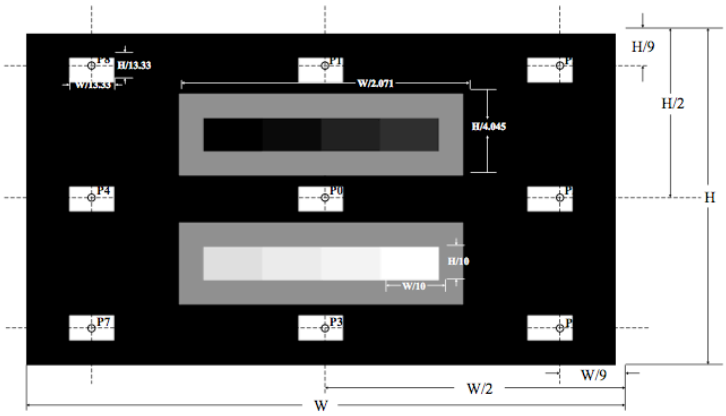


Figure 9: Integrated Nine-point layer and eight level grey image used in the 2013 revision of the Chinese TV test method

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Kommentar [1]: 2013 right? Text is in Chinese