LCD TVs get dimmer to lower backlight costs

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Historically, TVs have had brightness higher than 400 nits, as they are often placed in the center of a large, bright, room and viewed from large distances and viewing angles. In some cases, however it is placed in sunlight, close to a window. On the other hand, display brightness of less than 300 nits is typically sufficient for an IT device (such as a notebook PC or monitor), as they are generally viewed by a single user, straight on at a close distance. In addition, still pictures or content do not require as high a brightness to be seen, compared to motion pictures or video.

Recently, the requirements for display applications have become less differentiated, as IT and consumer devices have converged. As IT devices are increasingly used to show video content, they have adopted panels with higher brightness to ensure a quality viewing experience. Small-sized TVs (below 32-inches) using low-brightness panels are also becoming more popular with the increasing number of single households and the growing demand to add a second TV.

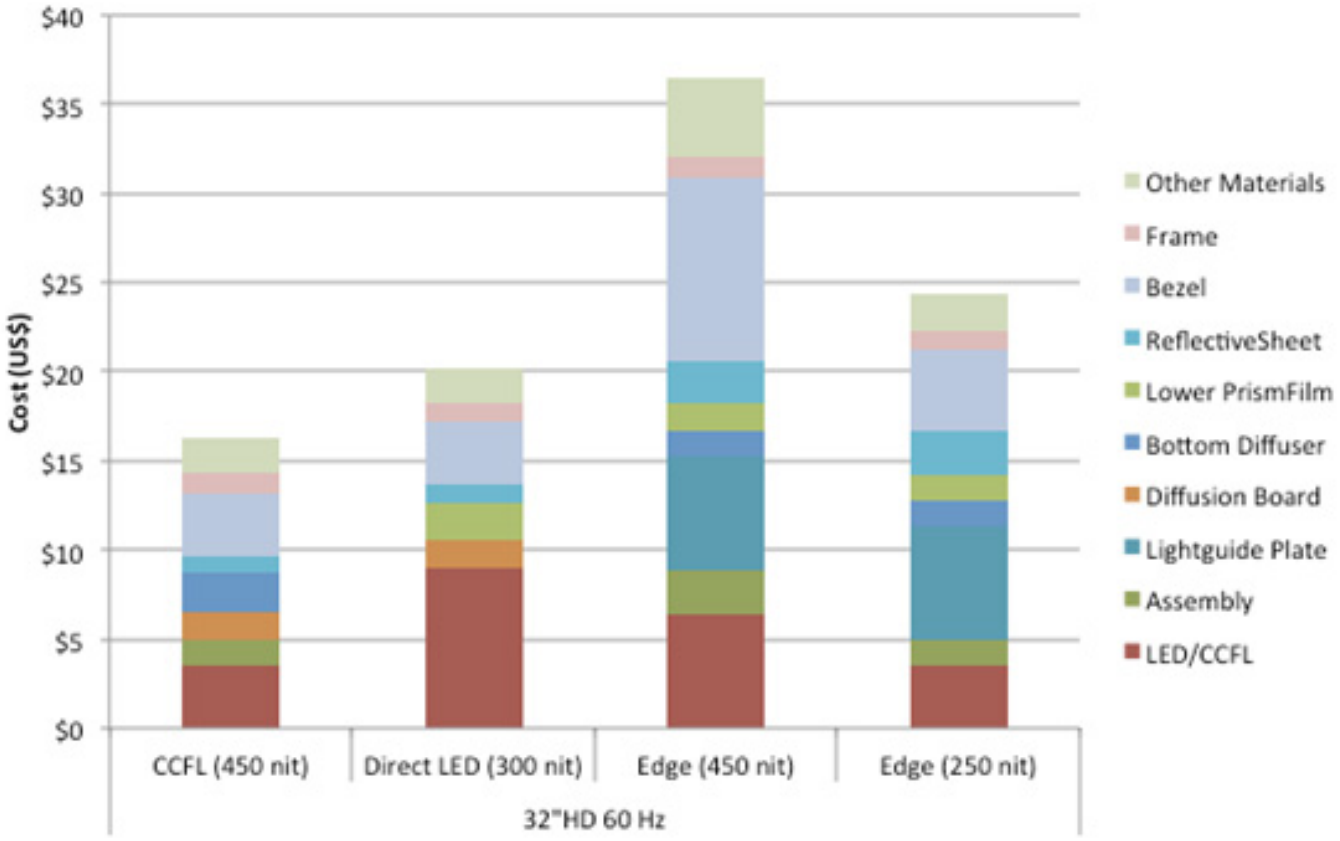
Up until 2011, most LCD panels used in low-brightness TVs were originally designed for desktop monitor applications, but recently low-brightness panels have also been used in small-sized TVs. At the same time, larger, primary flat panel TVs began to emerge featuring high-brightness performance. High brightness was particularly emphasized in the marketing of LCD TVs in competition with plasma TVs that had full-white brightness often less than 200 nits.

The first attempts to develop low-brightness TV models for the entry/mainstream large-size TV market were low-cost direct LED-backlit TVs, which were introduced in 2012. They traded off design and picture quality for lower cost, sacrificing thickness to save on the light guide plate (LGP) cost and brightness to save on LED cost. As a result, they reduced the cost gap between equivalent LED and CCFL backlights to less than 1.3X. These sets quickly created a new market segment; in Q2’12, low-cost direct LED-backlit TVs accounted for 10% of total LCD TV shipments. As a result, manufacturers concluded that high brightness was not a critical differentiator or strong value proposition for TV purchases.

Moreover, as LED penetration increases, the demand for low-brightness TVs has accelerated. As reported in the NPD DisplaySearch Quarterly LED & CCFL Backlight Cost Report, the cost of a 32”HD CCFL backlight is approximately $5 and $9 for an equivalent LED backlight. Given the cost structure of the two light sources, moving to low brightness results in greater cost reduction for an LED backlight than with an equivalent CCFL: if a manufacturer reduces light source components by 25% to implement a low-brightness display, they can save $2.3 on an LED backlight, but only $1.3 on a CCFL. To help gain a better understanding of the competitiveness of low-brightness backlighting, NPD DisplaySearch analyzed backlight costs (see figure below). The cost gap between CCFL and edge-lit LED backlights for 32”HD TVs with the same brightness is estimated to be 2.25X. Lowering the brightness to 250 nits

with the same edge backlighting structure decreases the cost gap to 1.5X, as the lower brightness models require fewer LEDs, reducing the cost of thermal management in the backlight. By using low-cost direct LED backlighting, in which fewer LEDs are used to illuminate the screen from behind, rather than from the side, the cost gap can be lowered further to 1.24X.
However, low-cost direct LED backlighting results in thicker sets and lower performance. Currently, edge backlighting is targeted at direct LED backlighting, while direct LED backlighting is successfully replacing CCFL backlighting.

Backlight cost changes by type and brightness



Source: NPD DisplaySearch

TV makers are planning to develop more low-brightness TV models. Thosewith a brightness of 400 nits, previously the typical brightness for LCD TVs, will only be found only in the high-end LCD TV segment after 2012. Most mainstream TV models are now designed with brightness of about 350 nits. Furthermore, the brightness of some entry models is expected to be 250 nits, in order to compete with low-cost backlit TVs at 300-350 nits.

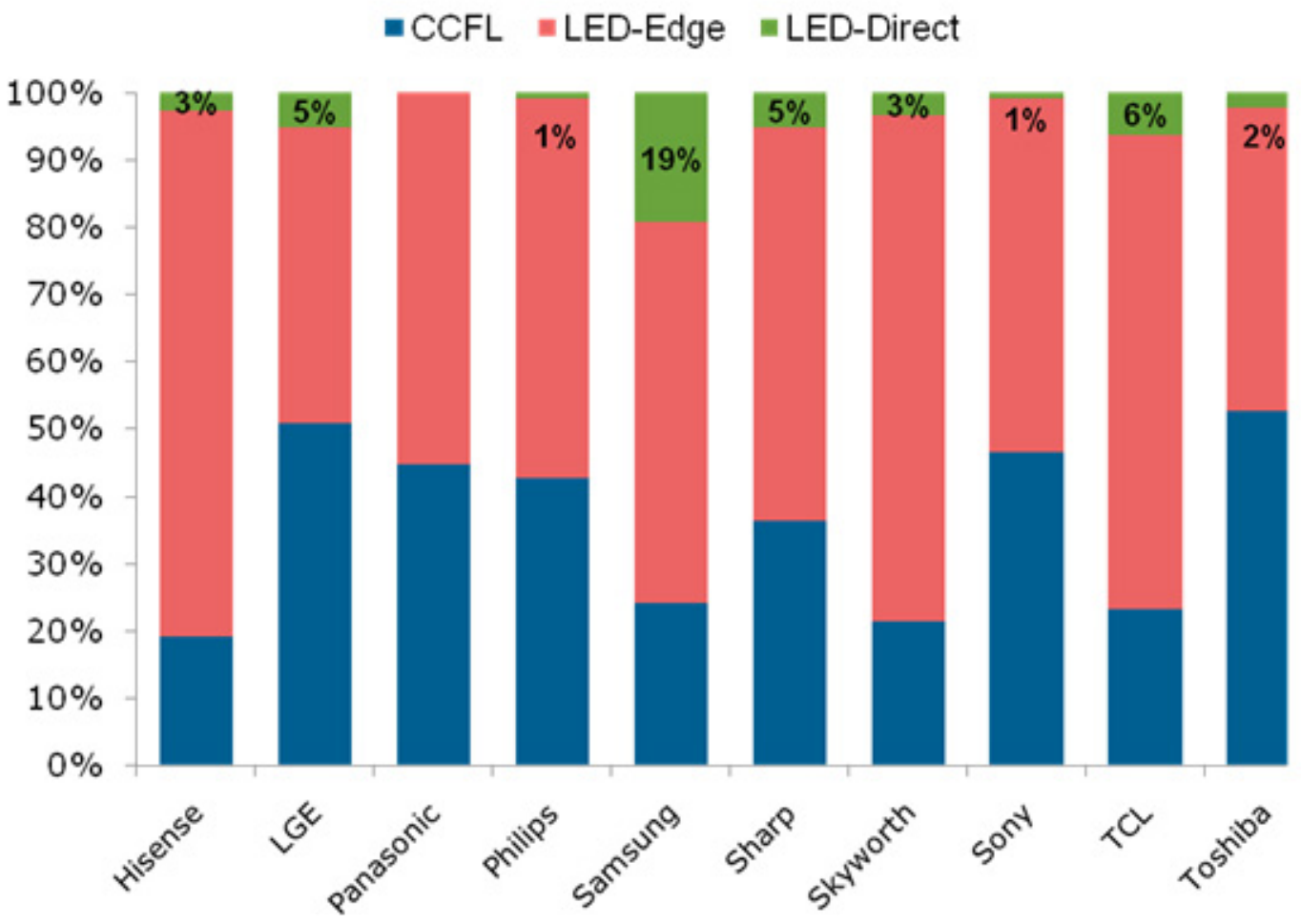
TV brightness by type and segment

BLU Type	Segment	2011	2012
Edge LED	High-end	400-450 nits	400 nits
Edge LED	Mainstream	400-450 nits	350 nits
Edge LED	Entry	400-450 nits	250 nits
Direct LED	Mainstream/Entry	-	300-350 nits

Source: NPD DisplaySearch

Samsung has moved most rapidly to develop direct-LED backlit TV models, as it used the approach in nearly a fifth of its LCD TVs shipped in the first half of 2012. An example is a mainstream 32-inch HD LCD TV set that uses 32 LEDs and is 3.75 inches thick. Rival LGE responded with a similar design using only 28 LEDs and slightly thinner at 3.4 inches.

Branded LCD TV shipments by backlight type, 1H 2012



Source: NPD DisplaySearch

In the long term, it is likely that LED costs will fall enough to enable edge-lit LED backlights to come down in price (especially at lower brightness) so that they remain the leading approach for LCD TVs.

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