

PDV *OBSERVATIONS*

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The Next TV Cycle

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Since HDTVs, there have not been any significant technological TV advancements that captured consumer interest. TV manufacturers had hoped that 3D TVs, which came to market in 2008, would spur demand. But that did not happen as consumers were put off by the expensive price tag, limited 3D content, and the uncomfortable glasses.

Brighter days may be on the way for TV manufacturers. At the 2012 Consumer Electronic Show (CES), a new category of televisions was introduced: 4K Ultra HDTV (4K or UHD TV).¹ While in their nascent stages, we expect 4K TVs to drive the next TV upgrade cycle.

Size; price; availability

The first waves of 4K TVs were very expensive and too big for the average living room. 4K TVs entered the U.S. consumer market in late 2012, with the first set being an 84-inch model from LG that went on sale in October 2012 with a list price of \$19,999.² A month later, Sony had an 84-inch model that went on sale with a list price of \$25,000.³ But the prices and size availability have changed over the past 15 months. According to a CNET article dated 10/1/2013, there were more than 20 models available for sale then, ranging from a 39-inch model for about \$500 to an 85-inch model for \$40,000.⁴ A recent check at the U.S. websites of LG, Samsung and Sony showed that these 3 major global brands all have smaller-size models (i.e. 55-inch) currently selling at substantially lower prices than before (e.g. about \$2,500 for a 55-inch model from Sony).

4K TVs are still much more expensive than HDTVs, but prices have been falling and will continue to do so. Per newscientist.com's article dated 1/13/14, Samsung's co-CEO Boo-Keun Yoon said that the price gap between full HD and UHD TVs will be less than 10% by the end of 2014.⁵ And according to NPD DisplaySearch, overall average prices for 4K TVs should be about \$2,000 in North America and \$1,100 worldwide in 2014.⁶

The estimated worldwide average price is dropping partly because 4K TVs from China are expected to constitute the majority of 4K TV shipments this year. According to Paul Gray, director of European TV research for NPD DisplaySearch, 4K TVs in China have "modest capabilities, start from smaller sizes, and are priced at relatively low premiums. By contrast 4K TV sets elsewhere in the world are very large, have relatively complex image processing, and have some degree of future-proofing."⁷

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4K content availability

In addition to price and viewing quality, the demand for 4K TVs also depends on the availability of interesting 4K content. Much of the current content is not in 4K resolution. While upscaling 1080p (Full HD) content on a 4K TV will improve the image quality somewhat, this improvement is most evident only within close proximity to the TV sets.⁸

4K content remains limited today because of the high cost of production and delivery. An expert panel at the 2014 CES noted that the hefty costs of post-production work for 4K content was an obstacle for the industry. According to Sony Pictures Technologies' Chris Cookson, who was one of the panelists, "producers are going to facilities with 4K projects and finding themselves charged two to three times the cost," though he also commented that progress was being made in cost reduction.⁹ For the broadcasters, Deloitte noted in a 2013 publication that the cost of creating a 4K channel, "factoring in upgrades to existing equipment and infrastructure, could be \$10 million to \$15 million," but the costs will decline in the future.¹⁰ On the streaming front, StreamingMediaBlog.com's Dan Rayburn noted that the content delivery pricing is not declining enough each year to offset the additional costs required by 4K content.¹¹

Despite the near-term challenges cited above, many content providers have been stepping up their effort in 4K production. For instance, ESPN indicated in June 2013 that it will continue to experiment with 4K production as it discontinues 3D production.¹² In December 2013, Amazon Studios announced that all of its comedies and drama series shot in 2014 will be done in 4K.¹³ Then at the 2014 CES, Amazon further announced that it is partnering with Samsung and top Hollywood studios like Warner Bros, Lionsgate, 20th Century Fox, and Discover to offer 4K content.¹⁴ Similarly, Netflix announced at the 2014 CES that all its original programs are being produced in 4K.¹⁵

Similar efforts are also coming from TV manufacturers. Sony has a 4K media player (compatible with Sony 4K TVs only) that comes pre-loaded with 50 videos and provides access to a library of over 100 titles that can be downloaded for rent or purchase. Samsung, on top of partnering with Amazon, Comcast, DirecTV, M-GO and Netflix to provide 4K videos streaming, is also going to release a UHD Video Pack that comes with 8 videos, with 50 additional titles available via download as they become available throughout 2014.¹⁶ In addition to partnering with Samsung on streaming videos, Comcast will also be launching new set-top boxes later in 2014 for providing 4K content to 4K TVs.¹⁷

Adoption

4K TVs, which have 4 times the resolution of 1080p HDTVs, should be very attractive to consumers because they have the potential to improve the viewing experience greatly. According to HDTVtest, which investigated the difference in image quality between a Samsung 4K TV and a Samsung 1080p HDTV (each was 55-inch, showing content that was 1:1 pixel-matched to its native screen resolution), the 4K TV "consistently presented more detail, particularly on faraway objects in a long shot" and that the difference was visible at the normal viewing distance (i.e. 9 feet).¹⁸ Since 4K TVs offer much better images and do not require special glasses, they should be a more natural upgrade compared to 3D TVs.

4K TV adoption appears to be accelerating. According to a press release from NPD DisplaySearch dated 3/18/14, there were 1.6 million units of 4K LCD TV shipped in 2013, with nearly 1 million units shipped in 2013 Q4 alone. While the shipment growth in 2013 was significantly driven

by China, shipments from the rest of the world more than doubled in 2013 Q4. The majority of 4K TVs shipped in China were 39-inch, 50-inch or 55-inch models. Outside China, 4K TVs shipped were more concentrated in the 55-inch and 65-inch models sold by Sony, Samsung and other global brands.¹⁹ In a press release dated 12/23/13, NPD DisplaySearch estimated that 4K TV shipments would be 12.7 million units for 2014, with China accounting for 78% of those units. The research firm also presented a chart showing that 4K LCD and OLED TV shipment in 2017 is expected to exceed 25 million units in China and 30 million units in countries outside of China.²⁰

Besides price and content, another factor that affects the adoption of 4K TV is the availability of faster connection speeds and more generous usage limits to access the bulkier 4K content. Fortunately, this issue is partially addressed by the emergence of video encoding technologies (i.e. HEVC and VP9), which are twice as efficient in compressing video data as the technology commonly used nowadays. This cuts the bandwidth requirement and makes the transmission of 4K content viable. Some 4K TVs being launched this year will have built-in HEVC decoding capability, while TVs supporting VP9 decoding is expected to hit the market by 2015.²¹ Of course, faster internet connection speed is still needed, as 4K content streaming will need about 12 to 20 Mbps.²² Interestingly, Netflix just recently agreed in a multi-year deal with Comcast to pay the broadband company for faster and more reliable delivery of Netflix content to its customers. This is a positive development for the future of streaming large video files.

Ultimately, the biggest deciding factor for the average consumer will be the price of 4K TVs. As prices drop, consumer interest will likely gain momentum. Recent survey results from Strategy Analytics show that 58% of U.S. respondents and 55% of European respondents said they would be very or somewhat likely to buy a 4K TV within the next 2 years, assuming the products meet performance and price expectations.²³ Furthermore, according to Gartner's Paul O' Donovan, the market has moved back to a classic replacement cycle where the average lifecycle for an HDTV is now 7 to 10 years.²⁴ According to a Forbes' article dated 2/12/13, Corning's CFO Jim Flaws indicated then that the industry had already sold 1 billion LCD TVs and many of those were at least 5 years old.²⁵ This suggests that 4K TVs might really take off in a few years as consumers begin replacing their existing LCD TVs.

An investment idea

What are some investments that might benefit from the expected 4K TV upgrade cycle? Companies that make LCD glass of course!

As the technology leader in the LCD glass substrates industry, Corning has been producing glass substrates that meet the evolving trends of display products. For instance, Corning's Lotus Glass, launched in 2011 and followed by a second-generation product in 2013, can withstand high temperatures used in the manufacturing process of high-performance displays, while providing the surface quality required for supporting displays that feature high resolution, fast response time, and bright picture quality. Lotus Glass was used in Sharp's 4K IGZO LCD monitors. In 2012, Corning introduced Willow Glass, which is an ultra-slim flexible glass that can help develop curved displays for more immersive viewing. In February 2013, James Clappin, President of Corning Glass Technologies, indicated that it would probably take at least 3 years for companies to start making flexible displays using Willow Glass.²⁶ At the 2014 CES both LG and Samsung showed off flexible 4K TVs, which can flex from flat to curved and revert back.

Since 4K TVs' superior viewing experience is better showcased in larger models (i.e. 65-in or larger), Corning can sell more glass through both increased unit sales and more glass content per unit. This in turn boosts demand for larger substrates, allowing Corning to achieve greater economies of scale and reducing the TV manufacturers' cost per square meter of glass. Any resulting downward pressure on prices will further stimulate demand for 4K TVs.

To get a sense of how much the continuing adoption of 4K TVs can benefit Corning, let's examine how Corning did during the most recent HDTV upgrade cycle. From 2004 to 2007, during which HDTVs entered the market and eventually gained widespread traction, the net income of Corning's Display Technologies segment (which produces LCD glass substrates) grew at a compounded annual growth rate of about 40%. While Corning also has other business segments, the company's Display Technologies segment is its most important.

The continued adoption of 4K TVs comes at an opportune time for Corning. Along with the likely increasing demand for its glass, Corning recently acquired low-cost global manufacturing capacity by purchasing the rest of its Korean joint venture with Samsung. The combination of these favorable demand and supply dynamics are likely to boost Corning's earnings significantly over the next few years.

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