

Electronic Appliances

HIGHLIGHTS

■ **PROCESS AND TECHNOLOGY STATUS** – This brief discusses the main consumer electronics in terms of ownership and total energy consumption at the global scale. The most significant technologies are Televisions (TVs) and Computers. These are both global commodities where ownership (and total energy consumption) has increased rapidly over the last ten years. TVs are responsible for between 6-8% of global residential electricity consumption. In the US, Australia, Europe and the Republic of Korea it is common for households to own more than one television. Historically most TVs were cathode ray tube (CRT) display screens, but in developed countries there has been a rapid replacement with liquid crystal displays (LCDs) and to a lesser extent plasma display panels (PDP). Developing countries still tend to have a larger share of CRT technologies. The main drivers in the television market have been demand for flat screen technologies and larger screen sizes, but there is also a transition to digital television and high resolution TV, also known as High Definition (HD) TV. In 2010, the worldwide Personal Computer (PC) market had sales of 320 million units and retail revenue was more than \$320 billion. The most recent available data indicates that ownership has reached 75% of US households, 85% in Japan, 57% in the EU, 80% in the Republic of Korea and 73% in Australia. In 2008 worldwide sales of desktop computers were ~138 million and laptop computers were ~126 million, but in 2009 the sales of laptop computers topped desktop computer sales due to the success of netbook PCs.

■ **PERFORMANCE AND COSTS** – In 2010, the average global energy consumption in Watts (W) for TV displays were estimated at Organic Light Emitting Diode (OLED) – 11 W; CRT – 55 W; LCD with light emitting diodes (LED) – 67 W; LCD with cold cathode fluorescent lamps (CCFL) – 72 W; and PDP – 120 W. However, these global averages do hide some of the within technology best and worst performers. Forecasts suggest that by 2014, a 40 inch OLED TV will be ~€1,050 compared to <€375 for a LCD TV. Most consumers will not buy OLEDs until they become more price-competitive, which is expected to take more than 3 years. The initial low competitiveness means that more 40-55 inch models will be released on the market compared to 30-39 inch models. There is also a price premium for increasing screen size. Whilst the price of a larger screen is generally higher for the same technology, there has been a decrease in the retail price for flat screen LCD and PDP technologies overall which is driving the market transition. PCs and laptop computers are covered by the International ENERGY STAR agreement between the EU and USA which is also adopted by many other countries including Japan. The average energy consumption in Australia has been estimated at ~121 kWh/yr for a desktop computer and ~44.4 kWh/yr for a laptop computer. In the US, energy consumption was estimated at 500 kWh/yr for a desktop computer, 28 kWh/yr for a laptop computer, 84 kWh/yr for a LCD monitor and 200 kWh/yr for a CRT monitor. Desktop computer and laptop computer prices vary depending on the specifications. It is very difficult to make any relevant price comparisons without some indication of the technology specifications. In 2005, desktop computers were on average €520 and €620 for commercial and domestic sectors, respectively [18]. The average US price for a commercial desktop computer in 2009, was very similar to the EU average at €557. The price of desktop computers has been decreasing since 2000. In the UK in 2012, desktop computers were available on the market at prices as low as €184. In 2005, laptop computers were on average more expensive than desktop computers at €990 and €1240 for commercial and domestic sectors, respectively.

■ **POTENTIAL AND BARRIERS** – New emerging TV technologies, such as OLEDs and LCD LEDs, have the potential to reduce energy consumption from TVs. The main barriers to reducing total global energy consumption from TVs include the price of these more efficient TVs; the increases in TV ownership, the number secondary and tertiary TVs and screen sizes – as energy consumption is proportional to screen area. The growth in screen size is a global issue. In 2010, the global shipment display area was 79 million m² forecast to increase to 104 million m² by 2014. The rapid turnover and demand for increased performance means computers are constantly evolving. Therefore, there is potential for tighter energy performance standards to be developed and saturate the stock in a short space of time. For desktop computers, there is also potential for upgrading components, such as hard disk drives, graphics cards and other parts. However, the development window is much shorter giving less time for impact assessments.

PROCESS AND TECHNOLOGY STATUS

Between 1990 and 2009, the world's total final energy consumption increased by 31 % [7]. Consumer Electronics and Information and Communication Technologies (CE/ICT) are among the fastest growing electricity end-uses in the residential and service sector. This rapid growth means there has been a greater

focus on energy efficiency in recent years. The world's ICT market has a particularly high economic value and reached an estimated €2,000 billion in 2008. The European and North American markets both make sizable contributions to the world ICT market and annual market growth was around 4% in 2007 for both the EU and World markets [3]. According to the