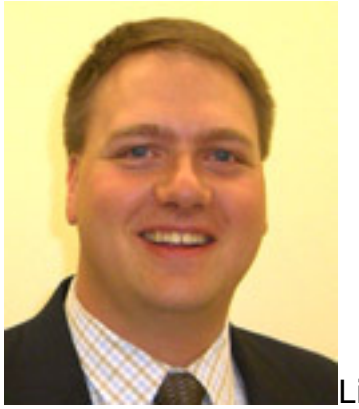
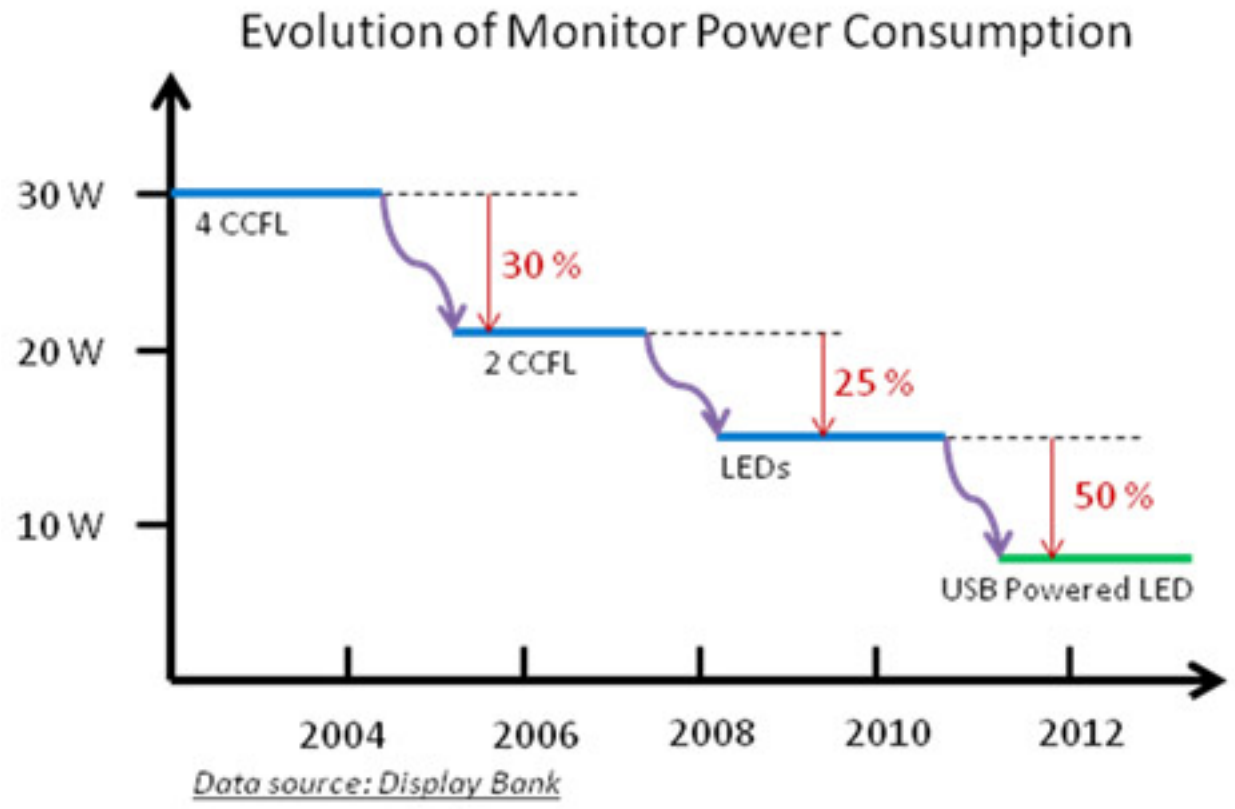
LEDs Enable Fresh Designs of Low-power Displays

Shannon Siefken and Dave Lamb, Optical Systems Division, 3M Company



Light Emitting Diodes (LEDs) are becoming the light source of choice for Liquid Crystal Display (LCD) illumination. LEDs were first adopted in mobile devices where the benefits of reduced power circuitry (elimination of high voltage AC required by fluorescent lamps) and increased efficiency could be transferred into more portable devices with longer battery running times. LEDs have been migrating into what are typically considered “fixed” LCD-based devices such as desktop monitors and televisions since the end of 2009.

LEDs enabled ultra-thin monitor and TV designs that had a differentiated form factor compared to lamp-illuminated displays. Now LEDs have surpassed fluorescent lamps in their efficacy, and more light can be delivered for an equivalent amount of power. This efficiency benefit is particularly timely as televisions are recognized for consuming more and more of the household power budgets around the world. Consumers are purchasing more TVs and bigger TVs, and they are using them longer due to added functionality (particularly internet connected and smart TVs). 2011 will see the implementation of mandatory consumer labeling for television power consumption in China, European Union, and United States. Consumer awareness of device power consumption combined with the efficiency benefits of LEDs ensures that LEDs will steadily continue to penetrate the “fixed” display market.



At 3M, we are developing ultra low-power prototype displays that can change the way consumers use their devices. These devices are important not only in themselves, but because of what they signify for other design changes. If a display can be run off the DC power from USB ports, then it no longer requires the bulky AC adapter of a conventional display. And if you remove the AC adapter, how does that influence the thickness of the display? And if a device is reduced in thickness, what does that mean for the materials that are needed to fabricate it, and the shapes that can be made from those materials.

Our group has also created a prototype LED backlight that eliminates 90 percent of the plastic in the backlight. Based on an entirely new film, the backlight allows superior light mixing within a hollow light guide. This leads to a significant reduction in materials and maintains uniform illumination even as the number of LEDs is reduced.

3M's goal is to create design innovations that deliver efficiency optimization without compromising performance. This "design provocation" can be used by the industry to recognize new possibilities and market opportunities.

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