

Innovations in Lighting May Be on the Horizon

BY MARTHA CARNEY AND BRIAN SLOBODA

The Edison bulb, still a cherished light source, especially for the home, may finally be entering its twilight years after well over a century of dominating the lighting market. The drive for efficiency is pushing major changes in the world of lighting.

Compact fluorescent lighting (CFLs) boasts four times the efficiency of the Edison bulb and has made a splash over the past few years. But even though quality, reliability, and the versatility of CFLs continues to rise, consumer acceptance has been slow. Many peoples' opinions were formed by their reaction to the early CFL lamps, which were known for their poor light quality and unreliable performance.

There is a new lighting product that is starting to make gains and may one day overtake CFLs and other types of lights in many applications. Light emitting diodes, or LEDs, are being hailed as the next great innovation in lighting, promising long life, great light quality, and super efficiency. However, the ultimate promise of the LED technology is not yet reflected in the current reality.

The Arlington, VA-based Cooperative Research Network (CRN) has partnered with several electric cooperatives throughout the United States to test a variety of LED lamps as an alternative to conventional lighting or CFLs. CRN and many electric co-ops are cautiously optimistic about LED technology because of the following benefits it can offer to consumers:

- LEDs could last longer, perhaps for decades
- The energy used by LEDs could be substantially less than that of CFLs or other fluorescents
- The lamps have no mercury content, so they are more environmentally friendly

- The products are rugged and more resistant to breakage
- LEDs perform well in cold climates, especially outdoor applications
- LEDs can be dimmed and produce a more pleasing light

As promising as the technology appears, the path to seeing store shelves stocked with reliable and economical LEDs is a long and rocky one. Obstacles such as limited light output and high initial prices are among the major barriers to widespread use of LEDs. In the current economy, consumers will not purchase LED lighting until manufacturers bring down costs significantly.

The Cost of an LED

The perception of LEDs is that they are expensive. Indeed, an upfront investment in an LED fixture today is far greater than for an incandescent bulb—sometimes as much as 100 times as expensive, compared to an Edison light 100-watt bulb priced at \$1. However, the cost of running the light encompasses the total cost of ownership over its lifetime. This includes the energy cost to run the light and the cost of replacement.

When LEDs are perfected, it should take about 50 incandescent bulbs, or 8–10 CFLs, to equal the life of one LED lamp. LEDs also are expected to be about 20 times more efficient than an incandescent bulb.

So when you compare the lifecycle cost of a light source, the question is: what would you rather pay—\$550 to use an incandescent bulb, or \$154 to use an LED?

Useful Life	Incandescent Bulb	LED Lamp
	50,000 hours—requires 50 replacements	50,000 hours—requires no replacement
Wattage	100 watts	10 watts
Cost of bulb/lamp	\$1	\$100*
Energy costs to operate	\$500	\$54
Total cost of ownership	\$550	\$154

Estimated cost of high-end LED lamp. Even at this exaggerated cost, the lifetime savings of the LED may make sense for some consumers.

Good-bye Filament... Hello Semi-conductor Chip

The Edison light bulb creates light by heating a filament—an inefficient process that actually produces more heat than light and explains why an incandescent light bulb is hot to the touch.

The LED, on the other hand, creates light through a semi-conductor chip mounted on an electronic circuit board. When energy passes through the chip, it creates bright light and almost no heat on the surface of bulb itself. Heat is dissipated out of the back of the lamp.

LEDs are not entirely new. In fact, they are the familiar red or blue indicator lights on electronics, such as stereos, personal computers, traffic lights, and Christmas lights. Over the last two years, there have been technological strides in the development of white, high-brightness LEDs. This opens opportunities for much broader lighting applications within our homes and offices and for outdoor street lighting. Several electric co-ops are working with CRN to test LED lamps in parking lots, roadways, farms, and schools. The results from these tests will give co-ops a voice with manufacturers in creating new LED lamps that will be less expensive, last longer, and benefit consumers.

Buyer Beware – A Strong Word of Caution

The message of “buyer beware” is crucial when speaking of LED lamps. Poor-quality LED products are flooding the marketplace and are purchased easily on several well-known web

sites and through big box retailers. Many products that promise to be “good for the planet” are not as environmentally friendly as they claim. Several of these products are manufactured outside of the United States, with components that produce low light levels, don’t stand up under long service life, or make exaggerated energy saving claims.

Two key positive indicators are price and the presence of an SSL Quality Advocate label. With LED lamps, you get what you pay for. A product that costs \$15 is likely to provide less light and have a shorter life than one that costs \$50. Even high-quality LED lamps are in a relatively early stage of development and few have undergone rigorous testing in real-life settings.

The Department of Energy (DOE) is an advocate for quality and is in the process of establishing Energy Star standards around LEDs. Until this happens, DOE is encouraging consumers to become educated before making an investment in LEDs. In fact, DOE actually asks that consumers look for the SSL Quality Advocate label, which is similar to the one used by the FDA for food labeling.

SSL Quality Advocate Label

Consumers should look for this label, which displays several important LED product features, such as light color and energy consumption. However, most consumers will need to go to the web site listed on the label to really understand what these terms and numbers mean. And the presence of the label is not a guarantee that the product is of high quality. It simply indicates that it might be better than one without the label.

LED lighting holds a great deal of promise. However, the gap between promise and the delivery of products that consumers want is wide. Most ready-for-prime-time LED products are in a few niche applications, such as task and display case lighting. General illumination lights are, for the most part, still a work in progress. It is advisable to do a little homework before purchasing LED lights today.

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