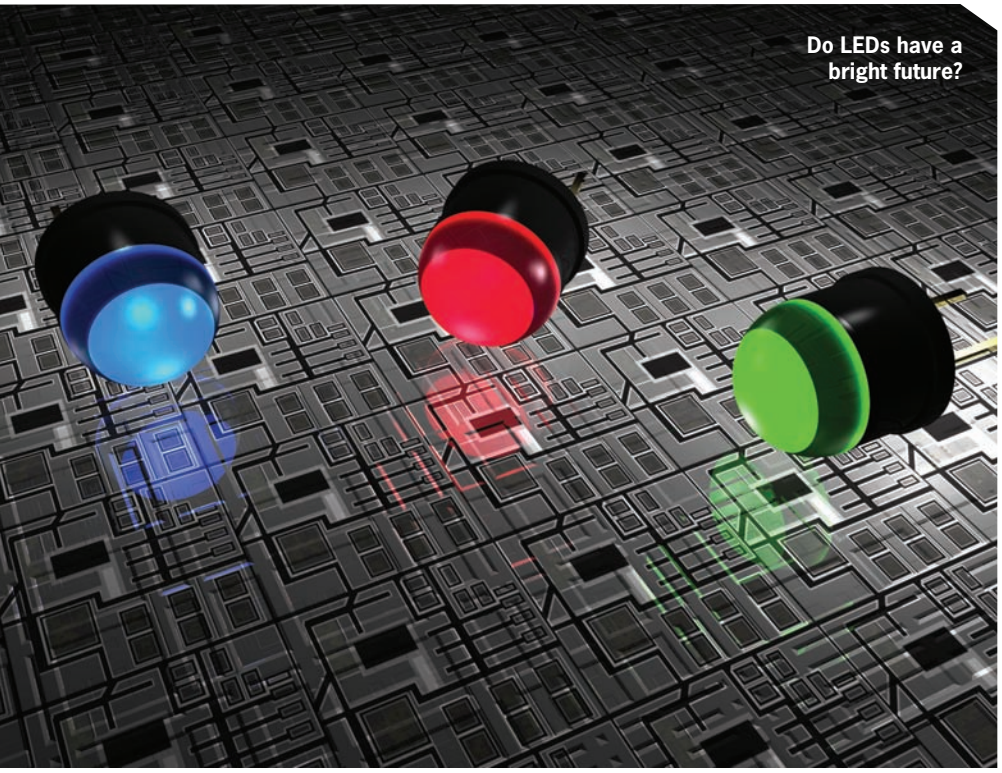

Do LEDs have a bright future?

The LED reality

Everyone is excited about light-emitting diodes—but how much effort and attention should really be devoted to them? **by Jerry Yudelson**

NAED's Education & Research Foundation's Channel Advantage Partnership (CAP) commissioned and funded a series of columns researching opportunities in green building and energy conservation markets. This article is the fourth in a 12-part series that will include specific technologies in the renewable energy and energy-efficiency field, new developments in lighting and onsite power generation, and how daylighting and other building control systems are gaining ground. Parts one through three can be found at tedmag.com.

From fantastic walls of programmable LEDs in the Bejing Olympic's opening ceremonies to the red Herman Miller "Leaf" lamp on my desk, it appears there's a LED light for every purpose. Of course, appearances can be deceiving—LED technology still has a long way to go to replace incandescents and CFLs as the lighting system of choice. That said, they do, of course, have advantages—including:

- Because LEDs rely on computer chips, there is the potential for long-term cost reduction and performance enhancements.
- Because they draw fewer watts per lumen of output than CFLs, LEDs have to be considered part of the long-term energy conservation equation.
- Because they won't add to the air-conditioning load, over time, LEDs can be used in existing buildings as replacement lighting. They are also likely to replace fluorescents in cold cases.
- With their long expected life, LEDs offer lower cost of ownership, as less labor is needed for lamp replacement.
- As computer chips, LEDs are much easier to control and more amenable to integrate with other electronic controls, such as daylight dimming.

On the other hand, there are features of LEDs that make them problematic from a distributor's standpoint; here are some examples:

- Are LEDs lamps or systems? This debate makes it difficult to know whether to plan to stock shelves with a box or a group of parts.
- The rapid pace of technology innovation makes it difficult to know which products to go with. For example, during a typical large commercial design project, what gets specified by an engineer or lighting designer might not even be on the market by the time the electrical contractor goes to install it.
- Answers to the questions of quality, durability, and reliability require stringent testing protocols not yet in place. Lighting designers are reacting more slowly because the lack of good product information makes it harder to specify a light fixture that might not work as intended, especially since light output declines over time (one source claims about a 50% degradation by the 50,000-hour mark).
- It's hard to know how long the lights will actually last, since 50,000 hours is the equivalent of about 12 years of 12-hour days—and nothing's been in place that long.

MARKET ENTRY POINTS

In studies of how new technology gets into the marketplace, relative economic

NEXT MONTH'S COLUMN WILL FOCUS ON DAYLIGHTING AND LIGHTING CONTROLS. FIND OUT MORE ABOUT NAED'S CAP AT NAED.ORG.

advantage trumps every other factor. And in the electrical industry, first-cost considerations tend to dominate (vs. life-cycle cost), especially when it comes to new technology. As a result, LEDs will certainly enter the value chain through specialty applications such as refrigeration, outdoor signage, OEM products, etc. Those who serve these markets might want to start paying closer attention.

Jim Crockett, editor of three industry trade magazines that focus on architectural products and lighting, sees LEDs first coming into specialized uses in buildings such as façades and task lighting. He also sees building owners with long-term perspectives such as universities and municipal government as being early adopters, since they understand total cost of ownership better than the private building owner and have more sophisticated facilities departments than, say, K-12 schools.

The lighting industry is paying special attention to the growth of LED usage, making the Illuminating Engineering Society (IES) of North America the obvious place to start (iesna.org). In the search for more information, together with the U.S. Department of Energy, the IES is producing a "Design Guide: Lighting Design with LEDs," which should be available within three to six months.

In addition, the federal government is hard at work at applying Energy Star ratings to LED fixtures so they can be rated and assessed just like other appliances; expect some rated fixtures to be introduced before the end of this year. And of course, *TED* magazine will continue to cover this topic as it gains in importance. ■

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OLDER BUILDINGS, ANCIENT LIGHTING

What does it take for a building's lighting system to be declared "ancient"—and totally energy inefficient? How about the documented fact that the building was built in 1979 or before, and that its lighting system hasn't had a significant lighting upgrade?

Those facts emerge from the *2003 Commercial Building Energy Consumption Survey (CBECS)*. This comprehensive outpouring of data on U.S. buildings, posted at http://tinyurl.com/ghca9, was updated in 1995 and 1999, with comparative data available for 1992 on the site of the Energy Information Administration. On the site, a close look at Table B43 reveals:

- There were 2,729,000 buildings in use in 2003 that were built in 1979 or earlier—of those, "lit" buildings totaled 2,537,000.
- One line provides the number of "lit" buildings that have undergone lighting upgrades "since 1980"—the total: 444,000.
- Therefore, more than 2 million older buildings—still in use in 2003—most likely were using ancient, energy-hogging, non-productivity-enhancing lighting systems.

This leads to an obvious question: Why? One might blame the (relatively lower) cost of energy in the period ending about five years ago. Another reason might be implied in the first set of data on page one of the Table 43 PDF: More than 72% of all "lit" buildings in the CBECS data were 10,000 square feet or smaller.

Apparently, no one has targeted these structures (remember, they are commercial buildings, not homes) for energy retrofits. ■

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Q+A

Q: How do LEDs function?

A: LEDs are simply miniature electronic devices that emit light. Whereas a common incandescent light bulb works by heating a filament that burns hot enough to produce light, LEDs are illuminated by the movement of electrons in a semiconductor material and operate at a significantly cooler temperature. As there is no true white LED, visible white light is achieved in one of two ways: a combination of three LEDs emitting red, green, and blue light; or by placing a phosphor coating over a blue LED.

Q: What are some limitations and benefits of LEDs?

Currently the limitations of the technology for traditional lighting purposes are that it is a single directional point source that at maximum energy efficiency produces only low levels of light and, like all electronics, is sensitive to heat. Like other light sources, LEDs produce more light when driven at higher wattages, but unlike other sources their efficiency drops dramatically as thermal management is needed to protect the electronics.

The benefits that distinguish LEDs from other light sources are that they are small in size, do not emit ultraviolet radiation, and can operate at very low wattages while producing light efficiently and for a very long time.

Q: What are some proper applications for LEDs?

LED technology has found a vast array of applications in the construction industry. Outside of color-changing theatrics, most current LED lighting applications are for task and accent lighting.

(**SOURCE:** Michael Hadank, national sales manager, W.A.C. Lighting)

***Submit questions to* mbyers@naed.org**