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## Fans of L.E.D.'s Say This Bulb's Time Has Come

By [ERIC A. TAUB](#)

Correction Appended

When the Sentry Equipment Corporation in Oconomowoc, Wis., was considering how to light its new factory last year, the company's president, Michael Farrell, decided to try something new: [light emitting diodes](#), or L.E.D.'s.

"I knew L.E.D.'s were used in stoplights. I wondered why they can't be used in buildings," Mr. Farrell said. "So I went on a mission."

What Mr. Farrell found was a light source that many of the biggest bulb manufacturers are now convinced will supplant incandescent bulbs and compact fluorescent bulbs.

By lighting all of the building's exterior and most of its interior with L.E.D.'s, Sentry spent \$12,000 more than the \$6,000 needed to light the facility with a mixture of incandescent and fluorescent bulbs. But using L.E.D.'s, the company is saving \$7,000 a year in energy costs, will not need to change a bulb for 20 years and will recoup its additional investment in less than two years.

"I'd do it again," Mr. Farrell said. "It was a no-brainer."

L.E.D. bulbs, with their brighter light and longer life, have already replaced standard bulbs in many of the nation's traffic lights. Indeed, the red, green and yellow signals are — aside from the tiny blinking red light on a DVD player, a cellphone or another electronic device — probably the most familiar application of the technology.

But it is showing up in more prominent spots. The ball that descends in Times Square on New Year's Eve is illuminated with L.E.D.'s. And the managers of the [Empire State Building](#) are considering a proposal to light it with L.E.D. fixtures, which would allow them to remotely change the building's colors to one of millions of variations.

The nation's Big Three of lighting — [General Electric](#), Osram Sylvania and Royal Philips Electronics — are embracing a new era of more efficient technologies, like halogen, compact fluorescent and solid-state devices. Encouraged by legislation and the rising cost of energy, as well as concerns about greenhouse gases, consumers are swapping out incandescent bulbs.

The switch is forcing a fast change in strategy, as companies reposition their manufacturing lines. General Electric, for instance, said earlier this month that it was spinning off its unit that makes bulbs.

The bulb makers face a tough problem. Their businesses were built on customers who regularly replaced

light bulbs. How do you make a profit when new lighting may commonly last 50 to 100 times as long as a standard bulb? Compact fluorescents, which use less than one-third the power and last up to 10 times as long as standard bulbs, have replaced incandescent bulbs in many homes and offices.

In some types of commercial buildings, L.E.D.'s are rapidly replacing older products. The industry seems convinced that new lower-cost L.E.D. bulbs, with their improved efficiency, will eventually become the chief substitutes for incandescent bulbs in homes.

L.E.D.'s, including new bulb types and applications, dominated the exhibits at Lightfair, the lighting industry's annual trade event held in May in Las Vegas. Traditional tungsten bulbs were largely absent. L.E.D.'s were shown for street and parking lot lighting, under-counter lighting, residential bulb replacements and office lighting. They are being used in commercial refrigerators, as substitutes for fluorescents and for illuminating the outside of buildings, allowing for easy color changes. Television production studios are installing L.E.D.'s to save money and eliminate the need for climbing in the rafters to change bulbs or filters.

The problem, though, is the price. A standard 60-watt incandescent usually costs less than \$1. An equivalent compact fluorescent is about \$2. But in Europe this September, Philips, the Dutch company dealing in consumer electronics, health care machines and lighting, is to introduce the Ledino, its first L.E.D. replacement for a standard incandescent. Priced at \$107 a bulb, it is unlikely to have more than a few takers.

"L.E.D. performance is there, but the price is not," said Kevin Dowling, a Philips Lighting vice president and past chairman of the Next Generation Lighting Industry Alliance, an industry group that works with the Department of Energy. "Even at \$10 to \$15, consumers won't buy L.E.D. bulbs," Mr. Dowling said.

The L.E.D., a type of semiconductor, generates light when an electric current is passed through positive and negative materials. Energy is given off in the form of heat and light. Different colors and greater efficiency are created by altering the composition of the material. Typically, a compact fluorescent bulb uses about 20 percent of the energy needed for a standard bulb to create the same amount of light. Today's L.E.D.'s use about 15 percent. Next-generation bulbs still in the labs do even better.

While compact fluorescents are beginning to replace standard light bulbs in many homes, lighting executives see those as an interim technology. They say the large size of the bulbs, the inability to dim many of them, the unpleasant color of the light and the five milligrams of mercury in each bulb will limit their appeal.

Philips is working to decrease the penetration of compact fluorescent bulbs. "We are not spending one dollar on research and development for compact fluorescents," said Kaj den Daas, chairman and chief executive of Philips Lighting. Instead, the bulk of its R. & D. budget, which is 5.2 percent of the company's global lighting revenue, is for L.E.D. research. Philips is betting the store on the L.E.D. bulbs, which it expects to represent 20 percent of its professional lighting revenue in two years.

Not everyone is sanguine about the technology's future.

"L.E.D.'s will gain dominance in downlighting, outdoor and track lighting," said Mark Rea, director of the

Lighting Research Center at [Rensselaer Polytechnic Institute](#). "I do not see a major step toward change in general illumination without transforming the infrastructure. To say L.E.D.'s will change everything, I don't buy it. I think a lot of it is hype."

Mr. Rea noted that work in the lab on compact fluorescents is creating versions that have improved color, start instantaneously and operate in cold temperatures.

Paul Gregory, the president of Focus Lighting, a New York-based lighting design firm, sees possibilities with L.E.D.'s that other technologies do not offer. He used L.E.D.'s to light the exterior of the Marcus Center in Milwaukee, recreating the look of a [Georgia O'Keeffe](#) painting, with continually changing colors.

"The Marcus Center lighting will require no maintenance for 15 years," Mr. Gregory said. "That's a dream for a lighting designer."

But he does not expect standard bulbs to disappear totally. Just as the invention of the light bulb did not completely kill the candle and kerosene lamp markets, Mr. Gregory said, "there will always be a need for incandescent bulbs. They will never totally go away."

"The way an incandescent bulb plays on the face on a Broadway makeup mirror," he said, "you can never duplicate that."

This article has been revised to reflect the following correction:

Correction: August 1, 2008

Because of an editing error, an article on Monday about advances in light-emitting diodes paraphrased incorrectly from a comment by Mark Rea, director of the lighting research center at the Rensselaer Polytechnic Institute, on the future of L.E.D.'s. Mr. Rea said he expected L.E.D.'s to take a dominant position in downlighting, outdoor and track lighting, though not in general illumination. He did not say he expected "limited success" for L.E.D.'s.

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