



LED Lighting: a bright future

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The next step in energy efficient lighting is light-emitting diode (LED) technology. This technology offers many benefits over old-fashioned incandescent bulbs, and even over today's compact fluorescent lamps—including low power consumption, longer life, compact size and reliable operation in cold temperatures.

But what is LED lighting, precisely?

An LED is a microchip that emits light. Compared to incandescent lamps that produce light by heating a tungsten filament, or fluorescent lamps that pass electricity through a tube of ionized gas, LEDs are basically semiconductors that illuminate with the movement of electrons.

Invented in the 1960s, LEDs were originally used in watches and as indicator lights. Today, researchers are finding ways to boost the light output of LEDs beyond even that of compact fluorescent light bulbs (CFLs) for unparalleled efficiency and longevity.

LED lighting is becoming increasingly popular in applications such as traffic lights; parking lot and garage lighting; commercial refrigeration

systems lighting; and, more recently, residential applications such as task lighting; recessed downlights and holiday lighting.

The future of this technology is only getting brighter. The U.S. Department of Energy (DOE) estimates that within 10 years, light-emitting diode (LED) lighting will overtake incandescent and compact fluorescent technologies to become the lighting solution of choice in American homes.

Some benefits of quality LED lighting products:

- **Energy efficiency.** LEDs use at least 75 percent less energy than incandescent lighting, reducing energy costs.
- **Instant startup.** LEDs illuminate immediately—no warm-up required.
- **Long life.** LEDs can last 35 to 50 times longer than incandescent lighting, and about 2 to 5 times longer than fluorescent lamps. Fewer replacements mean less time and money spent on maintenance.
- **Safety.** LEDs produce very little radiant heat, making the bulb cool to the touch.
- **Durability.** Unlike glass bulbs, LEDs are much more durable.



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Still early

LED technology is quickly evolving into one of the most promising alternatives in energy efficient lighting. But it's still a young technology that has some way to go before it is ready for widespread general use.

One reason is cost. Good-quality LED products carry a significant cost premium compared to standard lighting technologies. However, costs are declining rapidly. And because all lighting comes with two price tags—the purchase price and the cost of operation—LEDs start to look more attractive when you consider their efficiency, long life, and lower replacement costs.

Another concern is quality. Because LEDs produce light in an entirely different way than other technologies, manufacturers face a learning curve in delivering high-quality products. For this same reason, the advent of LED has created a gap in industry standards and testing procedures, and it will take time for the industry to catch up.

So what's a consumer to do?

Focus on Energy recommends that LED buyers look for ENERGY STAR®.

The ENERGY STAR is awarded to select fixture types that meet strict efficiency, quality, and lifetime criteria. To earn the ENERGY STAR, LED lighting products must pass a variety of tests to prove that the products deliver:

- **Efficiency as good as or better than fluorescent lighting.**
- **Equal or greater light output** than existing lighting technologies, and good light distribution over the area lighted by the fixture.
- **Consistent light output over time**, only decreasing toward the end of the rated lifetime (at least 35,000 hours or 12 years based on 8 hours of use per day).
- **Excellent color quality.** The shade of white light appears clear and consistent over time.
- **Instant-on light** when the light is switched on.

LEDs brighten the holidays

In recent years, LED holiday lights have been one of the season's hottest items for retailers and consumers alike. Why are these energy efficient decorations so popular? They are:

- **More energy efficient.** LEDs use 75 to 90 percent less energy than standard holiday bulbs.
- **Longer lasting.** LEDs can last up to 10 times longer than incandescent strands, and some manufacturers provide a five-year warranty.
- **More convenient.** LEDs are available in 35 to 100-bulb strings in a variety of colors. If one LED burns out, the rest of the string stays lit so customers can find and replace the bulb easily.
- **Safer and sturdier.** LEDs are cool to the touch and nearly impossible to break.
- **Versatile.** Some models offer features such as dimming and color shifting.

The DOE estimates that if all decorative light strings sold in America this year were ENERGY STAR qualified, we would save more than two billion kilowatt-hours per year (enough to power over 200,000 average homes annually) and reduce greenhouse gas emissions equal to taking over 300,000 cars off the road!

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