



U.S. DEPARTMENT OF
ENERGY

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U.S. DEPARTMENT OF ENERGY
ENERGY STAR® QUALIFIED LED LIGHTING
2009 PARTNER RESOURCE GUIDE



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CONTENTS

This document is designed to help partners understand and promote LED lighting products that meet the ENERGY STAR criteria established by the U.S. Department of Energy (DOE). You are free to use any of its messaging and graphics to promote ENERGY STAR qualified products on Web sites, print advertisements, in-store promotional materials, and other marketing materials. This document is divided into three sections:

Section I CONSUMER INFORMATION includes consumer messaging on product features and benefits, as well as fun facts.

- Driving consumer demand
- The evolution of lighting and communicating new technology to consumers
- What are LEDs?
- The value of ENERGY STAR qualified LED lighting
- Benefits of ENERGY STAR qualified LED lighting

Section II MARKET OUTLOOK identifies market opportunities for ENERGY STAR qualified LED products.

Section III DOE ENERGY STAR LED LIGHTING CRITERIA summarizes the DOE criteria for ENERGY STAR qualified LED products.

BIG EXPECTATIONS

In the next 20 years, LED lighting in the United States could:¹

- Reduce electricity demands from lighting by 33 percent.
- Eliminate 570 million metric tons of carbon emissions.
- Avoid 40 new power plants.
- Save as much as \$265 billion in energy costs.



ENERGY STAR is a government-backed program that helps consumers identify the most energy efficient products.

SECTION I: CONSUMER INFORMATION

DRIVING CONSUMER DEMAND

Increasing sales of ENERGY STAR qualified LED lighting requires effective consumer education to build confidence in the technology. Creating consumer understanding of ENERGY STAR for a new technology is a multi-step process, including:

1. **AWARENESS:** Consumers discover ENERGY STAR qualified LED lighting as an alternative to traditional residential and commercial lighting.
2. **KNOWLEDGE:** Consumers learn how ENERGY STAR qualified LED lighting may benefit them.
3. **ACTION:** Consumers begin to rely on the ENERGY STAR label to find quality LED lighting products.

DRIVING DEMAND IN THE COMMERCIAL SECTOR

In the early stages of market development, the low operating costs of ENERGY STAR qualified LED lighting products may be most appealing to commercial consumers. They are likely to have greater awareness of advanced lighting technologies and have more lighting technology alternatives at their disposal. Commercial consumers may therefore seek more detailed information to increase their knowledge of the benefits of LED lighting and the value of the ENERGY STAR label, such as the potential to earn points for LEED certification.

COMMUNICATING NEW TECHNOLOGY TO CONSUMERS

Use plain language in marketing materials to introduce ENERGY STAR qualified LED lighting to consumers. Messaging should build on their existing knowledge of lighting products to ease the learning curve. In particular, partners should avoid technical terms and jargon that is specific to the industry.

LED LIGHTING TERMINOLOGY

LIMIT USE/AVOID	USE INSTEAD
SSL	LED
Luminaire	Fixture
Lumens or luminous flux	Brightness
Luminaire efficacy	Efficiency
Correlated color temperature (CCT)	Color or light color or shade of white light
Color rendering index (CRI)	Color accuracy



DID YOU KNOW?

The U.S. Department of Energy estimates that at least 500 million recessed down lights are installed in U.S. homes and more than 20 million more are sold each year. LED technology can decrease recessed downlight energy use by 75 percent or more.

TOWARD MORE LIGHT, LESS HEAT

Incandescent light bulbs create light by passing an electrical current through a metal wire until it becomes so hot that it glows. Most of the energy is wasted as heat. Thomas Edison’s invention was revolutionary for his time, but 130 years later, we have much more efficient ways to get the job done.

Compact fluorescent light bulbs (CFLs) can create the same amount of light as incandescent bulbs using only one-quarter of the amount of energy! ENERGY STAR qualified CFLs last between 6,000 and 15,000 hours, or 5 to 13 years based on an average use of three hours a day.

CFLs don’t look or always act like incandescent bulbs because they use different technology to produce light. In a CFL, an electrical current passes through electronics, instead of through a wire. The current excites gases inside the coated glass tubing causing a reaction that produces light.

LED lighting products typically don’t use light bulbs at all, but are complete lighting systems that consist of a fixture with a permanent light source. LED lighting has the potential to be even more efficient and last even longer than fluorescent lighting, but non-qualified products on the market vary greatly in performance.

When an electrical current moves through a chip of semiconducting material in LEDs, it produces light. Though cool to the touch, LEDs generate a small amount of heat that affects the efficiency and performance of an LED product if the heat is not drawn away by a well-designed fixture.



WHAT ARE LEDs?

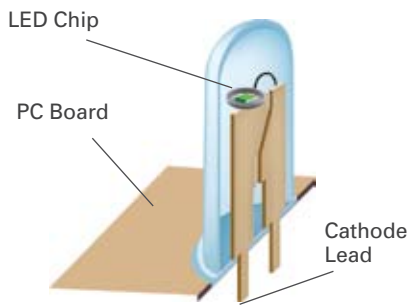
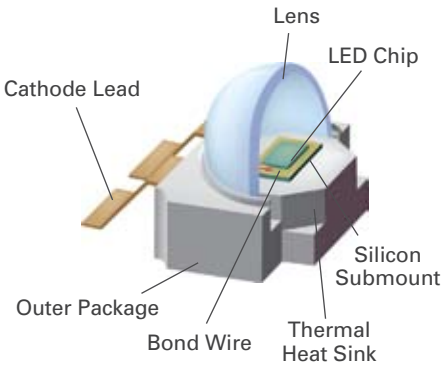
LED stands for light-emitting diode. LEDs are tiny light sources that give off light when an electrical current moves through a semiconducting material.

YOU’VE SEEN THEM BEFORE—YOU JUST DIDN’T KNOW IT

- Using LEDs to create white light for general illumination is fairly new, but colored LEDs have been around since the late 1960s.
- Most electronic devices use indicator (low-powered) LEDs to light up displays, on/off buttons and other controls.
- The LEDs used to create white light for the purpose of general lighting are often referred to as “illuminator,” “high brightness,” or “high-powered” white LEDs.

BASIC PARTS OF LED LIGHTING

LED lighting starts with a small LED device about 7 to 9 millimeters on a side, which can be used separately or in arrays. LED devices are mounted on a circuit board, which can be programmed to include lighting controls such as dimming and time sensing. The circuit board is mounted to a heat sink made of a heat-conducting material to pull heat away from the LEDs. The system is then encased in a lighting fixture, architectural structure, or even a “light bulb” package to fit into existing light bulb sockets.

LOW-POWERED LEDs	HIGH-POWERED LEDs
 <p>Low-powered LEDs are used for indication, such as an exit sign, a green power button on a computer, or a red blinking light on a video camera.</p>	 <p>High-powered LEDs are used for general lighting. ENERGY STAR qualified LED lighting uses multiple high-powered LEDs inside a fixture to produce white light.</p>



Superior light quality won't harm art, fabric, or other materials.

MAKE SURE IT'S ENERGY STAR QUALIFIED LED LIGHTING

With the rapid advancement of LED technology, it's important to remember that not all LED lighting products are created equal—and that many products already on the market are not living up to manufacturer claims.

The ENERGY STAR label helps identify energy-efficient, good quality products. When it comes to LED lighting products, the mark assures users of the following benefits:

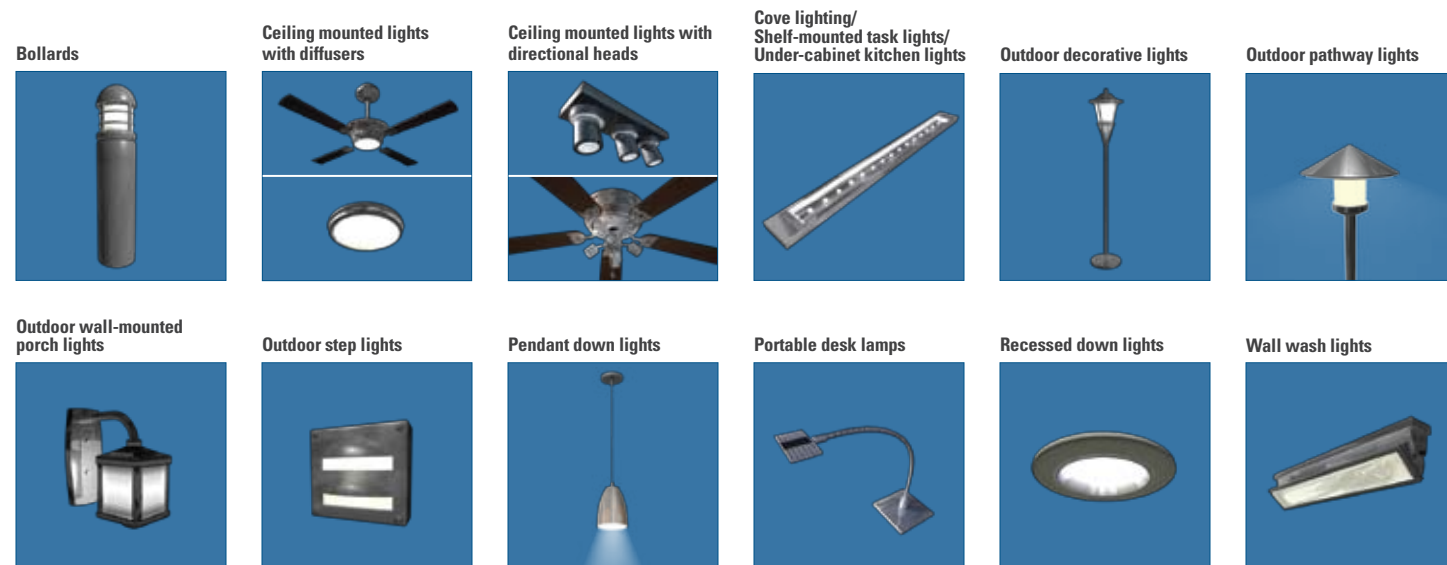
- Performance equal to or better than traditional lighting in terms of brightness and light quality.
- Energy efficiency equal to or better than fluorescent lighting.
- Operating lifetime of at least 25,000 hours.
- A minimum three-year manufacturer warranty.

ENERGY STAR QUALIFIED LED LIGHTING PRODUCT TYPES

LED technology is best suited to lighting applications where the performance of the product equals or exceeds that of existing lighting options. The DOE ENERGY STAR criteria cover requirements for LED products used for general illumination.

The DOE ENERGY STAR LED lighting program includes both residential and commercial products. In January 2009 DOE released a draft criteria for LED bulbs designed to replace existing bulbs. DOE will expand the ENERGY STAR program to include other lighting applications as LED technology improves. Examples of current applications covered in the criteria are shown below.

LED LIGHTING PRODUCT TYPES



SAVE ENERGY

ENERGY STAR qualified LED lighting uses at least 75 percent less energy than incandescent lighting and is at least as efficient as fluorescent lighting.

SAVE TIME

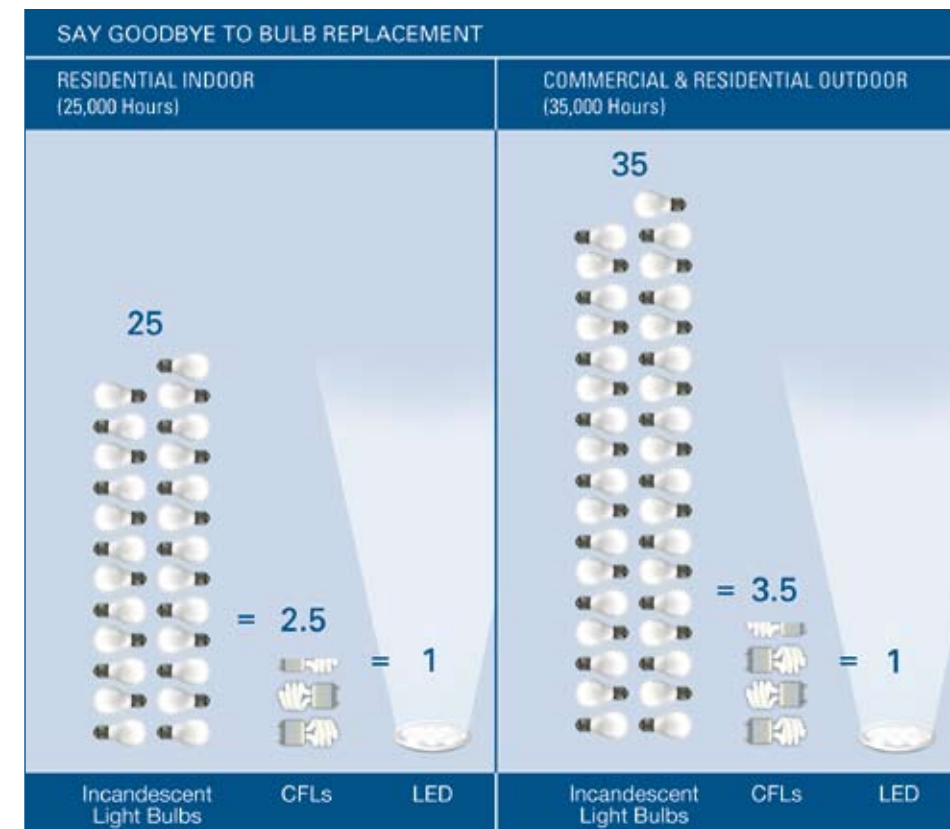
Stop changing light bulbs! Qualified LED lighting products combine the light source and the fixture, meaning you'll never have to change a bulb.




ENJOY BETTER DESIGN AND PERFORMANCE

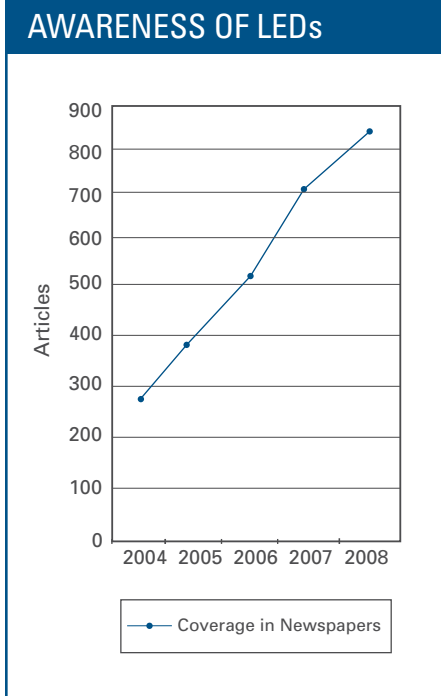
- The directional nature of LEDs allows for precise placement of light.
- Durability and enhanced cold-temperature performance make qualified LEDs perfect for outdoor use.
- When paired with compatible controls, LED fixtures allow reliable custom light settings.
- Low radiant heat can reduce air conditioning needs.
- Superior light quality won't harm art, fabric, or other materials.
- Compact, low-profile fixtures offer greater flexibility in placement.

LIGHTING THAT LASTS A GENERATION

Indoors, an ENERGY STAR qualified LED light fixture lasts at least 22 years—25 times longer than an incandescent bulb and 2.5 times longer than a CFL.² Outdoors, an ENERGY STAR qualified LED light fixture can last more than 10 years—35 times longer than an incandescent bulb and 3.5 times longer than a pin-based CFL.³



ANNUAL OPERATING COST COMPARISON FOR RECESSED DOWN LIGHTING				
LIGHT SOURCE				
		INCANDESCENT BULB	COMPACT FLUORESCENT BULB (CFL)	ENERGY STAR QUALIFIED LED LIGHT
LIGHT OUTPUT (LUMENS)	USEFUL LIGHT	575	575	575
	WASTED LIGHT	575	575	0
	TOTAL LIGHT	1,150	1,150	575
WATTS		75.0	20.0	16.5
LIFETIME (HOURS)		1,000	10,000	25,000 or 35,000
ANNUAL OPERATING COSTS ⁴		\$8.87	\$2.37	\$1.95



Growing awareness of LEDs is reflected in an increase in media coverage. In 2007, U.S. newspapers and wire services published 712 articles that mentioned LED lighting. In 2008, media coverage grew to 846 articles, an increase of 19 percent.⁵

LED LIGHTING MARKET OUTLOOK 2009

Establishing consumer confidence is key to advancing the LED lighting market. The early adopters in the lighting design and architectural communities, reluctant to gamble their reputations without quality assurance, anxiously await the market dominance of reliable, high-quality products. In this unpredictable burgeoning market, ENERGY STAR, along with other DOE SSL commercialization efforts, plays an important role in shoring up consumer confidence.

Currently, the commercial and industrial sectors can most practically realize a return on investment, while the residential market will take much longer to penetrate. As with any new technology, mass production, time, and competition will also help bring down prices to allow more rapid market adoption in all sectors.

Strategies Unlimited, a leader in market research for LEDs, projects the LED lighting market will grow at a compound rate of 28 percent a year, from \$1.5 billion in sales in 2007 to \$5.3 billion in 2012.

SECTION III: DOE ENERGY STAR LED LIGHTING CRITERIA

DOE's ENERGY STAR LED lighting criteria address product quality and efficiency to help ensure that residential and commercial consumers have a positive experience with this new technology. The criteria consider four features of LED lighting:

- Luminaire efficacy (the efficiency of the useful light that leaves the fixture)
- Minimum light levels that match existing technology
- Limited correlated color temperature
- Industry-accepted test procedures

To ensure product quality, the criteria will only apply to the most market-ready applications. In 2011, DOE plans to expand the ENERGY STAR program to include a wider variety of LED applications for general lighting.

DOE's ENERGY STAR criteria require LED products to deliver at least 70 percent of initial light output for the minimum number of hours specified below:

- Residential indoor: 25,000 hours
- Residential outdoor: 35,000 hours
- All commercial: 35,000 hours

The lifetime requirement for residential indoor products is lower because of the shorter operating cycles typical of residential indoor applications. For example, residential indoor lights are on an average of three hours per day, but commercial lighting products are generally used at least ten hours a day.

Please visit www.energystar.gov/SSLPartners to review detailed criteria specifications.



DID YOU KNOW?

ENERGY STAR qualified LED lighting products for outdoor use are required to last at least 35,000 hours. Based on normal use of ten hours per day, that's about 10 years.

END NOTES

¹ Numbers based on analysis by D&R International, Ltd., 2009.

² Estimated lifetime based on a 25,000-hour LED product, a 1,000-hour incandescent product, and a 10,000-hour fluorescent product.

³ Estimated lifetime based on a 35,000-hour LED product, a 1,000-hour incandescent product, and a 10,000-hour fluorescent product.

⁴ Operating costs for recessed down lights are annual and assume three hours of use per day for typical residential use, and an average utility rate of \$0.108 per kWh.

⁵ Based on a review by D&R International using LexisNexis databases of the appearance of LED lighting in U.S. newspapers and wires from 2004 to 2008.