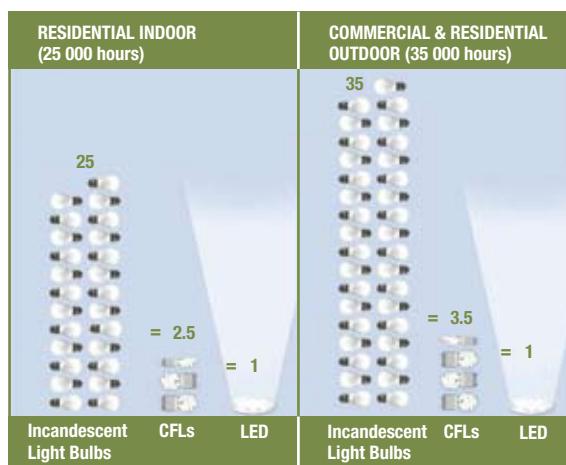




Learning about LEDs

Energy-efficient lighting can be used in your home to cut costs and to benefit the environment. There have been great advances in efficient lighting in recent decades, moving away from the traditional incandescent bulbs to halogen to compact fluorescent lamps (CFLs).

SAY GOODBYE TO BULB REPLACEMENT



Provided by the U.S. Department of Energy

The next technology on the horizon for general service lighting is light-emitting diodes (LEDs). They are already found in exit signs, traffic signals, cars and holiday light strings. LEDs are also seen in outdoor area and street lighting. While mainly available now for commercial use, LEDs hold great promise for consumers and residential lighting.

Good quality LEDs will be among the most energy-efficient lighting products available and will have a long lifetime. This represents cost savings to consumers and reduces greenhouse gas (GHG) emissions.

When the new national efficiency standards for general service lighting come into effect in 2012, you will still be able to choose from a broad range of lighting technologies and find products that meet your needs. LED products are a promising part of this inventory of choices.

What is a LED?

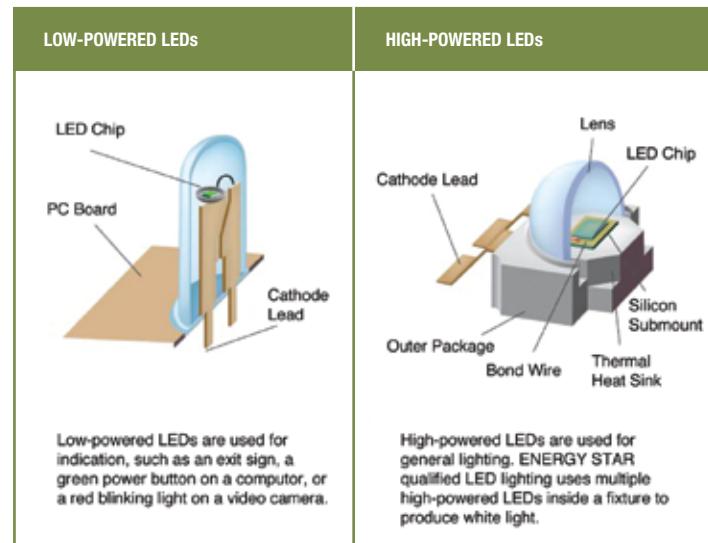
Originally used in electronic products, a LED is a semiconductor device (diode) capable of emitting light when an electric current is passed through it. Unlike incandescent bulbs, where only 5 % of the energy used is to produce light and the balance is wasted in heat, LEDs use energy more efficiently.

There are two basic types of LEDs. First, low-brightness LEDs, or 5-millimetre LEDs as an example, are seen in electronic devices and holiday lights. The second type is high-brightness LEDs, which are more appropriate for general lighting products.

The light produced by an individual LED is directional and focused. Using arrays or groups of LEDs, as well as lenses or optics, a LED lighting product can provide light over a larger area, for either ambient or task functions.

LEDs are sold in two formats: as “replacement” bulbs for your existing fixtures or as fixtures with integrated LED light sources. The integrated option is the more efficient because the fixture is designed specifically to effectively distribute the light output of the LED light source.

LOW vs. HIGH POWERED LEDs



Provided by the U.S. Department of Energy



**Say goodbye
to shopping and
replacing multiple light
bulbs, and say hello
to long-term cost
savings.**

The design of LED lighting fixtures is critical to good performance, because it takes into account various thermal and electrical conditions. This fact sheet is designed to provide you with information about LED technology so you can make informed buying decisions. As with any new product, there are variations in product quality and effectiveness, so look for the ENERGY STAR® symbol. It identifies products that meet or exceed high energy efficiency levels without compromising performance.

Advantages of LEDs

- low profile and compact size makes them ideal for space-constricted applications
- resistance to breakage and vibrations makes them more durable
- good performance in cold temperatures
- lifetime unaffected by turning them on and off frequently
- do not require any warm-up time (instant on)
- dimmable
- produce coloured light without using filters (which diminish light output)
- do not contain mercury or lead
- have a long lifetime
- do not produce intense heat, as with an incandescent source, making them safer to the touch

Limitations of LEDs

As an evolving technology, LEDS still require improvement. Their performance is affected by how efficiently they dissipate the heat produced and how well their light intensity is maintained over time.

The cost of LEDs is still high, although prices in some applications are becoming more competitive with other light sources. As research advances, more LEDs will be available at more reasonable prices. LED lighting is application specific and is not always suited for every application, but this will change as technology evolves.

- Beware of products sold at exhibitions or fairs, or even on Web sites.
- Look for a warranty of at least three years.
- Be sure of the seller's credibility to support the warranty and exchanges or returns.

New industry standards, test procedures and ENERGY STAR criteria have been developed to better evaluate and compare this technology with other light sources.

The energy cost of operating LEDs is a fraction of the cost of conventional fixtures. LEDs have the potential to make a significant dent in the electricity consumed by lighting in your home over their longer lifetime.



Cree LED Lighting



Lumen:

A measure of the quantity of light emitted by a light source, also known as light output, luminous flux or brightness. The higher the number, the more light you get. A typical 60-watt incandescent bulb emits about 800 lumens.

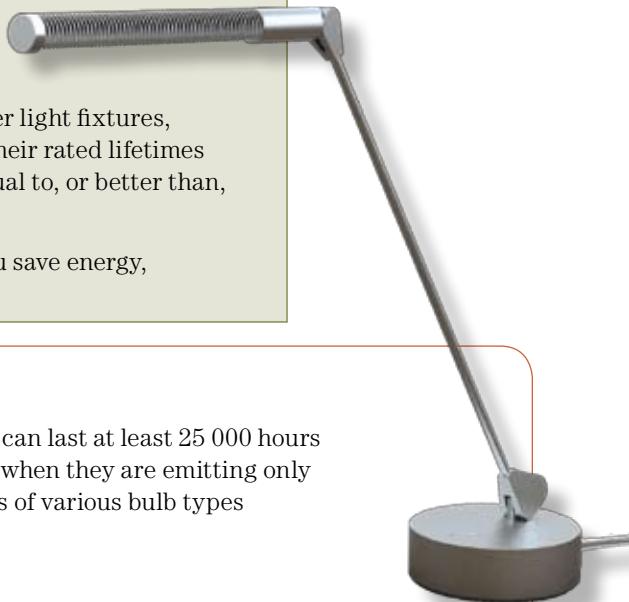


ENERGY STAR qualified LED products

More and more, LEDs are available for residential applications, such as desktop or direct lighting, under-cabinet lighting, recessed downlights, display lighting and outdoor lighting.

Look for residential light fixtures and, very soon, LED bulbs that are ENERGY STAR qualified. They meet high performance criteria: they must equal the brightness of other light fixtures, distribute light well, maintain consistent light output over their rated lifetimes and have excellent colour quality. Their efficacy must be equal to, or better than, fluorescent lighting.

Every time you use an ENERGY STAR qualified product, you save energy, money and GHGs.



Lifetime of LEDs

At the moment, white-light LED lighting products, with proper design and use, can last at least 25 000 hours (or 22 years based on average household use). Their useful life comes to an end when they are emitting only 70 % of their initial light output. The table below compares the average lifetimes of various bulb types with LEDs.

Light source	Lifetime (hours)
Typical incandescent	1 000
Halogen	2 500–5 000
CFLs	8 000–10 000
Linear fluorescent	30 000
High-quality LED	25 000



Cree LED Lighting

Energy efficiency and LEDs

Most of the energy that LEDs consume is used to produce visible light, rather than heat. LEDs emit little infrared and ultraviolet radiation and can consume substantially less electricity than other light sources. According to the U.S. Department of Energy, the best warm white LED lighting products can produce 27–54 lumens per watt (lm/W), and cool white LED lighting products can produce 60–92 lm/W, compared with 10–18 lm/W for incandescent bulbs and 35–60 lm/W for CFLs. However, low-quality LED lighting products that are not designed properly may be no more efficient than incandescent bulbs.

Where to go for more information on lighting:

Lighting: oee.nrcan.gc.ca/residential/personal/new-lighting.cfm?attr=4

U.S. Department of Energy: apps1.eere.energy.gov/buildings/publications/pdfs/ssl/energy_efficiency_white_leds.pdf

Lighting Facts: www.lightingfacts.com