

HOME ENERGY GUIDE

BULBS

The standard incandescent light bulb (which has changed very little since Edison's time) was the only real choice for most homes until fairly recently. Today, there are many options, based on performance, lighting designs, and energy use.

Incandescent bulbs

As electrical current passes through the filament in an incandescent bulb, it is heated to a high temperature (400°-500°) which causes it to glow with visible light. Because nearly 90% of the energy input is emitted as non-visible infrared (heat), incandescent bulbs are less efficient than other types that provides the same amount of light. This extra heat can also present a fire hazard in certain types of fixtures. Incandescent bulbs also have a relatively short expected lifetime—between 750-1,000 hours for a general service bulb.

Banned for use?

The Energy Independence and Security Act of 2007 does not actually ban the use of incandescent light bulbs, but it sets efficiency standards that cannot be met by most traditional incandescent bulbs. Importantly, there are many new products that will meet the new standards and provide more efficient and flexible lighting choices.

Halogen bulbs

While essentially an incandescent bulb, halogen bulbs are infused with inert halogen gas and have a quartz shell. This allows the bulb to last about three times longer and be about 25% more efficient than a standard incandescent with the same light output. Although commonly used in desk lamps, work lights, and track lighting, halogen bulbs are also available as spot or flood lights for use in recessed fixtures or outdoor lighting. Halogen torchieres (tall floor lamps that direct light towards the ceiling) are also popular; they can present a fire hazard if not properly used, however.

Just like their standard incandescent bulb cousins, halogen bulbs give off a lot of energy in the form of heat. In fact, because the quartz envelope is so much closer to the filament, halogen bulbs can become extremely hot. Most lamps and fixtures that use halogen bulbs are required to have an additional glass cover or shield to reduce fire risks and contain fragments in the event of a bulb failure.

Tube fluorescent bulbs

Available since the 1940s, tube fluorescent bulbs are commonly seen today in public buildings, schools, commercial buildings, retail stores—nearly everywhere that lighting is used. Even in residential homes, tube fluorescents are found in basements, garages, and workshops. Valued because of their long life, energy

efficiency, and balanced illumination, tube fluorescents are available in a variety of color temperatures and sizes. Recent advancements have replaced older tubes (T-12 with magnetic ballasts) with more efficient tubes (T-8 with electronic ballasts), representing significant energy savings in many buildings.

Compact fluorescent bulbs

The current crop of ENERGY STAR® labeled compact fluorescent light bulbs (CFL) use one-third of the energy and last up to 10 times longer than an incandescent bulb with the same light output. They also operate at cooler temperatures than incandescent bulbs, because they convert more energy into visible light.

Now available in a wide variety of sizes, shapes, and colors, modern CFLs have overcome many of the problems associated with their initial production in the 1990s. Newer bulbs have electronic ballasts which eliminate most of the flickering and slow starting of earlier models, and ENERGY STAR® standards have improved reliability and expected lifetimes considerably.

Along with energy use and estimated life, package labeling now includes information about brightness and light appearance—the best way to determine the appropriateness of a particular product. For many lighting needs, CFL bulbs are an energy-efficient alternative to standard incandescent bulbs.

What about mercury?

All fluorescent bulbs (both tube and CFL) contain small amounts of mercury vapor—between 1 and 5 milligrams in a CFL bulb. For comparison, a mercury thermometer contains 500 milligrams—about the same amount in a dental amalgam. In an unbroken CFL bulb, the mercury is contained; accidental breakage can release the mercury. Although the risks associated with the breakage of a single CFL bulb have been sometimes exaggerated, proper cleanup and disposal is recommended (epa.gov/cfl). Recycling of burned out CFL bulbs is required by law, so that the mercury and other components can be captured and re-used. Check with your county household hazardous waste program, electric utility, or retail store for locations for CFL recycling.

Additionally, because mercury is emitted from coal-fired power plants, anything that reduces electricity usage—including using CFLs—will reduce mercury in the environment.

(over)

Light emitting diodes

Also known as Solid State Lighting (SSL), light emitting diodes (LEDs) have been used in electronic devices (like laboratory equipment and calculators) since the 1960s. Advances in recent years have moved LEDs into illumination lighting for retail and commercial businesses—including streetlights, architectural lights, and freezer display cases. Residential lighting options are now entering the marketplace, offering new options for homeowners.

Long life + efficiency

LEDs have several characteristics that make them suitable for many applications in homes and businesses. Roughly equivalent to CFLs in efficiency (as measured by lumens per watt), LEDs have a clear advantage when it comes to estimated lifetimes, which makes

them a good choice for locations where bulb change-outs are either difficult or costly. Additionally, LEDs can deliver bright light in a more tightly focused area, making them very suitable for task lighting and directional accent or decorative lighting. LEDs also contain no mercury, but must still be properly disposed at the end of their life. Manufacturers are presently offering a growing selection of products to meet specific lighting needs, including general illumination options that spread and diffuse the LED light more effectively and warmer colors that match incandescent bulbs. Note: Although many LEDs are dimmable, it is important to check the packaging to be certain of compatibility with your dimmer switch.



LEDs: new options for home lighting

Some of the first LED products available for home use included reading lights and holiday lighting. Task lighting—in the form of spot bulbs and “under counter” fixtures—capitalize on the directional nature and brightness of LED lights.

The current generation of LED bulbs include improvements in styles, brightness, color temperature, and efficiency—along with moderating prices. New products will continue to provide expanding options for consumers.

Light bulb comparisons

The table below illustrates differences in cost, efficiency, and environmental concerns for selected light bulbs; different products may have different characteristics. Electricity costs are based on current statewide average, not projected costs. Bulbs selected for comparison are currently available retail products. Watts, efficiency, estimated bulb life, and retail prices are from retailers/manufacturers. Numbers have been rounded for clarity. Actual performance will vary.

	Incandescent	Halogen	CFL	LED
Watts	60	43	13	11
Lumens per watt	14	17	65	76
Dimmable	yes	yes	maybe	yes
Est. life in hours	1,500	1,000	10,000	25,000
Est. life in years	1	0.9	9	23
Purchase price	\$0.84	\$1.81	\$1.20	\$9.97
23 yr operating cost ¹	\$179	\$163	\$39	\$40
# of bulbs for 23 yr ²	17	25	3	1
23 yr CO ₂ emissions ³	1,900 lbs.	1,400 lbs.	420 lbs.	360 lbs.
Proper disposal	no special requirements	no special requirements	recycle	recycle

¹ Cost to keep a bulb operating 3 hrs/day at 11¢/kWh for 23 years (the estimated life of the longest-lasting bulb) plus the cost of needed replacement bulbs.

² Number of bulbs required over 23 years, operating at 3 hours per day, based on estimated life of bulbs.

³ Emissions per year x 23. Based on 1.3 lbs. CO₂ per kWh (MN avg) for 3 hours/day of operation.