



Lighting

In our homes, we tend to use a large variety of lamps and fixtures to provide us with our lighting needs. In the living room, we may have table lamps, track lights or cove lights to provide mood lighting, while in the kitchen and bathroom we may have more direct, task-oriented lighting. Outdoors we may also have common ordinary incandescent bulbs or high intensity discharge fixtures. Very few homes use a single lamp type; therefore, we need to be aware of the variety of choices.

Most of the time, we tend to choose a lamp and fixture by their price rather than by their efficiency. If you do this, you may be paying more for lighting than necessary. It is common for manufacturers or retailers to lower prices on items that operate under old technology principles in order to liquidate their inventories and make room for the "new" items. Be careful not to get caught in this trap and shop wisely.

New lighting products are not only more energy efficient, they offer many more possibilities to improve the quality of lighting in our homes, indoors and out.

How to compare cost and efficiency

Why would you buy a \$5 compact fluorescent lamp (CFL) rather than a \$0.50 incandescent light bulb? Because the CFLs produce more lumens (light) per watt (electricity used) than the cheaper incandescent bulbs, and last up to 10 times longer, making them a better bargain in the long run. The three basic pieces of information you need to find the best buy and the right product are right on the package.

1. **Watts** is often the only number people look for when buying a light bulb. It tells how much power the bulb consumes, but nothing about the light output.

2. **Lumen** is a measurement of the amount of light given off by the bulb.

Efficiency is expressed as Lumens per Watt (LPW), similar to miles per gallon.

3. **Lamp Life** is the hours of rated lamp life. Even long-life incandescent lamps are only rated at 1,500 hours compared to 6,000 – 12,000 hours of lamp life for CFLs. Install CFLs in hard-to-reach areas such as hallways and vaulted ceilings to reduce use of ladders for bulb burnouts.

The following example shows the savings in operating costs of a CFL compared to an equivalent incandescent bulb:

75-Watt incandescent bulb

Uses 75 Watts (0.075 kWh) of electricity
 Provides 1,200 lumens (16 lumens/watt)
 $\text{Operating cost} = 0.075 \text{ kWh} \times 4 \text{ hours/day} \times 365 \text{ days/yr} \times \$0.085/\text{kWh} = \$9.30 \text{ per year}$
 Lamp Life = 1,500 hours

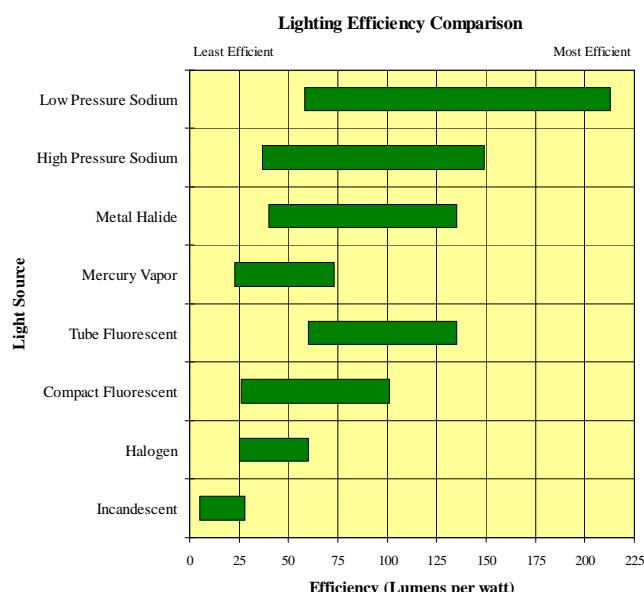
20-Watt compact fluorescent

Uses 20 Watts (0.020 kWh) of electricity
 Also provides 1,200 lumens (60 lumens/watt)
 $\text{Operating cost} = 0.020 \text{ kWh} \times 4 \text{ hours/day} \times 365 \text{ days/yr} \times \$0.085/\text{kWh} = \$2.50 \text{ per year}$
 Lamp Life = 10,000 hours

The additional \$5.00 cost of the CFL will pay for itself in less than 9 months and the CFL will last over 6 times longer.

Lighting efficiency

The graph presents an energy efficiency ranking by lamp type.



As the graph shows, incandescent are the least efficient lamps available. They provide an adequate range of lumens, but also, consume large amounts of watts in comparison to the amount of light they provide.

The most common lamps found in our homes are incandescent (bulbs, reflectors, flood lamps), halogen, compact fluorescent, and full size fluorescent (tube fluorescent).

Compact Fluorescent Lamps

No other new product in the lighting industry has had as great an impact as the compact fluorescent lamp (CFL). CFLs are smaller versions of standard fluorescent lamps. They consume between 5 to 40 watts, and have a brightness and color rendition that is comparable to incandescent lights. Unlike standard fluorescent lamps, they can directly replace standard incandescent bulbs.



The following is a comparison between the wattage of commonly available incandescent lamps and the wattage of a CFL that will provide similar light levels:

Incandescent	=	CFL
25 Watt	=	5 Watt
50 Watt	=	9 Watt
60 Watt	=	15 Watt
75 Watt	=	20 Watt
100 Watt	=	25 Watt
120 Watt	=	28 Watt
150 Watt	=	39 Watt

Modern CFLs have taken the best aspects of fluorescents – high efficiency and long life – while eliminating traditional problems of poor color, flicker and noise. Most CFLs still cannot be used with dimmer switches and do not perform well outdoors in cold weather (check the package for minimum operating temperature). CFLs cost an average of \$5 to \$20 per bulb, but they last ten times longer than incandescent lamps and use 60 to 75 percent less electricity!

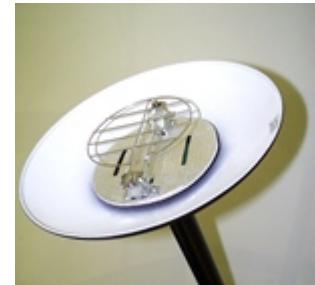
You'll get the most benefit by switching to CFLs wherever you use high wattage incandescent lamps more than three hours per day – often in the kitchen and family room or in areas that are difficult to change the bulbs when burnt out.

Halogen torchieres

Energy concerns and well-publicized fires have increased interest in alternatives to halogen torchieres. Manufacturers have designed torchieres that use incandescent lamps, compact fluorescent lamps (CFLs), or metal halide lamps instead of tubular halogen lamps.

Why halogen torchieres were so popular

Halogen torchieres were popular with consumers because of their appearance, light distribution, versatility, availability, and cost. Torchieres provide indirect lighting, which means they illuminate spaces by reflecting light off ceilings and walls. They are an inexpensive source (as low as \$10-\$15 per lamp) of indirect lighting that does not require an electrician to install. Their slim, upright design helps them fit into almost any decor. Torchieres make it possible to change the ambiance within a space by moving the torchiere or dimming the lamp. They are lightweight and can be easily moved from room to room. Halogen torchieres are often sold with continuous dimming, or bi-level or tri-level switching.



Problems attributed to halogen torchieres

Three-hundred-watt halogen lamps reach operating temperatures as high as 1,000 degrees Fahrenheit - high enough to ignite paper, cloth, wood, or plastic that is tossed into, blown into, or draped over the lamp. In some cases, fires have started when torchieres have fallen over and touched carpet, drapes, or bedding.

When tubular halogen lamps fail, they sometimes explode or shatter. Careful handling is required because oils from the skin make the lamps susceptible to shattering while operating. For this reason, a tempered glass "shatter shield" is required in halogen torchieres to enclose any fragments of hot quartz glass that can scatter on nearby combustibles. This shield closely covers the lamp and offers very little heat protection. The shatter shield should be reinstalled every time the lamp is replaced. Unfortunately, some consumers disregard this precaution.

In addition, halogen lamps might not provide the energy savings that are sometimes advertised for them. Although

some halogen lamps provide 18-20 Lumens per Watt (LPW), researchers found that the average imported halogen lamp produced less than 12 LPW--40% less than a standard 100-Watt incandescent lamp.

Although halogen torchieres are inexpensive to buy, operating cost makes them more expensive overall than most energy-efficient luminaires. The electricity costs of operating a halogen torchiere can be quite high, about \$37 per year (assuming a 300-Watt lamp, operated for four hours every day, at 8.5¢ per kilowatt-hour).

Electronic Controls

Lighting controls such as dimmers, timers and sensors ensure that lights are turned on only when they are needed. These controls can save a lot of energy if used properly.

- **Timers** save energy simply by turning lights on and off at pre-designated times. For instance, they will turn specific lights on automatically at dusk and off at “bedtime” making your house appear occupied when you are away from home.
- **Dimmers** regulate the brightness of lights and may extend the life of the bulb while saving you energy.
- **Sensors** turn lights on only when they are needed. Ultrasonic motion sensors turn lights on and off in response to movement; infrared sensors turn lights on and off in response to body heat; and photosensors turn lights on and off when light levels fall below or rise above pre-set levels.
- **Solar** powered lights are available for outdoor lights. These lights have zero operating cost as they store solar energy all day and use it at night.

Lighting Do's and Don'ts

Do switch to compact fluorescent lamps and look for the ENERGY STAR logo when purchasing light fixtures, CFLs, ceiling fans and ceiling fan light kits.



Do check the light output in “lumens” and the lamp life in “hours” on the package when you buy different brands of bulbs. Some off-brands may have a lower purchase price, but provide less light output or less hours of lamp life.

Do make sure your fixtures have been tested for safety and listed by an independent agency, such as UL or ETL. Look for one of these designations on the fixture before purchasing.

Do turn off your light when it isn’t needed.

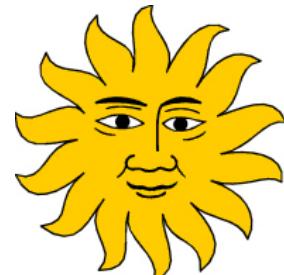
Do use lighting control devices like dimmers, sensors, photocells and timers to provide light only when you need it.

Do dust light fixtures and bulbs regularly. A heavy coat of dust can block up to 50% of the light output.

Do replace incandescent outdoor lights and floodlights with a high pressure sodium fixture and consider a photocell or motion sensor control.

Do use daylighting when possible. An excellent strategy for lighting energy conservation involves using a free source of energy: the sun. The sun provides tremendous amounts of light, even on a moderately cloudy day. Using this free light may reduce the amount of artificial illumination needed in your home.

In addition to saving electricity by using the sun, you can also save on heating energy.



Allowing the sun through your windows in the winter provides you with free heat. Open your window blinds or shades during the day to help warm your house, then after sunset, close them to keep the heat in.

Don't use “long life” incandescent bulbs – they may last longer, but put out much less light than a regular incandescent bulb, while still consuming the same amount of electricity. In places where changing a bulb is difficult and a long life lamp is desired, consider a compact fluorescent, which lasts ten times longer than a standard incandescent.

Don't use devices containing “diodes” (coin sized disks that install into lamp sockets) that claim to increase the life of a bulb. With these devices, light output drops

dramatically, and they may pose a safety hazard since they cause an electrified portion of the lamp base to be exposed.

Don't purchase expensive “full spectrum” fluorescent lamps that exaggerate the benefits of ultra-violet light. Fluorescent lamps are available with a color correlated temperature of 5,000 degrees Kelvin which is nearly a daylight equivalent and provides benefits for those seeking bright light to read by or daylight equivalent brightness.

Bibliography

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