

Energy Efficiency

Lighting Audit

Lighting accounts for a significant portion of the electrical use, about 10%. As an auditor, your job is to determine ways that the occupant can light their home using the same amount of light for less money. According to the U.S. Department of Energy, if you upgrade just 15 of the inefficient incandescent light bulbs in your home, you could save as much as \$50 per year.

Traditional incandescent light bulbs are very inefficient. Have you ever tried to remove a light bulb while it was still on? Careful, it could burn your fingers! All of the heat is actually wasted energy. In fact, 90% of the energy used by an incandescent bulb is given off in heat. Here are some choices for upgrades:



Energy Efficient Incandescent bulbs are 25% more efficient than traditional bulbs. Additionally, these high efficient incandescent bulbs are made to last 3 times longer than traditional bulbs.



CFLs, compact fluorescent lamps, are basically the same thing as the long fluorescent tubes you've seen. CFLs use about one-fourth the energy as traditional bulbs and last ten times longer. The energy savings is as much as 75%



LED, light emitting diode, is one of today's most energy efficient technologies. They use only 20% - 25% of the energy of traditional bulbs and last 25 times longer. LEDs are more expensive to purchase, but the efficiency pays for itself in the long run.

One important thing to remember when buying the right light bulb is 'lumens', not watts. We are used to looking at the watts on an incandescent light bulb and purchasing higher watt bulbs when we want 'more light'. Well, of course this is going to use more energy.

When you're shopping for light bulbs, look at the lumens. What is a lumen? Lumens measure how much light you are getting from a bulb. More lumens means brighter light, and less lumens means dimmer light.

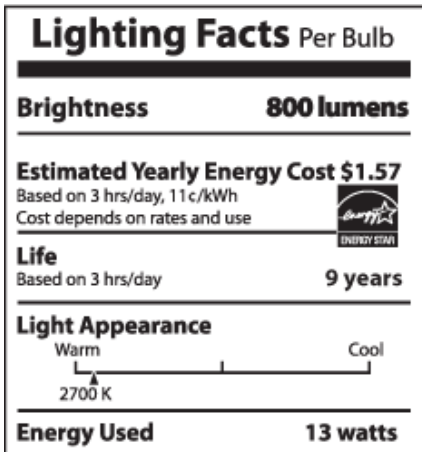
Here's a rule of thumb from the U.S. Department of Energy for replacing incandescent bulbs for equivalent bulbs in Lumens:

Incandescent

- 100 – watt
- 75 –watt
- 60 – watt
- 40 – watt

Equivalent Lumens

- about 1600
- about 1100
- about 800
- about 450

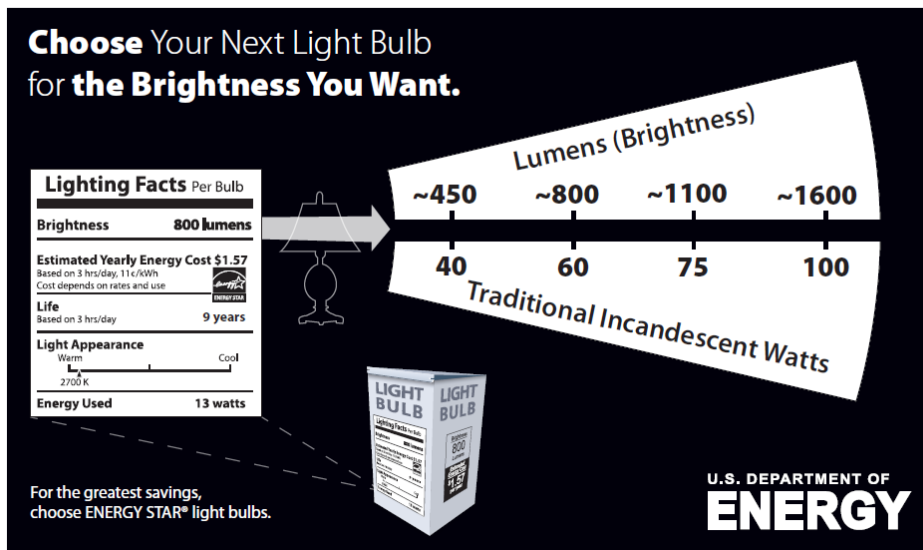


The Federal Trade Commission now requires that light bulb (referred to as lamps by electricians) manufacturers label the product for consumers:

It's very similar to nutrition labels on food products. The lighting Facts label helps consumers understand what they are really purchasing. The label clearly provides the lumens of the bulb, the estimated operating cost for the year, and the color of the light.

This chart is helpful for visualizing the comparison of traditional incandescent light bulbs to lumens:

LUMENS: THE NEW WAY TO SHOP FOR LIGHT



Lighting Principles and Terms (from www.energysavers.gov)

To choose the best energy-efficient lighting options for your home, you should understand basic lighting principles and terms.

Lighting Quality

Illumination - The distribution of light on a horizontal surface. The purpose of all lighting is to produce illumination

Lumen – A measurement of light emitted by a lamp.

Footcandle – A measurement of the intensity of illumination. A footcandle is the illumination produced by one lumen distributed over a 1-square-foot area. For most home and office work, 30-50 footcandles of illumination is sufficient. For detailed work, 200 footcandles of illumination or more allows more accuracy and less eyestrain. For simply finding one's way around at night, 5 – 20 footcandles may be sufficient.

Energy Consumption

Efficiency – The ratio produced to energy consumed. It's measured as the number of lumens produced divided by the rate of electricity consumption (lumens per watt).

Light Quality

Color temperature – The color of the light source. By convention, yellow-red colors (like the flames of a fire) are considered warm, and blue-green colors (like light from an overcast sky) are considered cool. Color temperature is measured in Kelvin (K) temperature. Higher Kelvin temperatures (3600-5500 K) are what we consider cool light, and lower color temperatures (2700-3000 K) are considered warm. Cool light is preferred for visual tasks because it produces higher contrast than warm light. Warm light is preferred for living spaces because it is more flattering to skin tones and clothing. A color temperature of 2700-3600 K is generally recommended for most indoor general task lighting applications.

Color rendition – How colors appear when illumination by a light source. Color rendition is generally considered to be a more important lighting quality than color temperature. Most objects are not a single color, but a combination of many colors. Light sources that are deficient in certain colors may change the apparent color of an object. The Color Rendition Index (CRI) is a 1-100 scale that measures a light source's ability to render colors the same way sunlight does. The top value of the CRI scale (100) is based on illumination by a 100-watt incandescent light bulb. A light sources with a CRI of 80 or higher is considered acceptable for most indoor residential applications.

Glare – The excessive brightness from a direct light source that makes it difficult to see what one wishes to see. A bright object in front of a dark background usually will cause glare. Bright lights reflecting off a television or computer screen or even a printed page produces glare. Intense light sources – such as bright incandescent lamps – are likely to produce more direct glare than large fluorescent lamps. However, glare is primarily the result of relative placement of light sources and the objects being viewed.

Lighting Uses

Ambient Lighting – Provides general illumination indoors for daily activities, and outdoors for safety and security.

Task Lighting – Facilitates particular tasks that require more light than is needed for general illumination, such as under-counter kitchen lights, table lamps, or bathroom mirror lights.

Accent Lighting – Draws attention to special features or enhances the aesthetic qualities of an indoor or outdoor environment.

Lighting Maintenance

Lighting Maintenance is vital to lighting efficiency. Light levels decrease over time because of aging lamps and dirt on fixtures, lamps, and room surfaces. Together, these factors can reduce total illumination by 50% or more, while lights continue to draw full power.

Here are some suggestions for lighting maintenance and improving the optimum energy efficiency:

- Clean fixtures, lamps, and lenses every 6 to 24 months by wiping off dust. Never clean an incandescent bulb while it is turned on. Water's cooling effect will shatter a hot bulb.
- Replace lenses if they appear yellow.
- Clean or repaint rooms every 2 to 3 years. Dirt collects on surfaces, which surprisingly reduces the amount of light they reflect.
- For commercial customers, suggest group relamping. Common lamps, especially incandescent and fluorescent lamps, lose 20-30% of their light output over their service life. Many lighting experts recommend replacing all the lamps in a lighting system at the same time. This saves labor, keeps illumination high, and avoids stressing any ballasts with dying lamps.