

# Lighting

Switching to High-efficiency Lighting is the Easy Way to Save Energy



Lighting upgrades can be simple, provide immediate energy savings and improve room or home aesthetics and safety. Approximately 70% of light bulb sockets in the U.S. still contain inefficient light bulbs. Replacing with an ENERGY STAR certified light bulb, even before the current bulb burns out, is a smart decision. Start with lights that are on the most in order to maximize savings.

## Lifetime Savings

An ENERGY STAR certified light bulb:

- Saves about \$5 a year in electricity costs and can save \$135 to \$150 over its lifetime
- Meets strict performance requirements that are tested and certified by a third party
- Uses at least 75% less energy than a traditional incandescent bulb and lasts 10 to 25 times longer
- Produces at least 75% less heat, making it safer to operate and reducing energy costs associated with home cooling

ENERGY STAR certified light bulbs are available in compact fluorescent lamp (CFL) or light emitting diode (LED) technologies. They are available in a variety of shapes and sizes for any application, including table lamps, recessed cans, track lighting, outdoor spot lights and more.

## Types of Light Bulbs

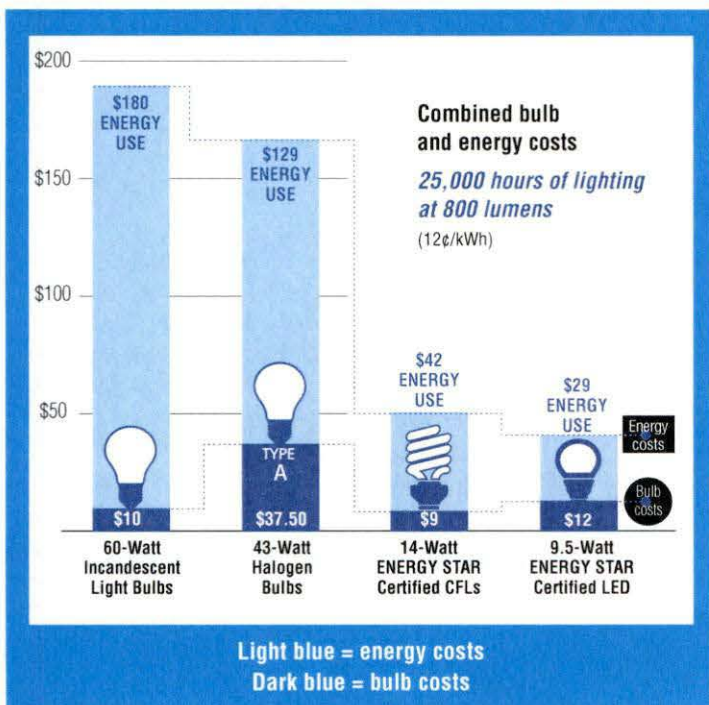
**Incandescents** produce light using electricity to heat a metal filament until it becomes "white" hot. As a result, incandescent bulbs use approximately 95% of the total energy to create light, while wasting 95% of their energy as heat. New halogen incandescent bulbs are approximately 25% more efficient than traditional bulbs with the addition of halogen gas. Traditional incandescent bulbs typically last 750-1000 hours, and halogen incandescent bulbs last up to 2,000 hours.

**CFLs** use approximately 1/4 of the electricity of incandescents to produce the same amount of light. CFL bulbs are usually identified by their "twisted" shape. CFLs are best used in sockets which are left on for at least 15 minutes at a time. CFLs typically last 6,000-12,000 hours and some, but not all, CFLs are dimmable. CFLs contain a small amount of mercury and should be recycled at the end of their life.

**LEDs** are a form of solid state lighting in which semiconductor devices produce light as an electrical current is passed through them. LED lights are available in a wide range of colors, making them ideal for signage and indicator lights. Many LED bulbs are dimmable, long-lasting and contain no mercury. LED bulbs typically last 25,000-50,000 hours.

Look for the **Lighting Facts label** on bulb packages. This label provides important information that will help in choosing the most appropriate bulb for a given condition and for comparing one bulb to another. The label lists Brightness (lumens), Estimated Yearly Energy Cost (dollars), Life (years), Light Appearance (Kelvin), Energy Used (watts), and indicates if the bulb contains mercury.

Lighting Facts Per Bulb	
<b>Brightness</b>	800 lumens
<b>Estimated Yearly Energy Cost</b>	\$1.97
<small>Based on 3 hrs/day, 12¢/kWh Cost depends on rates and use</small>	
<b>Life</b>	7.3 years
<small>Based on 3 hrs/day</small>	
<b>Light Appearance</b>	Warm ————— Cool
	2700K
<b>Energy Used</b>	15 watts



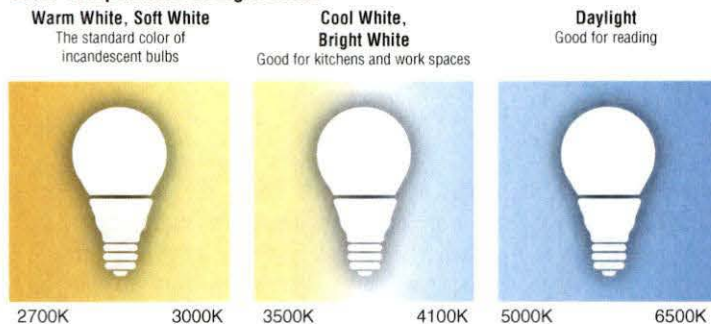
Incandescent: 60 watts, 1,000 hour life, 25 bulbs x 40¢ each  
 Halogen: 43 watts, 1,000 hour life, 25 bulbs x \$1.50 each  
 CFL: 14 watts, 8,000 hour life, 3 bulbs x \$3 each  
 LED: 9.5 watts, 25,000 hour life, 1 bulb x \$12 each

- **Brightness:** Expressed in lumens, brightness is a measure of the amount of visible light emitted by the bulb. An ENERGY STAR certified bulb uses far fewer watts to produce the same number of lumens.
- **Estimated Yearly Energy Cost:** The estimate is based on 3 hours/day of use, and does not include the cost of the bulb or additional home air conditioning costs due to heat given off by the bulb.
- **Life:** Life is based on 3 hours/day of use at full brightness. Dimming a bulb will typically extend bulb life; however this is not true for all bulbs such as CFLs.



- **Light Appearance:** Otherwise known as color temperature, different bulbs emit different colors of light ranging from cool to warm tones. While color preference is personal, most people prefer warm tones in most living spaces and cooler colors in kitchens and bathrooms.

### Color Temperature of Light Bulbs



Color temperature is measured in Kelvin (K) and generally ranges from 2700K to 6500K. The lower range is warmer (yellow) in coloration, the higher range approaches the color of daylight and is much cooler (blue).

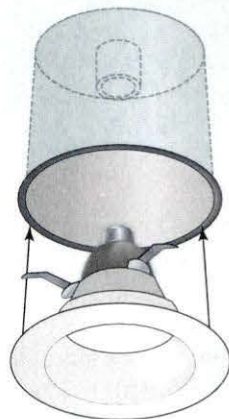
- **Energy Used:** The rate at which the bulb will consume electricity at full brightness.

Another important measure of bulb performance is Color Rendering Index, which will be listed for CFL and LED bulbs and fixtures.

- **Color Rendering Index:** CRI is a measure of how accurately an artificial light source displays colors compared to incandescent light. ENERGY STAR requires a CRI above 80.

Especially in areas of the country where cooling seasons are longer or more extreme, the air conditioner must run longer to remove the heat generated by an inefficient bulb. This means the homeowner pays double with incandescents, using energy to generate light (and lots of waste heat) as well as more energy to run the AC to remove the waste heat. And even in the winter, the waste heat delivered into the home is essentially electric resistance.

Recessed can lights present a large opportunity for improvement in most homes because they typically contribute a large percentage of the lighting electricity load and they are also primary areas for air leakage from the living space into the attic or into spaces between floors. LED retrofit kits are available that address both of these issues. By replacing both the existing bulb and trim with an integrated LED light and trim that is airtight, the fixture will become energy efficient, dimmable and will no longer be leaky.



An LED retrofit kit installs in older recessed fixtures. Air sealing at this important leak point is an added benefit beyond the savings of the LED.

## Controls and Switches

Lighting controls can play a major role in lowering lighting bills. Occupancy and vacancy sensors, dimmers and photocells are used to turn lights on only when they are needed. Most have an adjustable time-off control ranging from 5 to 30 minutes.

Occupancy sensors use infrared or motion sensors to turn light on when someone enters a room, then turn the lights off after a preset time period if no motion is detected. These are especially useful in rooms where occupants might enter with their hands full on a regular basis.

Vacancy sensors are a little different from an occupancy sensor in that they require the switch to be manually turned on when a room is entered but the sensor automatically turns the light off after motion is no longer detected for the preset time period. Vacancy sensors provide the highest level of savings since they never turn on when not needed.

Dimmers allow the light to be customized to the activity of an area. Dimmers may extend the life of light bulbs as well as lower energy consumption. They can be used with incandescent, LED, and dimmable CFLs. Use of dimmers with regular CFLs can shorten bulb life and cause flickering but dimmable CFLs are available. Make sure the dimmer switch and bulb are compatible.

Some lighting controls use a combination of control features, such as a dimming occupancy sensor. This allows room light to be set to an optimal level and also turn off automatically when not needed. LEDs work extremely well with dimmer controls.

## Disposal

Proper disposal of non-serviceable CFLs is important because they contain minute amounts of mercury. Contact local recycling resources for more information about proper disposal – today most big box hardware stores offer free recycling of CFLs. LED bulbs can often be accepted at electronics recycling events. Since efficient bulbs should last much longer, disposal will be less frequent.

## Fixtures

Some owners choose to replace or add fixtures to improve the look, efficiency, or safety of their home. Good choices for replacement fixtures are ones that carry the ENERGY STAR label. These are available in a wide variety of styles, designed to distribute light evenly and efficiently with use of two-pin CFL or LED bulbs. Most also carry a three-year warranty, above the industry standard. Some, particularly exterior fixtures, also include controls that balance safety with energy efficiency, such as motion sensors and photocells which turn the lights on automatically at dusk for a designated amount of time.

Another common-sense upgrade is to use only LED holiday lighting. Not only are light strands available in every color, they are energy efficient, last longer and are safer for indoor and outdoor use.