

Lighting



In 1879, Thomas Edison perfected the incandescent light. For the next 100+ years, lighting did not change much. The materials and bulb life improved, but the functionality of light bulbs in American households went largely unchanged for more than a century. However, incandescent light bulbs are exceptionally inefficient light makers, using only 10 percent of the electricity input to produce light! The other 90 percent of energy used by an incandescent is wasted as heat energy.

In 2007, the Energy Independence and Security Act was passed, and among other things it mandated improved efficiency in light bulbs sold in the United States. Today, CFL and LED lights are much more affordable and commonplace than they were even ten years ago. As technology has improved and production increased, the cost of these bulbs reduced to the point that now they are just as affordable as traditional, inefficient incandescent light bulbs.

This Is Your Light!

Sometimes it's easy to just grab the least expensive light bulb and be done with it. A light bulb is a light bulb, right? Well, not exactly. Some bulbs are a little more expensive than others, but they also last much longer, too. This activity will help you consider the entire life cycle cost of different light bulbs to use in your home.

Materials

- Internet access to a light bulb retailer, a trip to a light bulb retailer, or the packages of light bulbs you have already recently purchased
- Your home's electricity cost per kilowatt-hour (from your electric bill)
- Calculator

Procedure

1. Choose a halogen incandescent (halogen), a compact fluorescent (CFL), and a light emitting diode (LED) bulb that each produce about the same number of lumens of light. You can find this information in the Lighting Facts label on the package.
2. Record the watts, lumens, expected life, and purchase price of each bulb.

When shopping for a light bulb, consider two important pieces of information, both of which are found on the Lighting Facts label of the bulbs. The first is how many watts of power the bulb uses to produce light. This will tell you how expensive the bulb will be to operate. The second is how many lumens of light are produced. Always compare lumens produced when comparing one bulb to another. You may also find it useful to look at color temperature, which indicates the color of the light produced. Higher temperatures are brighter, bluer light while lower color temperatures are softer, more reddish or yellow light.

3. Circle the life span for the bulb that will last the longest. This is the number to which you will standardize all of your other calculations. In other words, if the LED bulb will last 25,000 hours, and this is the longest life span of all of the bulbs, all other light bulbs must be calculated to 25,000 hours. This ensures a fair comparison.
4. Determine how many light bulbs of the other types are needed to equal the life of the longest-lasting bulb. Record this in the table.
5. Multiply the purchase price per bulb times the number of bulbs needed to give the standardized hours of light. This is the total purchase price.
6. Convert watts to kilowatts in the data table by dividing the wattage of each bulb by 1,000.
7. Multiply kilowatts by the life span to which you are standardizing (25,000 in the example). This is the total energy used in kilowatt-hours by each bulb.
8. Multiply kilowatt-hours by the rate your utility charges, rounding to the nearest cent. This is the operation cost of each bulb for the stated number of hours of light.
9. Add the operating cost to the purchase price to get the entire life cycle cost for each type of light bulb.

This Is Your Light!

Data



| | INCANDESCENT BULB | HALOGEN | COMPACT FLUORESCENT (CFL) | LIGHT EMITTING DIODE (LED) |
|--|-------------------|---------|---------------------------|----------------------------|
| Lumens | | | | |
| Watts | | | | |
| Expected life span | | | | |
| Cost for one bulb | | | | |
| Number of bulbs needed | | | | |
| Purchase Price | | | | |
| Watts (copied from above) | | | | |
| Kilowatts | | | | |
| Hours of operation (copied from circled value above) | | | | |
| Total kilowatt-hours | | | | |
| Electricity rate (from utility bill) | | | | |
| Operating Cost | | | | |
| Purchase Price (copied from above) | | | | |
| Total Life Cycle Cost | | | | |

Discussion

1. Which light bulb is the least expensive when accounting for the entire life cycle cost?
2. Many utilities sell efficient light bulbs at a reduced cost. How many light bulbs can you replace in your home to use a more efficient light style?
3. If you change five light bulbs, each for a more efficient bulb, how much money will you save over the life of the efficient bulbs?