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Saving Energy One Lightbulb at a Time

In 1990, Orange & Rockland Utilities offered to replace the incandescent lightbulbs in my home with compact fluorescent lightbulbs (CFL) free of charge. Orange & Rockland's highly publicized program was intended to show customers that they could reduce their lightbulb electric bill by two-thirds by switching to CFLs.

Compact fluorescent lightbulb

The electricity conservation program aimed to push past consumer reluctance to purchase more expensive CFL bulbs by showing that the cost of each bulb would be eclipsed by savings on electric bills and longer CFL bulb life. A CFL bulb lasts 6 to 10 times longer than its incandescent equivalent, which means replacing bulbs only once every 8 to 10 years. So far—15 years after I received the CFL bulbs—I've replaced just one.

Why would a utility company push a program that would reduce its customers' electric bills? Research conducted by the Electric Power Research Institute (EPRI) since 1973 indicated that the demand for electricity was growing at twice the speed of our nation's ability to meet demand. EPRI called for conservation and so did the New York State Public Service Commission's Demand Site Management Program, which financed the lightbulb swapping program. Since 1991, peak demand in the areas served by Orange & Rockland Utilities has increased 50 percent. Without a doubt, we will all need to use conservation, alternate energy sources and new technologies to address future demand.

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The amount of light from a light source is measured in lumens; the amount of electricity a device uses to run is measured in watts. In the case of incandescent bulbs, the larger the wattage of a bulb, the more light it will produce. However, most of the wattage consumed produces heat rather than light. A 100 W incandescent lightbulb produces about 1,600 lumens, which equals the light output of a 32 W compact fluorescentlightbulb.

The basic designs of these two types of lightbulbs determine their power needs. An incandescent bulb uses electricity to heat a filament until it glows red, giving off both heat and light. A CFL bulb has glass tubes coated with phosphors. When stimulated by electricity, the phosphors emit light, with almost no heat as a by-product.

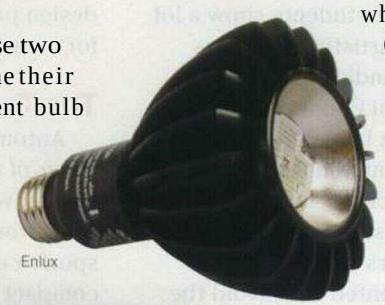
Photo above shows the Enlux LED white floodlight.

Shown at left, red, green and blue LED lights on the circuit board combine to produce white light.

Convincing the public to use more efficient lightbulbs hasn't been easy. Perhaps the solution involves introducing another, even more efficient lighting system that uses solid-state electronics to harness the potential of the light-emitting diode (LED). A lightbulb built around LEDs uses even less electricity than a CFL bulb as it produces light by moving electrons through a semiconductor circuit.

A 2005 U.S. Dept. of Energy study indicated that simply switching home and office lightbulbs to LED lighting could "cut electricity costs by $100 billion over the next 20 years." You don't have to wait to try LED lighting at home—a number of companies currently sell LED-based bulbs. The one that I find most interesting is made by Enlux, in Chandler, AZ. Their LED floodlight recently won top honors from *Popular Science* in the magazine's "best of what is new" home technology category.

The Enlux bulb uses an LED array on a circuit board that the company calls a "light engine." By clustering a large number of LEDs on a single board, Enlux has created a more concentrated light source that produces a great deal of heat. Since heat would lessen the life of the bulb, which Enlux rates at 50,000 hours, the company developed an aluminum fin design to serve as a heat sink, which keeps the bulb at an optimum working temperature. The Enlux LED lightbulb that I tested uses 22 W to produce about the same amount of white light as a 65 W incandescent bulb. Can you imagine replacing a lightbulb only once every 35 years?



Enlux

Recalling the Facts

1. Why is the general population reluctant to adopt CFL bulbs?
2. Do you think people will more quickly adopt LED bulbs as they become available? Why?
3. Describe how incandescent, CFL and LED bulbs convert electricity into light. ©