Let There Be (LED) Light

You've no doubt heard that U.S. power plant emissions have been dropping overall and that one of the reasons has been decreased thermal generation resulting from essentially flat demand. As of Jan. 1 this year, you have former president George W. Bush to blame, or thank, for a major factor contributing to that nearly flat demand growth: more energy efficient lightbulbs.

More Heat Than Light

Incandescent bulbs (or lamps, as they're called in the industry) convert less than 10% of the energy used into light, wasting over 90% as heat. That heat can add to space-cooling needs, which adds to overall energy costs. The energy-efficiency standards Bush signed into law in 2007 require new bulbs to use about 25% less energy than common incandescent models, but some are even more efficient.

As of the new year, producing and importing 100, 75, 60, and 40 W bulbs is banned. But that doesn't mean the "death" of incandescents. The law has loopholes for "rough-service," specialty (as in appliances and chandeliers), colored, low-wattage, three-way, and halogen bulbs—technically, a more sophisticated, and expensive, type of incandescent. However, for most applications, you'll have to choose something else when your stockpile of Edison filament lamps burns out.

Cost Containment

Lighting accounts for roughly 10% to 12% of average residential electricity costs and 19% of power use nationwide. Cut that percentage by 25% to 80%, and over time, more expensive bulbs pay for themselves. However, in our immediate-gratification, throw-away culture, low first costs get all the attention. We can tell ourselves we are saving money by buying replacement incandescents at a lower price than the light-emitting diode (LED) bulbs displayed on the next shelf, but eventually, we pay the price for first-cost thinking—in higher electricity bills and more-frequent bulb purchases.

LED prices range enormously, depending upon the style, rating, quality, and where you buy them, so I'll use the example of eight recessed flood lights we recently bought at Costco to replace a hodgepodge of "traditional" and compact fluorescent light (CFL) models we were testing in our kitchen. (Our first LED switchover was made in the garage. No regrets there, as we have higher lumens, zero flicker, and no cold weather performance penalty, as with fluorescent tubes.)

Our LEDs (for replacing the equivalent of 65 W bulbs) are shaped like the original lamps, use 13 W, and deliver 750 lumens for an estimated annual cost of $1.57 per bulb, according to the manufacturer (based on 3 hours/day at 11¢/kWh). At the same electricity rate and usage level, a 60 W incandescent's energy cost would be $7.23/year. With savings of $5.66/year/bulb, each $18.75 LED should pay for itself in 3.3 years. (It's possible to get other styles of 60 W-equivalent LEDs for even less.)

Yes, low-income consumers may need to budget for a gradual transition to LEDs, putting them first in fixtures used most frequently (so they save the most on their electricity bills) and using CFLs as a "bridge" technology elsewhere. They will also find that many utilities offer bulb replacement incentives.

Go Directly to LED

The Department of Energy claims that by 2027, "widespread use of LEDs could save about 348 TWh (compared to no LED use) of electricity: This is the equivalent annual electrical output of 44 large electric power plants (1000 megawatts each)." Does that mean more plant closures? Perhaps, though they are more likely to be fossil than nuclear plants, despite the title of Michael Kanellos' Oct. 28 Forbes.com article, "Can LED Bulbs Make Nuclear Plants Obsolete?"

As noted, initial costs for incandescent alternatives may determine technology choice for some. But of the available options, LEDs are clearly the way to go. Energy efficiency is the main reason they are being promoted, but LEDs also offer superior safety, lighting quality, and longevity benefits.

Current LED bulbs are sold in a range of lumen (rather than wattage) ratings and can offer dimmable capability and wider angles of light dispersion than earlier models. You can also choose bulbs along the spectrum, from "cool" to "warm," depending on their Kelvin rating. Though we all grew up under yellow-toned incandescent light, "cool white" bulbs provide "cleaner" light, more like natural daylight, which can be useful for settings where you want to reveal true colors.

Compared to CFLs, LEDs promise longer life (22.8 years at 3 hours/day for the model we bought) as well as full lumens when you flip the switch, instead of the warm-up period needed for fluorescents. And, unlike CFLs, they contain zero mercury (I'm with my predecessor in finding the Environmental Protection Agency's instructions for cleanup of broken CFLs impractical).

Longevity offers benefits beyond life-cycle cost. For our house, it means we should never again have to drag out the pole light bulb changer to replace bulbs. For power plants, which are increasingly switching to LEDs, it means both lower operating costs and decreased maintenance—a growing concern for budget- and staffing-constrained plants. For example, portions of Arizona's Palo Verde Nuclear Generating Station, the largest nuclear plant in the U.S., have been upgraded using 130 LED fixtures. The fixtures' manufacturer, Albeo Technologies, claims expected savings in energy consumption will pay for the cost and installation within two years.

If you still can't handle this year's sticker price for LEDs, manufacturers claim prices will fall as demand for LEDs ramps up. You can thank me for being an early adopter when you buy your first LED lamps next year. ■

*—**Gail Reitenbach, PhD** is editor of POWER. Follow her on Twitter @GailReit and the editorial team @POWERmagazine.*