

The Switch Is On

By Mark Fischetti

1 Incandescent lightbulbs may be history. As of 2007, compact fluorescent lightbulbs (CFLs), which are more energy-efficient, had made only modest inroads because they were more expensive. But in December the U.S. Congress passed a major energy bill that included a new lighting standard. By 2012 manufacturers selling any 100-watt (W) bulb must make it 30 percent more efficient than today's 100-W incandescent bulb. Similar requirements will phase in for 75-W bulbs in 2013 and 60-W and 40-W in 2014. Europe has passed its own rules, too. CFLs already meet the specs, and although makers will try to improve the old hardware, the new bulbs clearly have the edge and continue to improve.

The technology inside a lightbulb is quite advanced [see illustrations]. The tungsten filament in an incandescent glows at more than 2,200 degrees Celsius and must be made perfectly uniform because any tiny imperfection will cause it to rapidly burn out. Yet only about 10 percent of the electricity entering the bulb is emitted as visible light; 90 percent or so is radiated as heat. A CFL is about four times as efficient as an incandescent bulb. A 26-W CFL can therefore shine as brightly as a 100-W incandescent, requiring only one quarter of the energy. The tubular fluorescent bulbs common in overhead lighting are slightly more

efficient still but do not fit standard light sockets, as CFLs do.

CFLs still present some problems, which manufacturers are solving. For example, some consumers find the light too harsh. "The human eye wants to see all color wavelengths," says James Dakin, senior consulting engineer at GE Lighting in Cleveland, but the phosphor coating inside the bulbs fails to emit certain wavelengths. Phosphor improvements are filling in those holes, Dakin explains.

Early bulbs took several minutes to reach full output and may have hummed or flickered, but the electronic ballasts that have replaced the original magnetic ballasts have ended those shortcomings and also allowed smaller tubular shapes. "We have a huge effort under way to create CFLs that are suitable for more applications," says James Meyer, general manager of GE Lighting. Lowering cost further, he says, is now mostly a matter of even greater mass production.

Light-emitting diodes (LEDs) could also pose competition in years to come; the solid-state lights are about as efficient and last three times longer than CFLs. But the screw-in versions struggle to outshine even a 25-W incandescent and cost far more. For now, CFLs have the brightest future.

