



CAN A NEW LIGHTBULB SAVE THE WORLD?

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There may be a bright idea in the ongoing effort to balance America's consumption of energy with the need to protect the environment -- a better light bulb.

In the U.S., light bulbs account for one quarter of all electricity used, but waste nearly half their energy.

But recent scientific breakthroughs in light-emitting diodes could reduce national energy consumption by 29 percent by 2025 for a total savings of \$125 billion, according to the Department of Energy.

Light-emitting diodes

Light-emitting diodes or LEDs are semiconductor materials, such as arsenic, gallium and nitrogen that emit light when an electrical current flows through them.

LEDs have the potential to be significantly more energy efficient than the commonly-used incandescent light bulb, in which a wire enclosed in a glass bulb gives off light through heat generated by an electric current.

While incandescent light bulbs use 95 percent of their energy to generate heat and 5 percent for light, LEDs could use nearly 100 percent of their electricity to directly create light, consuming significantly less energy.

Incandescent light bulbs typically last 850 hours, although long-life bulbs can last up to 2,500 hours. LEDs vary in life, but some white LEDs can last up to 50,000 hours or nearly six years of constant use.

Scientific breakthroughs

Red, yellow, and green LEDs have been in use since the 1960s. The color depends on the type of material used.

At first they were used to light-up the numbers on digital clocks, but now you can find them in some cell phones, car dashboards and large stadium screens.

In 1993, a Japanese company produced the first blue LEDs, which produced white light when mixed with red and green LEDs. This breakthrough set off a wave of research and improvement in white LEDs -- which could be used in homes and offices.

However, the light produced by most white LEDs can make skin look sickly and are not as pleasing to the eye as that of incandescent lighting.

But researchers in the U.S., Europe, and Asia, realizing the power and potential of light-emitting diodes, are determined to continue improving LEDs.

Advances in LED technology could lead to a whole new concept of home and office lighting -- without light bulbs.

"It's not going to just change the light bulb; it will change the lighting paradigm," Arpad Bergh of the Optoelectronics Industry Development Association told the Technology Review.

General Electric (GE) has said it is close to introducing a white LED device that would use half to one-third the energy of an average incandescent bulb and last six times as long.

But LEDs are not the only game in town in the race to change the light bulb. Organic light-emitting diodes, which diffuse a patch of light instead of a bright point of light, could lead to light sheeting on walls, ceilings, curtains, and even furniture.

Widespread use

LEDs are already becoming more common in some places, such as traffic lights. According to research firm Strategies Unlimited, 39 percent of all red lights and 29 percent of all green lights use LEDs.

Bright white LEDs can be found in many flashlights and hiking lamps and LEDs light the rotunda of the Jefferson Memorial in Washington, DC.

But despite their energy efficiency and electricity savings potential, white LEDs have not yet gained popularity in mainstream markets. At around \$20 an installation, the \$0.75 incandescent bulb still has the market cornered.

The challenge now facing researchers is to bring quality up and price down.

Environmental impacts

The growing use of a better bulb is just one part of a national effort to conserve energy and prioritize its use. The Alliance to Save Energy found that since 1973 energy efficiency technologies and conservation efforts have led to a 40 percent cut in the amount of energy consumed in the U.S.

Despite these efforts to use energy more efficiently, environmental activists are still concerned about how that energy is made. Over 70 percent of the electricity in the U.S. is still generated by burning fossil fuels such as oil, gas, and coal.

Burning fossil fuels results in the emission of carbon dioxide, causing global warming and rising sea levels. When coal is burned, it can lead to acid rain, which kills fish and trees.

"If we don't curtail our energy use, we could face higher prices if not running out of fossil fuels," said Ronnie Kweller of the Alliance to Save Energy. "We can't stay on this path of ever increasing energy use and air pollution. It's just not a sustainable approach."

For More Information Visit: <http://www.microscopy.fsu.edu/primer/java/leds/basicoperation/>

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