

A light bulb moment

Story Highlights

- Christmas trees are being decorated with new highly efficient LED lights
- New white LED lights currently being fine tuned to replicate sunlight
- LED lights are energy efficient and long lasting reducing waste and contamination

LONDON, England (CNN) -- Even the most cheerless environmental activist would find it hard not to register the faintest trace of a smile at seeing Christmas lights shimmering in the murk of a December evening. Any lingering sense of 'green guilt' about the environmental cost of a billion festive bulbs being switched on should quickly dissipate in the bursts of electric color festooning our streets and houses.

But if that isn't enough to placate an ardent green activist there is, thankfully, environmentally-friendly light at the end of the tunnel. Steps to make our Christmas' greener are already being made. Christmas trees all over the world, including the one on Capitol Hill in Washington D.C. are being decorated with highly efficient LEDs (Light Emitting Diodes).

Nobel Prize winning former Vice President Al Gore has, up until now, experienced high electricity bills at his Tennessee mansion. But he has recently completed a number of improvements making his home more energy efficient - right down to the lights on the family's Christmas tree.

Moreover, it is expected that the lights will go out on one of the world's most ground-breaking inventions -- the incandescent bulb -- consigning its environmental profligacy of the past. Thomas Edison's long lasting filament bulb -- patented in 1879 and updated with a tungsten filament by William Coolidge in 1910 -- which has been the blueprint for decades will be completely phased out in Australia and the UK by 2010 and 2011 respectively. California has also made plans to implement a bulb ban.

Alternatives, as any energy-conscious consumer will know, are already widely available on the high street. Compact fluorescent lamps (CFLs) -- have been around since the 1980's and use only 20 percent of the energy required by incandescent bulbs and last 12 times longer. And according to Greenpeace, halogen bulbs -- which on average last twice as long as regular bulbs -- account for about seven percent of light bulb sales in the UK.

But these impressive energy savings for the home will, researchers think, eventually be trumped by LEDs.

LEDs are semi-conductors that convert electricity into light. They are an incredibly green source of illumination boasting long life (up to 100,000 hours), energy efficiency (up to 90 percent less energy used) and are non-toxic, unlike their fluorescent cousins which contain mercury. They also come in a variety of colors and because they have no moving parts they are extremely durable.

LED's have been found in all sorts of electrical goods for many years -- standby buttons on computers and televisions are good examples. In more recent times they've been applied in consumer electrical staples like the mobile phone and back lights for flat screen televisions. They are also being used on



A visitor looks at the Capitol Christmas Tree after the lighting ceremony on Capitol Hill. This year's tree is decorated with strands of energy-efficient LED (Light Emitting Diodes) lights.

our roads, in traffic and car brake lights. Because they take just 20 milliseconds to light up -- over ten times faster than incandescent lights -- they allow for an extra 24 feet of stopping distance at 50 mph, thus saving lives.

The application of LEDs to such a wide range of products owes much, if not all, to the work of Professor Shuji Nakamura who in 1993 astonished the scientific community by creating the first successful blue light-emitting diode. A green LED followed, then a white one. His work, which won him the Millennium Prize in 2006, paved the way for what had been something of a holy grail for scientists over the years -- to find an LED which can provide white light that is suitable for use in our homes.

White LED light is created by putting a coating of phosphor over a blue LED light. The phosphor absorbs most of the blue light but, at the moment still gives off quite a cold light, which remains unsuitable for the home.

Although 'white light' is already in the marketplace, researchers worldwide are still refining its glow, with the aim of replicating the warmer light of the sun. The Lighting Research Center at the Rensselaer Polytechnic Institute in New York is the world's leading university-based research and education organization devoted to lighting. CNN spoke to its Director of Research Professor Nadarajah Narendran about some of the current LED applications and its prospects of lighting up our homes.

"LED technology is different to the light sources we have had in the past," Professor Narendran told CNN. "And at the Lighting Research Center we try to educate the public in how best to use this new light technology. "The issues with LEDs are no longer technical," Professor Narendran said, "they are about cost. But even that has been coming down rapidly in the past few years."

Professor Narendran described the work of the Center as more system based than technical, i.e. looking at how best to implement LED lighting in a given environment rather than researching the LED chip materials that create the light. Although recently they have developed a new white light that has a warmer glow to it. In recent years the center had helped Boeing with the interior lighting on the new Dreamliner aircraft, looking at how lighting fits into the limited space of the fuselage and how different light hues affect the comfort of passengers. A more down to earth LED application has been to replace the lighting in supermarket freezers. "LEDs perform better in the cold than traditional fluorescent lamps," Professor Narendran said.

More universal light sources -- like office spaces -- will have to wait a little bit longer for LEDs says Professor Narendran. "Replacing fluorescent office lamps is probably the wrong LED application right now. But in two years time the story might be completely different," he said.

"Currently, spotlights are a perfect application for LEDs, because you can direct the beam very well, and you have less wasted light," he said. Although, like an incandescent bulb, LEDs create heat, a far greater proportion of the energy is converted into light. "In a traditional bulb only 5-6 percent is converted into light, the rest is infrared radiation," Professor Narendran said.

Not too far in the future we will be utilizing LEDs, not just to light our homes, but to radically alter the mood and appearance of public spaces and buildings. "We can change LED colors very easily and cheaply," said Narendran. Architects will be sharpening their pencils in anticipation of the aesthetic possibilities.

With all these benefits, the LED light will be an unequivocally positive environmental step towards reducing carbon emissions.