



# The **light** at the end of the tunnel



**LED lighting technology** has the potential to slash electricity consumption in the UK – reducing carbon emissions by an estimated 23m tonnes – and dramatically cut energy bills. UK material scientists are at the forefront helping this technology penetrate the domestic and office markets by increasing its affordability.

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**23m tonnes**

Potential cut in UK  
CO<sub>2</sub> emissions from  
GaN lighting.

Over the last couple of years, low energy light-emitting diodes (LEDs) using gallium nitride (GaN) have begun appearing in applications such as camera flashes, bicycle lights, mobile phones and interior lighting for buses, trains and planes. Even the façade of Buckingham Palace is now illuminated using GaN LEDs.

The Cambridge Centre for Gallium Nitride has established itself as a world-leading authority at the cutting edge of GaN research. Set up in 2000 and underpinned by EPSRC funding ever since, it has recently developed a detailed new theory that explains the mystery of exactly why GaN emits light so strongly. Such understanding is absolutely vital to improving GaN lighting's quality and slashing manufacturing costs.

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**100,000 hours**

Lifetime of GaN bulb.

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But for GaN, home and office lighting is the real Holy Grail. Such lighting currently accounts for around 20 per cent of UK electricity consumption. GaN could reduce this to five per cent. Switching to GaN lighting could therefore deliver major cuts in carbon dioxide emissions from power stations and preserve fossil fuel reserves.

**"GaN LEDs have huge potential,"** says Professor Colin Humphreys, who heads the Cambridge centre. "In particular, they are incredibly long-lasting. A GaN LED can burn for 100,000 hours. In practical terms, that means it only needs replacing after 60 years of typical household use. Also, unlike the energy-saving compact fluorescent lights now in use, GaN LEDs don't contain mercury. Disposal therefore isn't such an environmental headache.

At present, GaN LEDs are too expensive to manufacture for wide-scale deployment in homes and workplaces. However, the University of Cambridge based Centre for Gallium Nitride, supported by EPSRC, has developed a new way of making GaN which could produce LEDs for a tenth of the current price.

"GaN lighting should start making its mark in homes and offices within about five years," says Professor Humphreys. "That won't just be good news for the environment. It will also benefit consumers, in terms of convenience, electricity bills and quality of life."

This lower cost method could mean cheap mass produced LEDs become widely available for lighting homes and offices within the next five years.



**23<sup>m</sup>  
tonnes**

Potential cut in UK CO<sub>2</sub>  
emissions from GaN lighting.

**Research Councils' Energy Programme,  
led by EPSRC**

The mission of the Energy Programme is to position the UK to meet its energy and environmental targets and policy goals through high quality research and postgraduate training. The programme builds on a strong portfolio in power generation and supply and aims to grow the portfolio areas of demand reduction, alternative energy vectors, transport and security of supply.

