

A BRIEF GUIDE TO ENERGY-EFFICIENT LED LIGHTING

Above Holy Sepulchre, Peterborough

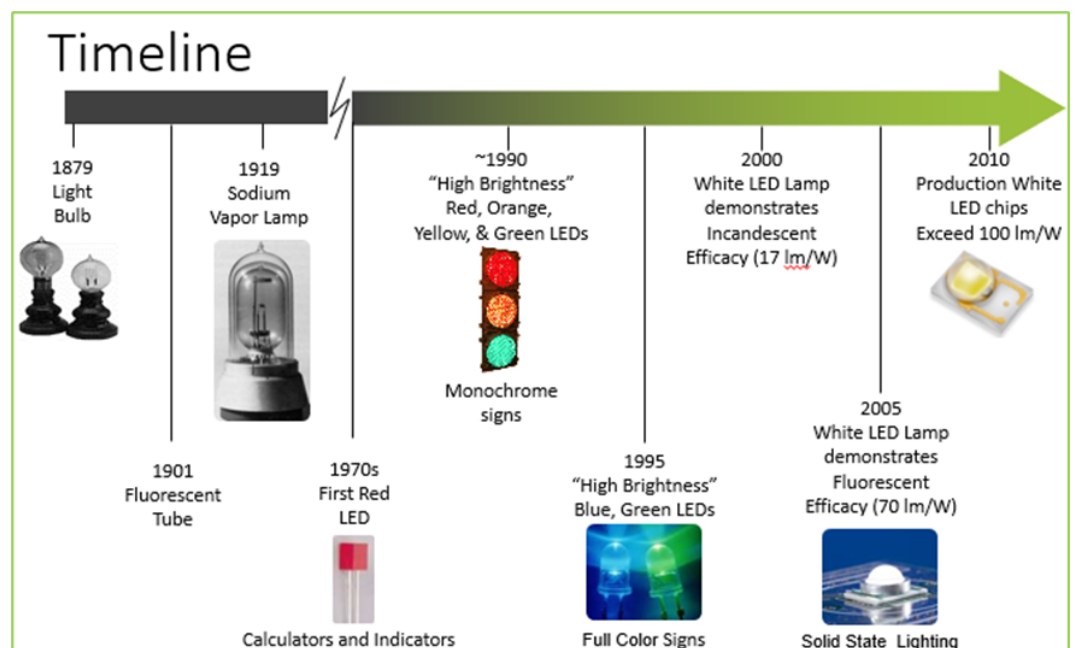
Introduction

This is one of a series of short guidance notes on the technologies which can help the Church move towards net zero carbon. It has been written on a pro-bono basis by [Briar Associates](#), on behalf of the Cathedral and Churches Buildings Division, with input from the Diocesan Environment Officers Energy Group.

Light emitting diode (LED) lighting has established itself as the most efficient form of modern lighting. Installing it in churches, schools and associated buildings bring benefits such as:

- reduced energy consumption
- reduced cost
- reduced carbon footprint
- improved colour temperature
- improved safety.

Lighting technology has never stopped developing, and the last few years have demonstrated this with a step change in the development of LED lighting systems.



Why change to energy efficient lighting?

LED lights are far more efficient than other types of light bulbs and fittings and last longer. Older style incandescent light bulbs (the old 100W light bulb that used to be common-place in houses) last approximately 1,000 operational hours. Normal fluorescent light bulbs / lamps typically last for 15,000 operational hours. LED, by comparison, can last between 50,000 and 75,000 hours, although you might not achieve quite this long with intermittent use in a church.

It is advised that for larger lighting projects, a specialist lighting contractor is used. They will be able to provide the most suitable solution, with the best mix of energy savings and convenience.

Cost, Safety and Maintenance

LED lights need to be replaced less often than incandescent or fluorescent light bulbs or tubes. Replacing light fittings less reduces waste and the impact on the environment by reducing the quantity of material sent to landfill, it also reduces the quantity of raw material required to make the fittings.

As they last longer, the cost of replacement fittings, although more expensive than incandescent light bulbs, needs to be spent less often. Churches can purchase LEDs through [Parish Buying](#).

In addition, replacing lights less often also reduces the installation and maintenance costs, as the true cost of replacing a light fitting not only includes the cost of the light bulb itself, but also the labour cost to replace it.

Furthermore, some lights are located in difficult to reach locations and sometimes necessitate the use of costly access equipment to reach them safely. Any use of access equipment such as ladders, access towers or scaffold has associated costs and risks.



Above: **Pershore Abbey**

Methods of installing LED

There are two typical routes to installing LED lighting, you can either continue to use the same light fittings and just replace the lamps (bulbs) in them with new LED lamps, or you can completely replace the entire lamp fitting.

Just change the bulbs!

The less costly option is to replace the existing light bulbs with new LED versions. This allows existing ornate fittings to be retained, and is quite a simple procedure for many types of bulb. However, consideration should be given to the life expectancy of the light fitting itself. Installing LED lamps into a 15 year old fluorescent fitting could prove a false economy, as the existing switchgear in the light fitting will be at the end of its life and could fail in the short term.

In situations where standard household bulbs are in use within a church, hall or school, it is an excellent idea to replace these with modern LED bulbs. Types with higher lumen levels for the bulb wattage should be chosen, as they provide more light for the power consumed.

This may not work, however, if you have dimmers. If the church lighting system uses a dimmer, compatible bulbs must be used, or the lifetime of the expensive dimming equipment is shortened. Replacing a conventional bulb with an LED on a dimmer switch can produce unpleasant flickering.

New fittings

Although more costly, completely replacing existing light fittings is the better long-term solution, as the potential for short-term failure is removed.

Replacing entire fittings with LED alternatives can drastically reduce the cost of running lighting by up to 80%.

All light fittings can be replaced with LED alternatives, both inside and out including flood lighting, which many churches employ for both security and aesthetic reasons. Ceiling grid lighting and strip lights often found in halls and classrooms are also easily exchanged / replaced by modern LED alternatives.



Above: **St Brandon, Brancepeth**

Lighting design

Working out what you need the lighting to *do* for you is the critical first step. You need to consider what activities you need the lighting for, now and in the future, and in which parts of the building. What features do you want to draw attention to, such as the altar, arches or paintings? Do you want different moods for evening services, weddings or concerts? What zones do you want within the building, because certain areas are used more often?

This is covered more in the full [Church of England lighting guidance](#).

Specifically, in relation to LED lighting, energy savings can be realised by undertaking a redesign of the lighting when replacing old fittings with new LED lighting. A lighting engineer can assess the requirements for lighting, and it is often the case that less lights will be required to maintain, or even improve, the required light levels than are currently installed.

The frequency and brightness of the lights chosen can have a significant impact on some fragile fabrics and materials: if this is relevant in your church you must seek advice from a qualified conservator before changing your lighting.

Lighting controls

Lighting controls can be added to lighting systems to regulate the use and prevent waste. These include the following sensor options:

- passive infra-red (PIR),
- microwave (for large areas)
- day light (LUX level)

PIR and microwave sensors sense when the space is in use and are great in situations where lights get accidentally 'left on'. Daylight sensors can limit the output of light being emitted by light fittings by sensing how much daylight is illuminating rooms naturally. These control systems allow further savings to be achieved. A lighting contractor would be able to advise on the most suitable type of sensor.

Colour temperature

An added benefit of installing LED lighting is to improve the colour of the light being emitted, or in other words, alter its colour temperature. Some flood lights (SON lights in particular) have an orange glow, this then changes the appearance of a building. LED lights can be various types of white ranging from warm to cold, The correct white light should be specified and installed, so that buildings can be illuminated to show their true appearance and not have an orange glow. Installing trial bulbs of different colour temperatures will help you choose the best ones.

Floodlighting and path lighting

Energy efficient lighting is also useful for external lights, such as floodlighting and path lighting. This will save energy and money. (Where appropriate, reducing the hours of use is also a very effective energy-saving measure.)

Lumen depreciation and guarantees

Unlike conventional light sources that reduce in output and eventually fail, LED products do not normally suddenly fail. Instead, the light output reduces over time. The normal convention is to measure the life from when the output has reduced by 30%, i.e. when there is 70% light output remaining. This is often quoted as the L70 life and is measured in hours. It is worth checking the L70 life when choosing your bulbs.

Bulbs will come with guarantees, and it worth checking these carefully. Guarantees are typically for 3-5 years. However, the manufacturer will only supply you with a new bulb, not cover the cost of the labour and access to replace it. Consider purchasing higher quality bulbs for the high up lights which it is hard to replace, to avoid expensive replacements.

Suggested first steps

A local electrician would be able to advise on small upgrades that may be required. All electrical work should be carried out by qualified electrical contractors registered with the EICIEC or NAPITT organisations. For larger jobs, you will want to speak to a lighting contractor.

An independent energy audit can be a good place to start, to put a project like this in the context of all the changes you could make. Parish Buying offers energy audits, as do some dioceses.

For more information on lighting in historic buildings (internal, external, and emergency exit signage) please refer to the Historic England guidance;

<https://historicengland.org.uk/sitesearch?search=lighting>

And the Church of England guidance;

<https://www.churchofengland.org/resources/churchcare/advice-and-guidance-church-buildings/lighting>

Our Net Zero webinar programme includes a session on how church lighting can increase energy efficiency: <https://www.churchofengland.org/about/policy-and-thinking/our-views/environment-and-climate-change/webinars-getting-net-zero-carbon>

Below: **Boxgrove Priory**

