Free Range Practice Guide No. 2:

Switching to Low Energy Lights

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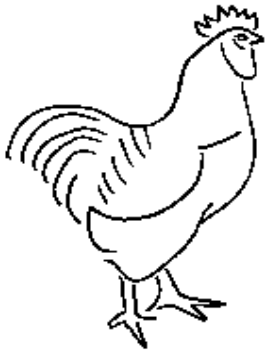

Changing your light bulbs saves energy and can cut your electricity bill

We all use lights – at home and at work. Lights use electricity. Every year the UK 'burns' away millions of pounds worth of electricity to produce light. Depending on how you use electricity in your home, lighting can account for 20% to 40% of your bill.

Many people use incandescent bulbs. These bulbs have not advanced technically since the early Twentieth Century. They are cheap, uncomplicated, and easily available. But they are inefficient (see 'techie talk').

Today there are more efficient alternatives to the incandescent bulb.

Natural light

The level of light that comes through a window on an average day is far more powerful than the lights plugged into the light fittings. The problem is that often this light is not well used, particularly in workplaces.

The first step to saving on the power used for lighting is to maximise the use of natural light during the day. You can do this in a number of ways:

- Keep the windows clean to maximise the level of light passing through.
- Use a long curtain rail so that you can pull the curtains back to the wall. This ensures that light is not obstructed from entering the room.
- Paint the surrounding wall/architrave of the window white, and keep it clean. This reflects more light into all areas of the room during the day.

Using natural light is as important as improving your lighting – natural light is free.

The efficient use of lights

Most of the lights in our homes are covered up – under shades. Shades are important because they diffuse light – ensuring that you are not dazzled, which can cause eye strain.

You must ensure that your lamp shades are kept clean and free from dust. Dirty shades are less transparent, meaning that light will be wasted.

Some houses use light fittings that bounce light off the ceiling from a number of points. These are only efficient if the ceiling is painted a light colour – preferably white – and it is kept clean.

Another issue with lights is that people will use high-power bulbs in situations where they are not required – such as beside lamps, sidelights, etc. Checking the values of the bulbs you have installed, and trying low values for a time to see if they are suitable, is a means to reduce your costs for the investment of very little cost or effort.

Finally, you should use lighting where you need to have it, and not where you don't. This requires that you decide what you need light for, and use it appropriately. For example, where you sit in a room requires lighting. One light works well in a small room. But in larger rooms you could try using more than one light, of a lower power rating. This will ensure that all parts of the room are equally well lit.

In any size of room, if you cover your walls in light colours the light will bounce around the room. This means that you will need less lights than if your room were decorated with dark colours.

Compact fluorescent lights

The 'techie talk' box on the previous page outlines how the compact fluorescent light works. The important aspect of the compact fluorescent is that its greater efficiency makes it cheaper to run – when factoring in the higher cost and longer life of the bulb, usually a 30% to 40% saving. For an idea of how much cheaper see the 'cost savings' box above. However, compact fluorescent lights are not an efficient replacement for incandescent lights in all situations.

Compact fluorescent lights run using little power – but they are energy intensive to start up. Repeated starting also affects the life expectancy of the light. Therefore they are better suited to locations where the light is left on for more than twenty or thirty minutes at a time – for example hallways, landings, main living rooms, bedrooms and bathrooms. They are not suitable for lights that are used for short periods – such as cupboards.

The other limitation of compact fluorescent lights is that they

Compact fluorescent lights - the techie talk

Ordinary incandescent light bulbs work at a relatively low voltage. A very thin wire is plugged into the mains power supply, making it glow white hot. To stop the wire burning away the bulb is filled with inert gas. Light is actually a stream of energy emitted from the atoms of the wire filament. Heating the wire makes it's atoms become energised. They then spontaneously release this energy as light.

Fluorescent lights work electrically. The low mains voltage is stepped up to a very high voltage - usually a few thousand volts. This high voltages discharges through a tube containing a gas. The atoms in the gas are energised, and release light. This strength of the light is multiplied by the addition of a coating on the inside of the tube that receives some of the higher frequency light and fluoresces - glowing white.

The difference between these two systems is that energising the atoms electrically is far more efficient than heating the atoms. Fluorescent systems were widely used from the 1960s as high powered 'strip lights' - usually used in industrial buildings. The yellow sodium discharge lamps that are used for street lighting also use a similar process to produce light efficiently.

During the 1970s the fluorescent was developed and improved. The used of a high frequency and high voltage 'ballast' to run the tube made it more efficient. The fluorescent materials used in the tube were also improved. This led to the development of the 'compact fluorescent - a high powered fluorescent light that can plug into a standard household light fitting. These come in various shapes and sizes, and power ratings. Also, because they run at high frequencies, they are less susceptible to flicker than the older fluorescent lights.

Compact fluorescent lights are usually available as a range of power levels. The early versions used 25% of the power of incandescent bulbs. But the recent models are roughly equivalent to 20% of the power rating of the standard incandescent bulbs (rating are in Watts - W):

- 9W compact fluorescent - equivalent to 50W bulb
- 11W compact fluorescent - equivalent to 60W bulb
- 15W compact fluorescent - equivalent to 75W bulb
- 18W compact fluorescent - equivalent to 100W bulb
- 22W compact fluorescent - equivalent to 110W bulb

require a constant mains voltage. Therefore they're not suitable for use with dimmer switches. You may also have problems is your power supply is unstable – for example using the light in a workshop where high-current power tools are on the same circuit.

The main problem with compact fluorescent lights is the cost. Ten years ago they cost around £10. Today they are available for prices varying from £2 for the older, less efficient models. To £4 or £6 for the newer, more efficient models that also give you a more 'natural' light.

Catalogue shops such as Argos or Index sell compact fluorescent lights for around £3. Do-it-yourself shops also sell lights at a range of prices. The easiest way to get a better price is to buy in bulk. Bulk ordering is possible if you go to a electrical trades wholesaler (see your local Yellow Pages for details). Electronic mail order catalogues, such as Maplin Electronics, sell a range of compact fluorescent lights, and give a small discount for bulk purchases. But as these bulbs are not part of their core business they are usually more expensive.

Most houses contain around eight lights that can be replaced with compact fluorescent. Most of these are rated at 100 Watts. Replacing the main five or six lights in a home (which use around 900 kilo-Watt hours per year), you could save around £30 a year on your power bill. That will pay back your purchase of the compact fluorescents in the first year, and should run for another two to three years.

Other types of lighting

Many houses now use halogen lamps. These are more efficient than incandescent lights. But because they usually have a very narrow beam there may be little overall gain in efficiency if you are using them in a large area.

The other significant development over recent years has been the growth in the use of security lighting. These are usually halogen-based lights, so are efficient. But they produce an intensely bright beam of light and so tend to use more power than other household lights. Whilst other types of light may be more efficient, few radiate as much energy. For this reason there is no cheaper alternative.

The issue is whether these lights are a useful addition to security. Those lights that are switched on and off by motion detectors are more efficient. The continuous use of these lights at night is not only expensive, but it also pollutes the night sky with excessive light.

Beyond the mains

Once you have minimised your use of power for lighting, there is not much more you can do. For most people lighting is the simplest option to tackle if you want to reduce power consumption. But for those with more ambition lighting is the one area of home energy use that can be met by alternative sources.

Lighting is, compared to other household uses of power, a fairly constant and low intensity use of power. Lighting uses less energy than most other household uses of power. This makes it easier to disconnect from the main. For houses with modern wiring, the lighting should be on a different power

circuit to the plug sockets. This means you can 'disconnect' the lights and power them from other sources. This can be wind or solar. Power is stored in batteries from the wind turbine or photovoltaic cells. It is then converted to mains power using an 'inverter' to be fed into the lighting circuit.

Installing this type of equipment requires expert assistance. This is not just because of the technical difficulties. It is important to design the system correctly. If you have to big a capacity you will have lights in Winter, but in Summer you will may waste power if your system is based on photovoltaic cells. For this reason it makes more sense to design a system to meet your needs for most of the Summer months, and supplement it from the mains over the Winter months. But the pay-back period from such as system is likely to be a lot longer. Perhaps five or six years, compared to the one to one and a half years for replacing your incandescent lights with compact fluorescent lights. But such systems will operate for at least ten to fifteen years.

Summary

Modern society makes profligate use of electric light. But much of that lighting is badly installed, and is inefficient compared with the alternative options. For those who wish to reduce their energy bills, lighting is the easiest aspect of energy use to tackle, and at the lowest cost.

The first step to saving energy is to improve natural lighting. This can remove the need to switch on lights during the day. But it is also important to look at the shades, and the cleanliness of the ceilings, to ensure that light is transmitted and reflected without dimming over the whole room.

There are usually five or six lights in a house that can be replaced with compact fluorescent lights. This requires an initial investment of around thirty pounds, but that will pay for itself in around one year through the savings made to your electricity bill. Each individual light replaced will save between £15 and £30 over its lifetime – which will be three to four years for ordinary use.

The main barrier to change is the initial cost of buying the new bulbs. The price of these bulbs is dropping. But if you shop around, and buy in bulk with friends if possible, you can get better prices.

Cost savings from Compact Fluorescent Lights

Compact fluorescent lights are more expensive than incandescent bulbs. But that higher costs masks the savings that you make over the lifetime of the compact fluorescent light.

The table below shows the cost of different ratings of incandescent and compact fluorescent lights. The cost of the power consumed by each bulb is then calculated. As each type of bulb runs for a different length of time we have to equate the two to see the difference in cost. For this reason an 'equivalent total' is provided, representing 8,000 hours of use, to compare the two.

The cost saving of the compact fluorescent over the incandescent lights is then calculated in the final column.

Bulb Rating	Unit price	Cost of use	Equivalent total	Cost saving
Incandescent bulb				
60W	£0.06	£3.30	**£26.88**	
75W	£0.65	£4.13	**£38.20**	
100W	£0.70	£5.50	**£49.60**	
Compact fluorescent				
11W (equiv. 60W)	£6.00	£4.84	**£10.84**	**£16.04**
15W (equiv. 75W)	£7.00	£6.60	**£13.60**	**£24.60**
18W (equiv. 100W)	£8.00	£7.92	**£15.92**	**£33.68**

How the savings are calculated:

Compact fluorescent lights run for 8000 hours, incandescent lights for 1000 hours. To calculate the 'cost of use', the rating of the light is multiplied by the lifetime of the bulb in hours, and then divided by 1000 to convert to kilo-Watt hours. Then this figure is multiplied by the cost of electricity per kilo-Watt hour - roughly 5.5 pence.

The equivalent total is calculated by adding the 'unit price' and the 'cost of use' figure for each light. But the figures for the incandescent lights are multiplied by 8 to create an equivalent use to the compact fluorescent lights - 8000 hours.

For the most ambitious, lighting represents the easiest part of your power consumption to disconnect from the mains. But this is a very technical option, requiring professional assistance. It also takes a few years to return your initial investment.

The Free Range Network is a 'disorganisation' of activists and specialists that organises workshops and develops information resources for community and grass roots campaigning organisations. Free Range Practice Guides are produced on an occasional basis, and are intended to develop the level of practical skill within community organisations.