



# Energy efficient lighting for your home

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There are many different types of lighting available on the market but with a little research you can ensure that the lighting in your home meets your requirements, is energy efficient and looks good. In this brochure we provide you with the basic know-how and information about lighting so whether you're doing a retrofit with existing fittings, renovating or building a new home you can find a lighting solution that suits you.

See the below for a table listing of some of the commonly used lighting terminology.



Alice **Solar** City  
ENERGY CHAMPIONS



# Light Talk



Come in and try before you buy at the Smart Living Centre lighting display



GU10 base



MR16 base

<b>Watts</b>	The wattage of a lamp indicates the amount of electricity it consumes - the higher the wattage the higher its running cost.
<b>Voltage</b>	Most lights operate on either 240 volt or 12 volt (often referred to as low voltage). Just because it is low voltage doesn't mean it is a low energy lamp; halogen downlights are typically 12 volt but use more than 50 watts compared to Compact Fluorescent Lamps (CFLs) which generally use around 20 watts or less. Low voltage lamps also need a transformer to convert the mains power from 240 volt electricity to 12 volt electricity – this can add around 10 watts to the total electricity consumption.
<b>Incandescent</b>	The incandescent light bulb is a type of light that works by incandescence (a general term for heat-driven light emissions) and are historically the most commonly used type of household lighting.
<b>CFL</b>	Compact Fluorescent Lamps (CFL) are a type of fluorescent lamp. CFLs are designed to replace an incandescent lamp and can fit into most existing light fixtures formerly used for incandescent lights.
<b>LED</b>	A Light Emitting Diode (LED) is an electronic light source, where electricity is converted to light. They are considered to be the future of lighting.
<b>Lifetime</b>	Lamp lifetime refers to the average number of hours a particular lamp will last. This varies between different lamps and is as low as 1,000 hours for a typical incandescent lamp and as high as 45,000 for some LEDs.
<b>Downlight</b>	The term downlight refers to lights that are usually in recessed ceiling fittings that shine downwards. The most common example are small halogen lights (sometimes referred to as dicroic), usually operating on 12 volt electricity, however normal downlight fittings using incandescent lights and CFLs are also common.
<b>GU10 / MR16</b>	GU10 and MR16 are two types of light fittings commonly used for small lights in downlight applications (these can be either halogen, CFL or LED globes). Lights with GU10 fittings run off 240 volt supply (i.e. no transformer in the ceiling). GU10 fittings have two small pins that look like the <b>head</b> of a nail. Lights with MR16 fittings run off 12 volt (need a transformer). MR16 fittings also have two small pins and look like the <b>sharp end</b> of a nail. They are not interchangeable – in other words, it is not possible to use a light with MR16 pins in a GU10 fitting.
<b>Colour</b>	Lamp colour is measured in Kelvins – ranges from 2700 Kelvin (warm white – which emits a 'yellowy' light) to 5000 Kelvin (cool white – which is soft, pure white light). Think about the kind of lighting effect you prefer when selecting lamps. A "warm white" CFL is generally about 3000K while a "cool white" or "daylight" CFL is closer to 5000K.

All light globe images courtesy of Philips.

# Lighting options



Incandescent  
(bayonet cap base)



Typical CFL lamp with  
(edison screw base)



PAR 38 CFL spotlight  
(edison screw base)



Mini CFL downlight  
(GU10 base)

## Incandescent Lamps

Incandescent lamps have historically been the most commonly used type of lighting in households and are generally either 'bayonet cap' or 'edison screw' fittings. Although they are cheap to purchase initially, their expected lifetime is the shortest of all available lamps at only around 1,000 hours. Incandescent lamps are also very inefficient converting less than 5% of the electricity they use into light – the remaining 95% is wasted as heat. Incandescent lamps are gradually being phased out in Australia and there are an increasing range of new lighting options available as direct replacements.

One example is halogen lights, which look very similar to traditional incandescent lights, and can be installed in the same fittings. These halogen replacements, whilst being more efficient than typical incandescent lamps, are still significantly higher energy users than CFL or LED lighting and thus are not recommended for most applications where efficiency is a priority.

## Compact Fluorescent Lamp (CFL)

Compact Fluorescent Lamps or CFLs have gradually become more common and affordable and are now available in a wide variety of shapes and sizes. They can usually directly replace any incandescent bulbs (including the traditional outdoor spotlight) with 'bayonet cap' or 'edison screw' fittings and come in two main colours – cool and warm white. CFLs can have a lifetime of up to 15,000 hours and use around 80% less electricity than incandescent and halogen lamps. When changing from incandescent to CFL, you apply a 5:1 ratio – i.e. a 20 watt CFL is generally sufficient to replace a 100 watt incandescent. By simply changing any existing incandescent bulbs to CFLs you can cut your lighting energy use by 50% to 80%, which is a substantial saving off your lighting bill.

CFLs are also available as 'downlights' to replace halogen downlights (these are known as mini-CFLs). However in most cases, you will need to replace the entire light fitting, as the lamps may not be the right size for your existing fittings and quite often halogen downlights only use 12 volt electricity (i.e. MR16 fitting) whereas CFL downlights (mini CFL's) generally use 240 volt electricity (i.e. GU10 fitting).

CFLs are also now available for fittings where a dimmer switch is in use – look for lamps which specify they are able to be used with dimmer switches.

## What about the mercury in CFLs?

Compact Fluorescent Lamps contain small amounts of mercury, as do regular fluorescent tubes. The amount of mercury in the average CFL is very small – 3 to 5 milligrams – and the risk of mercury exposure to an average person from a broken CFL is very low. You should still take care when cleaning up if you break a CFL:

- Open nearby windows and doors to ventilate the room
- Wear disposable rubber gloves
- Use a brush to carefully sweep up the pieces and then use a paper towel, preferably moist, to wipe up any remaining glass fragments and phosphor powders
- DO NOT use a vacuum cleaner because this can spread the contents of the bulb and contaminate the cleaner
- Place all of the pieces of the light bulb and clean-up materials into a sealed container (e.g. glass jar) for disposal in your waste bin or in accordance with the advice of your local waste disposal authority.

**To find out more about safe disposal of CFLs and recycling opportunities go to [www.environment.gov.au/settlements/waste/lamp-mercury.html](http://www.environment.gov.au/settlements/waste/lamp-mercury.html)**

## Other Fluorescent Tubes



T5 fluorescent lamp

Fluorescent tubes are often used in office buildings to provide internal light but are also used for residential lighting. Older T12 tubes with a diameter of 1½” (one and a half inches) can sometimes be seen in particularly old fittings. Fluorescent tubes are still some of the most efficient lighting solutions available for many applications and tubes vary in shape (straight or circular), length and diameter.

### T8 vs T5

Most of the fluorescent tubes currently in use are the traditional T8 tube, where the diameter of the tube is 8/8” in diameter (1 inch). Newer T5 tubes, which are more energy efficient than T8 tubes, are also available and have a diameter of 5/8” (five eighths of an inch) although they are generally shorter in length than T8 lamps. Retrofit kits are available so you can replace T8 lamps with T5 lamps without having to replace the old fitting. These kits will mean that you can use the more efficient T5 tubes, which are around 20-30% more efficient than the T8 tubes. To save even more energy, replace the old fitting (which usually has a magnetic ballast) with a new electronically ballasted fitting, using the new T5 tube.

While fluorescents have a bad reputation, the quality of light they produce has improved considerably, and they can be purchased with a range of ‘colours’ (i.e. warm or cool).



240 volt LED globe  
(bayonet cap base)

## Light Emitting Diode (LED)

Light Emitting Diodes or LEDs are semiconductor devices that convert electricity to light. The most recent development in modern lighting, they use different technology to incandescent and fluorescent lamps and are generally considered to be the future of lighting.



240 volt LED downlight  
(GU10 base)



12 volt halogen downlight  
(MR16 base)



LEDs are generally more expensive to buy compared to CFL, halogen or incandescents, but they use far less energy. LED lamps commonly range from 2-20 watts and last longer (up to 45,000 hours). They can work with some dimmer switches (check this with your lighting retailer first) and they produce less heat compared with standard bulbs.

The range of applications for LEDs is increasing. A common use is as a replacement or alternative to traditional downlights. For example, they can be used as a straight replacement for downlights (either low voltage MR16 fittings, or 240 volt GU10 fittings are available). If you are considering replacing existing halogen downlights with LEDs, it is important to check the fitting is correct, that the globe will physically fit into the existing fitting, and that the amount of light that the LED produces is appropriate (the latter is particularly important as LEDs generally do not produce as much light as typical 50 watt halogen downlights that they are replacing).

However, it should be noted that LEDs often produce a softer light with more 'spread', so achieving the exact light output may not be that critical.

As production increases, the prices of LEDs are expected to come down significantly. LEDs come in an ever increasing range of shapes, sizes and fittings.

## Halogens

Halogen lamps, in particular downlights, have become increasingly popular over the years. Whilst they are available in 240 volt, low voltage halogens are the most common type found in households; bear in mind that low voltage doesn't mean lower energy consumption. The transformer, which converts 240 volt mains electricity to 12 volt electricity for the lamp, also uses energy, so a 50 watt halogen lamp can use up to 60 watts once the electricity usage of the transformer is taken into account. Compare this to a CFL downlight which would consume around 18 watts and provide almost as much light.

Although they are slightly more efficient than incandescent lamps and have a longer life time (generally 2,000 to 3,000 hours) halogen lamps are really only suited to task lighting where they highlight a particular area such as a kitchen bench or feature wall. Because of this, halogens need to be used in large quantities to be able to provide enough light for general room lighting. This in turn means that energy consumption increases significantly compared to a room lit with a fluorescent, LED or incandescent lighting.

Downlights can also be a fire hazard if not installed properly as they generate a lot of heat, and they have been the cause of many house fires in Australia. There must be a gap between the fitting and any insulation in the ceiling which in turn means ceiling insulation doesn't work as effectively as it should.

### Retrofit tip for replacing halogens

If your house is full of low voltage halogen downlights in MR16 fittings (i.e. 12 volt fittings), your options to reduce energy consumption are to:

- replace the globes themselves with a LED light (i.e. with an MR16 base) - a good idea is to purchase one light to test, as LEDs generally do not give off the equivalent amount of light compared to a standard 50 watt halogen. Also, because LEDs consume far less electricity, it may also be necessary to change the transformer.
- replace the whole fitting (you'll need an electrician to take out the transformer) with a GU10 (i.e. 240 volt) fitting and either CFL or LED globes.
- replace the current globes with a more efficient style of downlight (normal 50 watt halogen downlights can be replaced with newer 35 or even 20 watt IRC\* halogens). These lower wattage halogens cost more than the standard 50 watt globe, but use between 30% and 60% less electricity and produce a similar amount of light, or
- replace the entire halogen light and its fitting with a standard recessed light fitting (with either Edison Screw or Bayonet Cap 'normal' sized lamps). These should ideally be CFL lamps. Choosing CFLs will also enable you to choose special dimming CFL lamps for these fittings. NB. This would normally involve cutting your ceiling, as halogen light fittings are smaller than 'normal' sized recessed fittings.

\* IRC or infrared coated halogen downlights use less electricity to provide the same amount of illumination as a higher wattage halogen.



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