



Household lighting energy use in Australia is increasing due to the construction of larger homes and the installation of more light fittings per home. Most homes could probably reduce the amount of energy they use for lighting by 50 percent or more.

Good lighting is about more than just light levels. The same level of light can provide effective or ineffective lighting. Some lighting can make rooms flat and featureless even when it's bright. A lighting designer will be able to help you design more effective lighting, but make sure they know you also want an energy efficient system.

An efficient and effective lighting system will:

- > **Provide** a high level of visual comfort.
- > **Make** use of natural light.
- > **Provide** the best light for the task.
- > **Provide** controls for flexibility.
- > **Have** low energy requirements.

TYPES OF LIGHTS

INCANDESCENT LAMPS

Incandescent lamps or bulbs are the most commonly used type of lighting. They work by heating an electric element to white hot. They are inexpensive to buy and are available in a wide range of shapes and sizes, but their running costs are high.

Incandescent lamps are the least energy efficient type of lighting.



Almost all of the electrical energy is converted into heat rather than light. Standard incandescent bulbs only last about a thousand hours and must be regularly replaced. Incandescent lamps are most suitable for areas where lighting is used infrequently and for short periods, such as laundries and toilets.

Incandescent spotlights have built-in reflectors that increase their effectiveness slightly as they reflect the light forward. Light output falls over time as some of the tungsten in the filament evaporates and coats the glass bulb.



Halogen lights are also a type of incandescent lamp. The halogens in the bulbs prevent evaporated tungsten from depositing on the glass bulb. They are more expensive to buy but last up to two thousand hours. They can be either 240V bulbs, which are usually tubular and often used in uplighters and outdoor floodlights, or low voltage

bulbs typically used in downlighting. All halogen lamps require special light fittings.

Low voltage halogen lamps are not low energy lamps.

Low voltage halogen lamps are slightly more efficient than normal bulbs of the same wattage, but they use a transformer that can consume from 10 to 30 percent of the bulb energy, reducing the efficiency gain.

More efficient electronic transformers are available which reduce transformer losses.

Low voltage halogen lamps are most suitable for highlighting features such as paintings or for task lighting directly over a cooking area or study desk. If used, fit lower wattage and more efficient bulbs. Efficient 35W lamps are available that produce as much light as a standard 50W lamp.

FLUORESCENT LAMPS

Fluorescent lamps are the most energy efficient form of lighting for households. They work by causing a phosphor coating in the inside of a glass tube to glow. Different types of phosphor give different colour light.

Although more expensive to buy they are much cheaper to run and can last up to ten thousand hours. With careful design they can replace incandescent and halogen lights in most situations.

Fluorescent lamps are ideal for areas where lighting is required for long periods of time, such as the living room and kitchen, and for security lighting. They also produce less heat, helping keep your home cooler in summer.

Fluorescent lamps use only about one quarter of the energy used by incandescent bulbs to provide the same light level.

Many people associate fluorescent lamps with cold, hard lighting, but in fact they come in different colour temperatures for different purposes. Warm white or daylight lamps have a colour temperature of about 3000 K, which is close to an incandescent bulb, and are suitable for kitchens and living rooms. Cool white tubes have a higher colour temperature, around 5000 K, and are more suited to garages and workshops. When mixing different types of lighting in a room try to use similar colour temperatures.



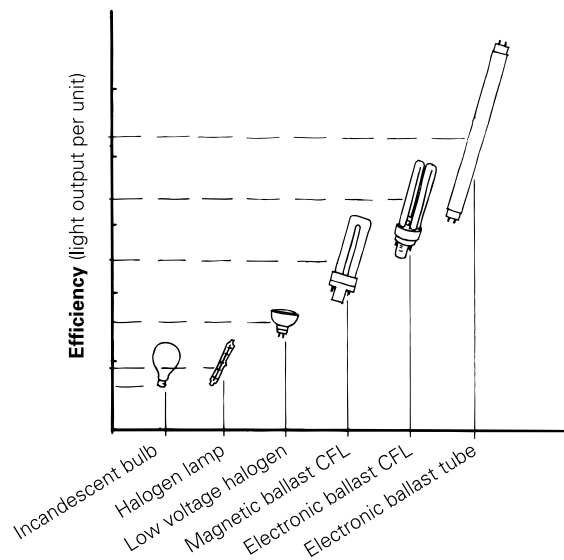
There are two main types of fluorescent lamps - tubular and compact.

Tubular lamps, also known as fluorescent tubes, are available in a straight or circular style. They are cheaper to buy than compact fluorescent lamps (CFLs), but unlike CFLs require special fittings. Tubes are ideal for kitchens, garages and workshops.

Compact fluorescent lamps (CFLs), also known as long life bulbs, are usually designed to fit into conventional bayonet or screw fitting light sockets. They come in a range of shapes, most common is the 'stick' type, but there are also globe style, or circular and 'square' 2D types.

CFLs can replace incandescent light bulbs in many light fittings. Not all light fittings are suitable for conversion to CFLs but most can be successfully converted with the right choice of lamp.

When replacing an incandescent lamp with a CFL in an existing fitting, it is usually better to use a slightly higher wattage than recommended by the manufacturer to ensure adequate light output. For example, use a 20W CFL instead of a 15W to replace a 75W incandescent. The light distribution of CFLs is different and may appear less bright than the bulb they replace unless used in a specially designed fitting. The light output also drops slightly over time.



Ballasts

All fluorescent lamps need a ballast to start them. For tubes, the ballast is separate and usually located in the light fitting. CFL ballasts are generally built into the lamp base. However, some CFLs have a separate tube and ballast. As the ballast is more expensive and lasts longer than the tube, the tube is detachable and can be replaced when it fails. Few domestic light fittings are currently specifically designed for separate ballasts, although desk lamps and some surface mounted models are available.



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Ballasts can either be older magnetic types or newer electronic versions. Electronic ballasts are more expensive to buy but much more energy efficient. They also start the lamp quicker, produce less flicker and last longer.

Magnetic ballast lamps cannot be dimmed, but some electronic units can. They cannot be used with standard light dimmers.

COMPARISON OF LIGHTING COSTS

The cost of running a light is directly related to the wattage of the globe plus any associated ballast or transformer. The higher the wattage, the higher the running cost.

CFLS are actually cheaper when the life cycle cost is considered.

The type of lighting you choose will affect the amount of electricity used, your lighting bill, and greenhouse gas emissions.

The table below shows the lifecycle costs for lighting systems using different globes to produce the same amount of light. Lifecycle costs include purchase, running and replacement costs.

	20 W CFL	100 W INCANDESCENT	65W HALOGEN
Running cost over 10,000 hours*	\$20	\$100	\$75**
Average life	10,000 hours	1,000 hours	2,000 hours
Purchase cost	\$25 1 lamp	\$5 10 bulbs @ 50c	\$20 5 lamps @ \$4
Total cost	\$45	\$105	\$95

* Based on 10 cents per unit of electricity,

** Includes magnetic transformer losses.

EFFICIENT LIGHTING CHOICES

CHOOSE THE RIGHT LIGHT

The most energy efficient light is natural light. Well designed north-facing windows, skylights and light tubes let in light without adding to summer heat and winter cold. Light coloured interior surfaces, especially in south-facing rooms and hallways, reflect more light and reduce the level of artificial lighting required.

Most rooms need two types of lighting. General lighting is needed for all over illumination. Task lighting is used to illuminate specific areas, such as benchtops and desks. Different light bulbs and fittings should be used for these two purposes. Accent lighting can also be used for decorative or dramatic effects.

Pendant or surface-mounted light fittings can be used to provide general lighting. Use desk, table or standard lamps where most light is needed, such as for reading, so less lighting is required in the rest of the room.

Use fluorescent lights where lighting is required for long periods of time, such as living rooms, over kitchen benches or on desks.

Most fluorescent lamps do not switch on immediately. This is a design feature to lengthen the life of the tube. Fluorescents also take a minute or so to reach their full brightness so they may not be suitable in areas where immediate light is required.

The light output of CFLs is reduced at low temperatures, so they may not be suitable for outside use in very cold areas, or you may need to use a higher wattage lamp.

The light output of most lamps reduces over time. This is a problem with fuorescents as they last so long. To ensure adequate light output over their life it is worth buying a higher wattage lamp initially to offset the drop in light output.

Try to use incandescent lights for general or task lighting only in rooms used infrequently and for short periods, such as laundries and toilets.

Downlights provide bright pools of light rather than general illumination. Up to six downlights may be required to light the same area as one pendant light. They can also cause gaps in the ceiling insulation, particularly if they require clear space to allow heat to dissipate. Think about other ways of lighting with fluorescents before installing halogens. If used, fit lower wattage and more efficient bulbs.

Choose light fittings that allow most of the light through so a lower wattage lamp can be used. Some light fittings can block 50 percent or more of the light.

SWITCHES AND CONTROLS

Provide multiple switches to control the number of lights that come on at any one time. Using one switch to turn on all the lights in a large room is very inefficient. Place switches at the exits from rooms and use two way switching to encourage lights to be turned off when leaving the room.

'Smart' light switches and fittings use movement sensors to turn lights on and off automatically. These are useful in rooms used infrequently where lights may be left on by mistake, or for the elderly and disabled. Make sure they have a built-in daylight sensor so that the light doesn't turn on unnecessarily. Models which must be turned on manually and turn off automatically, but with a manual over-ride, are preferable in most situations. Be aware that the sensors use some power continuously, up to 5W or even 10W in some cases.

Use timers, daylight controls and motion sensors to switch outdoor security lights on and off automatically. Similar controls are particularly useful for common areas, such as hallways, corridors and stairwells, in multi-unit housing. Consider using solar powered lighting for garden and security lights.

Modern dimmer controls for incandescent lights save energy and also increase bulb life. Most standard fluorescent lamps cannot be dimmed, but special dimmers and lamps are available.

USE LIGHTS EFFICIENTLY

Rooms are often excessively lit. Make sure you are not using a higher wattage bulb than is necessary.

Turn off unnecessary lights, including fluorescent lamps especially if leaving a room for more than ten minutes.

Clean light fittings regularly to allow more light to pass through.

Decorating with light coloured finishes and furnishings can allow lighting levels to be reduced.

ADDITIONAL KEY REFERENCES

Sustainable Energy Authority Victoria
www.seav.vic.gov.au

Sustainable Energy Development Authority NSW Energy Smart website www.energysmart.com.au/ESAbout.shtml

International Association for Energy Efficient Lighting
www.iaeel.org

Illuminating Engineering Society of Australia and New Zealand Incorporated www.iesanz.asn.au

Lighting - The Electronic Textbook
www.energy.arce.ukans.edu/book/contents.htm

CHOICE, October 2000 "Long Life Bulbs - Which Really Deserve the Name?" Australian Consumers' Association