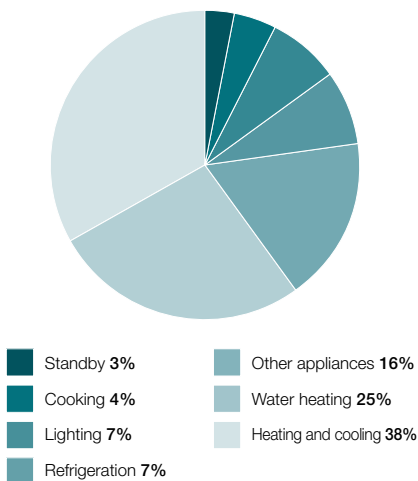


Lighting

Household lighting energy use in Australia has been rapidly increasing in recent years due to the construction of larger homes and the installation of more light fittings per home. Most homes could reduce the amount of energy they use for lighting by 50 per cent or more by making smarter lighting choices and moving to more efficient technologies.

Home energy use
(Baseline Energy Estimates, 2008)



In February 2007 the Australian Government announced plans to phase-out inefficient lighting technologies where viable energy efficient alternatives exist by introducing minimum energy performance standards (MEPS). The first target of the phase-out is general lighting service bulbs (traditional Edison incandescent bulbs) which will no longer be sold from 2009/10.

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 have for many years been 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, and will be phased out where ever possible over the next few years.

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 reflect the light forward. Light output decreases 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 four thousand hours. They can be either mains voltage bulbs (240V) or low voltage bulbs (typically used in downlighting).

Low voltage halogen lamps are not low energy lamps. Only halogen lamps that meet the minimum energy performance standards will be sold once the new regulations come into force.

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 per cent of the bulb energy, reducing the efficiency gain.

More efficient electronic transformers are available which reduce transformer losses.

Low voltage halogen lamps usually have a very narrow beam angle and so 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. Compact fluorescent lamps designed for down lighting are an energy efficient alternative that should be considered.

Large numbers of low voltage halogen lamps are often fitted to light large spaces – this is a misuse of these lamps and results in unnecessary energy consumption.



Fluorescent lamps

Compact fluorescent and linear or tubular fluorescents lamps are the most energy efficient form of lighting for households. Fluorescent lamps use only about one quarter of the energy used by incandescent bulbs to provide the same light level.

They work by causing a phosphor coating in the inside of a glass tube to glow. Different types of phosphor emit different coloured light.

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

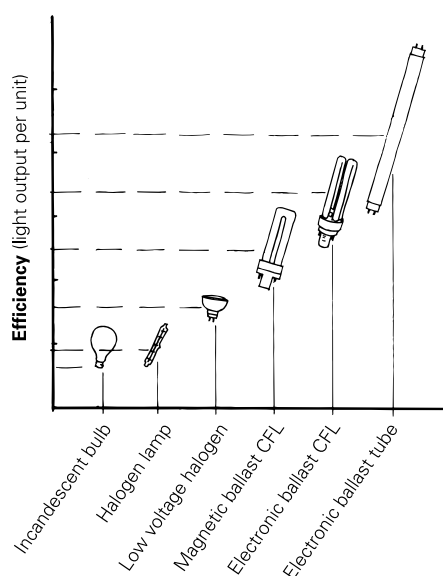
Fluorescent lamps are ideal for areas where lighting is required for long periods of time, such as the living room and kitchen, and for security lighting. They also produce less heat, helping keep your home cooler in summer.

There is much greater variation in the quality of fluorescent lamps sold in Australia than there is for other lighting types. In the past some poor quality fluorescent lamps were sold. To counter this, at the same time as bringing in regulations to phase out inefficient lighting the Government will bring in performance and quality standards for compact fluorescent lamps.

Fluorescent lamps are a developing technology and there have been many improvements in the performance of both linear and compact fluorescent lamps (CFLs) in recent years. Fluorescent lamps that cover a range of desired colours, including the 'warm' light of most incandescent globes (around 2,700° Kelvin) are readily available. Cool white tubes have a higher colour temperature, around 5000° Kelvin, and are better suited to garages and workshops. By selecting the appropriate wattage and colour fluorescent lamp a large range of lighting effects are achievable. 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 and so are the ideal replacement for inefficient incandescent bulbs. 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.

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.

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

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

Light Emitting Diodes (LEDs)

LEDs are currently used in countless applications including lighting displays in household appliances, mobile phone screens, and traffic signals.

LEDs for general lighting purposes are an emerging lighting technology which is expected to be the future of household lighting. Most lighting companies are developing LED bulbs for direct replacement into normal fittings, which are expected to be available for some applications in the next couple of years.

The benefits of LEDs include lifetimes of up to 100,000 hours, and potentially very high efficiency levels. Current prototypes have issues with poor light quality, and low light output, but they are rapidly improving. The main barrier for LEDs is cost, but as the technology improves and demand increases costs should come down.



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 the cheapest form of household lighting 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.

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.

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.

Incandescent lamps are inefficient and so will not be available in the future for general lighting. However, some specialty use incandescents will continue to be sold until energy efficient alternatives become available.



Downlights are designed for spotlighting as they 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 per cent 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 (including halogens) save energy and also increase bulb life. Most standard fluorescent lamps cannot be dimmed, but special dimmers and lamps are available. When installing new light fittings and controls ensure they are compatible with CFLs.

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 READING

Contact your State / Territory government or local council for further information on energy efficiency. www.gov.au

Australian Consumer Association
www.choice.com.au

Department of the Environment, Water, Heritage and the Arts (2008), *Australian Residential Sector Baseline Energy Estimates 1990 – 2020*.

Energy Efficient Lighting, Australian Government
www.greenhouse.gov.au/energy/cfls/

Lighting Council Australia
www.lightingcouncil.com

ReNew: technology for a sustainable future magazine, *Lighting Buyers Guide*, Issue 94
www.renew.org.au

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