

Lighting

Lighting is one area of school energy use where:

- **Teachers and management** can make a difference by correct use of lights and by turning off lights when not in use.
- **Caretakers** can make a difference through maintenance.
- **School boards of management** can make a difference with support to staff, energy saving programmes and investment.
- **Students** can make a difference by turning off lights when not in use.

Electricity is expensive and has a relatively high global warming potential. Reductions in lighting energy use therefore can significantly reduce utility bills and help to protect the environment. If the school's complete lighting system cannot be upgraded, one or two rooms could be done at a time. The old lamps and fittings could be used for spare parts in other parts of the school until all the lighting has been upgraded.

Note: Care should be taken to ensure that the schools electrical earthing system is compatible with the proposed lighting installation works.

Top tips

- Replace incandescent bulbs with LED bulbs. As CFL bulbs fail, replace those with LED bulbs.
- Where practical, use daylight. Switch off lights when daylight is adequate, especially the row of lights nearest the window if possible.
- Actively use window blinds to promote daylight and control glare. Only close blinds when there is a problem with glare e.g. from direct sunlight.
- Switch off lights when the room is empty.
- Read the electricity meter regularly and send the reading to the electricity supplier once per month.
- Rather than buying fluorescent tubes for existing fluorescent fittings, consider replacing fittings with new energy efficient LED fittings room by room and keeping the old fittings as spares. New LED fittings can last for up to 50,000 hours and the only maintenance the fittings should need is cleaning. No more changing fluorescent tubes! Note that failed led fittings must be preplaced in full, lamp swap out is not possible.

Low cost and no cost measures

- In rooms with older fluorescent fittings, if there is too much light in an area with multi-lamp fittings, it is often possible to reduce energy usage by removing one lamp (i.e. one tube).
- Some secondary school physics labs have light meters which you could use to measure light. Light levels are measured in units of lux. About 300 lux is recommended at student desks, and G.P. halls. P.E. halls should have 400 lux. 120 lux is recommended for corridors and toilets. Over-lit areas are generally found in schools where lighting has already been replaced, but without advice from a design engineer.



Light meter

- Diffusers and fluorescent tubes should be clean. Dust and insects reduce the light output of the fitting.



Clean bulbs and diffusers

- Exterior lights left on during the day, or all night, waste energy. If time clocks are used to switch lights, make sure they are adjusted when the clocks change. Ask your caretaker to ensure this. An education facility reduced its external lighting electricity consumption by 22% by simply activating and setting existing time clocks.
- If there are areas with security concerns, the exterior lighting could be controlled by motion detectors. However, this is not recommended for playground areas, as it encourages children to use the playground outside school hours during hours of darkness.

- Use of artificial light can be reduced by making maximum use of daylight. Blinds should be opened when practical, and windows and skylights kept clean.
- Utilise separate switching of lights where provided. For example, if the lights closest to the windows in a class can be switched off separately when the daylight through the window is sufficient this can reduce energy use. Labels should be used to indicate which lights each switch controls.



Label light switches

- Ordinary incandescent lamps are inefficient and should be replaced with LED bulbs. Energy savings of over 80% are usually realised, and the LED bulbs should last up to 20 times longer. In fact, because the lamps last so much longer, lamps pay for themselves in replacement costs alone, and the energy savings come free. Similar arguments apply to replacing CFL bulbs with LED bulbs, with savings of perhaps 50%.



Left to right: tungsten, CFL and LED bulbs (most efficient).

- To prevent lights being left on in unoccupied rooms, an awareness campaign should be implemented with signage to remind staff and pupils to switch off lights.
- Read your electricity meter at least monthly and record usage in a spreadsheet to track it. There is a bill tracking tool available at www.energyineducation.ie

- Inform your electricity supply company of the meter reading monthly. They only read the meter every 4 months, and monthly readings will mean accurate bills.

Measures requiring investment

Most schools have fluorescent light fittings in most areas. More energy efficient LED fittings are now available. The cost of LED light fittings has reduced in recent times. The use of LED fittings are promoted in schools where a lighting upgrade project is undertaken that are replacing T8 fittings.

Fluorescent linear fittings come in three sizes. The oldest, fatter 38mm diameter "T12" fluorescent fittings are the least efficient and are still found in some older schools. In all but newer schools, the most common fluorescent fittings have 26mm diameter "T8" lamps. Both T12 and T8 fittings would benefit from replaced by LED light fittings. Newer schools have the thinner 16mm diameter "T5" fluorescent lamps and these should be retained for the foreseeable future.



T12, T8 and T5 (most efficient) lamps (Top to bottom).

Old light fittings should generally be replaced for several reasons:

- In older fluorescent light fittings with plastic diffusers, the diffusers become discoloured with age. This often reduces the light output substantially. In addition, the older style diffusers do not distribute the light as well as newer fittings.
- Older fluorescent fittings have magnetic "ballasts" which are inefficient. The magnetic ballast adds to the energy consumption of a fitting by about 25% over and above the energy used by the lamps. New LED fittings have electronics inside instead of magnetic ballasts, and the electronics use very little energy. T5 fittings also use electronics which is one reason they are more efficient than older fluorescent fittings and should be retained for now.

To ensure lights are only operated when they are needed i.e. when the room is occupied and daylight levels are too low, automatic controls can be installed. These can dim the lights in response to the daylight levels, and switch them off when there is sufficient daylight or no one in the room.

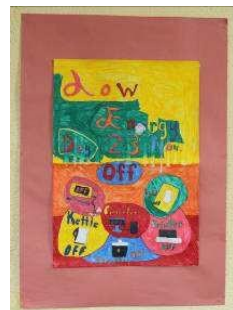
Dimming control will require new fittings to be installed, but can save 75% of the electricity used for lighting. These controls will also monitor motion in the room and switch the lights off after a few minutes if there no motion is detected ('absence detection').

- Keeping exterior lights on all night for CCTV cameras can be avoided by using cameras with infrared illuminators. Cameras with built in infrared lamps are available which can "see" up to 20m.
- When selecting laptop or computer screens, it is important to select screens with a matte finish rather than a glossy finish. The matte finish is less likely to give problems with reflections from windows, and will thus assist with promoting use of daylight. Screens with a gloss finish can cause blinds to be closed more often, resulting in lights having to stay on.



Choose matte computer screens

For more detailed information see other resources at www.energyineducation.ie.



Use signs as reminders

Did you know?

Magnetic ballasts

If your fluorescent light flickers a few times before it comes on, then it has old style magnetic ballasts. If the light starts after a short interval, without flickering, it has modern, more efficient high frequency ballasts. The older ballasts use about 25% more energy than the new high frequency ballasts.

Lamp colour

Light emitted from different types of fluorescent tubes will vary slightly in colour and may look different. A consistent type of tube should be used throughout a room and preferably throughout the school. The most common and recommended type for schools is "cool white" rather than "warm white". "Cool white" is particularly important in classrooms where the colour of teaching material is important, such as art, design, technology or home economics. If new LED lighting is installed, it too should use "cool white" lights.



Dead lamps are wasting energy

Dead fluorescent tubes

"Dead" fluorescent lamps can still use energy. If, after you switch on a fluorescent fitting you see it glowing at its ends, but the lamp does not come on properly, then it is using energy, but producing no useful light. Replace the lamp, or at least remove it until a replacement is available.

Lamp life

An old fashioned incandescent lamp will last about 1,000 hours (about one school year). Fluorescent lamps last 8 to 20 times longer. Replaceable LED bulbs last 20 times longer and new purpose-built LED light fittings last 50 times longer.

Controls

It is important to note that, unless there is sufficient daylight available from the existing windows in a room, daylight sensing controls should not be installed. Absence detection should always be installed to operate with manual switch-on only. The required standard of daylighting and other relevant specifications are available on the Department's Technical Guidance Documents at <https://www.gov.ie/en/publication/7e515-technical-guidance-documents/>

Maintenance

- Clean windows and skylights to promote daylight.
- Take off the lamp diffuser and clean it each summer.
- Replace dead fluorescent tubes.
- Check that time clocks are set correctly.
- Annually clean outdoor light sensors controlling outdoor lights.

Energy contracting / lighting as a service

A number of schools have contracted a third party to supply energy measures (commonly lighting) in schools, with zero capital cost. The school would be required to make a regular payment to this supplier (supported by energy savings) rather than making the investment themselves. Sometimes described as 'lighting as a service', there are a number of suppliers who offer this (including energy suppliers) with a variety of contract structures. This can range from a simple lease arrangement (i.e. a fixed fee per annum over 10 years) to a 'pay as you save' arrangement (i.e. the school pays a percentage of demonstrated savings for a number of years).

These contract structures may be beneficial for the school as they do not have to find the funding to deliver the projects, but schools should be cautious of the contract conditions and understand what they will ultimately pay for the project, which will normally be more than if they paid upfront. Schools also need to understand what happens if there are any issues with the installed systems during the contract term.

The school should ensure that the existing lighting running costs and the hours of lighting use detailed in the proposal are accurate and not assumed or guessed, as an under or over estimate of these factors can distort the paybacks grossly. Remember the lights may not even be on all the time during the schools timetabled hours.

The School should also ensure that the lighting service provider confirms and demonstrates that the proposed light fittings comply with the Departments TGD 033 with regard to quality, specification and light performance.

Please contact publicsector@seai.ie for advice if you are considering this type of arrangement.