THE UNIVERSITY OF ADELAIDE
ENERGY INITIATIVES CASE STUDY
EVOLUTION OF ARTIFICIAL LIGHTING REQUIREMENTS AT THE UNIVERSITY

The University has always had a need for artificial (electric) lighting to allow operations to continue efficiently indoors and at night.

Fluorescent lighting technologies, when commercially introduced in the 1940's, provided an excellent source of light exhibiting long lamp life and high output.

For many years, fluorescent light fixtures mostly comprised wire-wound iron-cored "ballasts", connected to "4 foot" 38mm diameter lamps. These lamps had power consumption of 40W, plus 10 Watts loss. In the early 1980's, 26mm lamps provided a direct retrofit for the older style lamps, and with a reduced consumption of 36 Watts per lamp were able to provide a 10% energy saving.

The 1990's saw the introduction of the tri-phosphor fluorescent lamp, which due to its increased output and greater life, provided significant savings on a life cycle basis, with the ability to reduce the number of required luminaires in new installations. Many of the University's lighting systems were retrofitted with this technology, as the equipment was able to operate with older light fitting internal controls, without the need for any further work.

Since the late 1990's, the lighting industry has concentrated on further benefits that are available in using electronics. Electronic controllers are now available to replace iron-cored devices and 'starter switches' are no more.

Electronic controllers operate at high frequencies, and are therefore able to provide features such as dimming which previously was not a viable consideration.

In addition, the industry has adopted "T5" fluorescent lamp technologies, which provide modular lamps sizes (1200mm in lieu of '4 foot'), greater lamp wattage selections from the 16mm diameter lamps, and significant energy saving based on the 28 Watt lamp replacement for the obsolete 36W lamp.

Possible Energy Savings – Simple Analysis
The possible energy savings available due to lighting and lamp technologies become significant when considered on a building or campus basis.

The previous generation of lighting generally comprised twin lamp fittings at approximately 2.4m centres. This produced an energy consumption of around 15 Watts per m².

The modern equivalent light fitting, due to the efficiency of its optics, can normally be spaced at 3.0m x 2.4m. With a total consumption of around 60 Watts or less per fitting, the energy consumption is around 8.5 Watts per m². This represents a saving of over 40%.

Considering a large building of say 10,000m², the total energy consumption saving is around 65 kW, which is equivalent to 130,000 kWh per annum at nominal operation of 2000 hours per annum.

Energy savings can be further increased in buildings that have good ambient light, by incorporation of dimming systems that automatically respond to the available natural light to maintain constant illumination levels.

Benefits to the University
The University must not only consider energy consumption, in an obvious effort to save expense, but also the reduction of maximum power demand, which reduces the need for greater electrical infrastructure, switchboards, power supplies and maintenance.

Case Study – Physics Building
During 2004, the University refurbished a large section of the Physics Building, including laboratory and office areas.

New lighting was provided throughout the refurbished areas, generally utilising 2x25W 'T5' fluorescent luminaires with ultra-low brightness louvres. The project was completed in early 2005. A total of over 200 light fittings were installed.

Use of this lighting system in this building provides and energy saving of around 10,000 kWh per annum, or 10 tonnes of CO_2 emissions.

In addition, there is no loss of amenity to the users, and there have been no maintenance call-outs to the installation since commissioning.