Lighting Council AUSTRALIA

A PROPOSAL TO INCREASE THE ENERGY EFFICIENCY OF LIGHTING INSTALLATIONS BY APPLICATION OF LIGHTING CONTROLS

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WHAT ARE LIGHTING CONTROLS?

A lighting control system consists of a device that controls electric lighting and devices, alone or as part of a daylight harvesting system, for a public, commercial or residential building or property. Lighting control systems are used for working, aesthetic and security illumination for interior and exterior lighting. They are often part of sustainable architecture and lighting design for integrated green building energy conservation programs.

Lighting control systems, with an embedded processor or industrial computer device, usually include one or more portable or mounted keypad or touchscreen console interfaces, and can include mobile phone operation. These control interfaces provide users with the ability to remotely toggle (on-off) power to individual or groups of lights (and ceiling fans and other devices), operate dimmers and pre-program space lighting levels.

Lighting control systems contain three components linked by communication wiring, which is used to transmit control signals, and power wiring, which supplies power.

Component	Sensing Device →	Logic Circuit →	Power Controller
Function	Provides information to logic circuit	Decides whether to supply lighting, and how much	Changes the output of the lighting system

Lighting controls include:

- relay controllers
- high frequency ballast controllers
- time clocks
- sensors (PE/PIR/ultrasonic)
- dimming systems
- LED controllers
- integration devices
- control management software and interfaces (wall panels, touch screens)

WHAT ARE THE ADVANTAGES OF LIGHTING CONTROLS?

A major advantage of a lighting control system over conventional individual switching is the ability to control any individual light fitting, group of lights or all lights in a building or on a property from a single user interface device. Any light fitting or device can be controlled from any location. This can provide a high level of flexibility and allows light to be provided in the right amount where and when it is needed.

Lighting controls can contribute significantly to saving energy in new and installed lighting systems. Recent technological developments have automated lighting controls and allowed easy integration of devices into both existing and new installations. Modern lighting controls provide flexibility, reliability and interoperability between devices from different manufacturers.

The following table indicates the energy savings potential of lighting controls:

Type of Control	Energy saving potential (%)
Daylight controls	40-60
Daylight harvesting blinds	20
Presence detection	15-30
Time management	5-15
Maintenance control	10-25

PROPOSALS TO REALISE ENERGY SAVINGS POTENTIAL OF LIGHTING CONTROLS

A: Amendments to Building Code of Australia

1. Review Section J6 of the Building Code of Australia to achieve unified compliance across all Australian jurisdictions
2. Mandate strict inspection, reporting and policing process by building certifiers.
3. Amend Section I of the Building Code of Australia to incorporate mandatory reporting processes for annual building tuning and re-commissioning of the lighting and controls system.
4. Control system vendors to declare compliance with Specification J6 where appropriate.
5. Review key changes to Section J6.3, Specification J6.4, Section I2 and Section F4.4 of the Building Code of Australia.
6. Mandate implementation of Automated Lighting Controls (Section J6.3 of the Building Code of Australia) for all commercial and retail buildings and adjust the correction factors to more realistic values achievable today.

B: Commercial office lighting control

1. Encourage adoption of LED task lighting in conjunction with ambient office lighting. Introduce control management software enabling individual operation of task lighting; minimal disturbance to overhead ambient lighting uniformity.
2. Introduce zones (max. 100m2) to enable effective presence sensing.
3. Incorporate egress path lighting control onto office floor plates.
4. Remove switching for perimeter lighting and introduce dimming with separate relay for after hours closure.
5. Limit wattage consumption per circuit for all building class types.
6. Adopt scalable networked control systems. Require all 'A list' (Property Council of Australia) Class 5 commercial properties to have in place trunk and spur control technology for global building lighting control that is suitable only for dimmable ballast and network operation.
7. Require all Class 5 'A list' commercial properties to have no more than 10% of lighting in operation outside normal trading hours.
8. Require reporting of lighting energy performance by all 'A list' building and tenants based on annual data logging processes and sub-metering.

C: Government

1. All educational facilities, both new and established, to be operated only by lighting controls.
2. Install separate dimmable perimeter zoning for all educational facilities, both new and established.
3. Require minimum NABERS energy requirements to be adopted by local government planning authorities for all commercial approvals – commence with a minimum of 3 Star NABERS Energy ratcheted every three years.
4. Require Energy Performance Certificates to be displayed by all public buildings, including 'A list' spaces.

D: Education

1. Introduce a program of training on Section J6 & I2 of the Building Code of Australia.
2. Introduce a program of training on NABERS Energy and Lighting Control.

E: Commissioning of lighting systems

Adopt CIBSE Code L as a mandatory requirement for commissioning of all lighting systems and controls for commercial buildings and tenancies.

F: Dimming fluorescent lighting

Introduce minimum performance standards for dimming fluorescent luminaires, including CFLs. (Dimming should result in a net decrease in energy consumption.)

G: Daylight harvesting

The importance of daylight to health and well being is well proven. Current research is reinforcing this principle. Daylight improves the internal environment, its impact on productivity and health is well documented and at the same time it can save electric lighting energy.

Windows are no longer the only daylight source for building interiors. New devices such as solar tubes with advanced optics are now available. Solar light tubes can provide good consistency in interior light levels, reduced glare and radiant heat, are dimmable via baffles and utilise lenses to change daylight to a warm colour temperature. Solar light tubes have the ability to integrate with both the artificial light (dimming) fittings and daylighting control to satisfy required luminance levels.

In order to meet the energy targets of Greenlight Australia, building designers – architects, consultants and engineers included - should consider offering a daylight harvesting option on all projects.

H: Additional recommendations

- Mandate a control system for all exterior lighting, the minimum being a time switch or a daylight sensor.
- Lighting energy evaluations need to include usage time (the BCA W/m² method does not adequately address this).
- Lighting circuits should have separate metering and higher energy tariffs should apply to lighting power use outside normal trading hours (to discourage lighting being left switched on all night).
- More lighting controls should be used in retail areas. The use of time switching, motion detection and daylight dimming should be encouraged.
- Daylight should be used more in retail lighting spaces. When shopfront window displays are adequately lit by daylight, artificial lighting should be dimmed or switched off.
- All celled offices irrespective of building class type to be operated on presence sensing.
- All workstation layouts irrespective of building class type to be operated on presence sensing either via motion sensor or workstation PC.
- All perimeter lighting irrespective for building class 5 to 8 to operate on daylight PE sensing with provision for secondary row lighting to also be adjustable/dimmable in accordance with daylight requirements. Remove "switching" methodology.
- All lighting areas to be zoned no greater than 100m2 and to be operated by automated control – presence sensing and capable of being fully dimmed.

- All lighting zoned areas to be linked via automated egress control strategy. Here, placement of “smart sensor” technology that links an “afterhours” occupied zone within an area and tasks relative sensors to set up an egress path to ensure occupant comfort in relation to safety and well being. This avoids unnecessary lighting of the entire floor plate to accommodate one small area.
- Apply limits on wattage consumption per circuit for all building class type spaces, including residential.
- Where technology permits, all light source ballasts available for sale should only be dimmable.
- Adoption of scalable networked control systems separate to the BMS that interfaces between occupant and building operator. Scalable because as both occupier and area requirements change, the network is upgraded to accommodate. This includes advanced integration with HVAC, BMS, security, fire detection, access control and blinds. Overall control can be communicated remotely via TCP/IP configuration.
- Network technology coupled with either soft wiring (modular wiring) or a DALI solution virtually eliminates wasteful re-work and rewiring of the ceiling space and creates a true sustainable approach to green building office fit outs. Office lighting fixtures can be physically unplugged from one location and placed in another within the office space and via a ‘smart’ LCM (lighting control module) automatically take its addressable place within the lighting layout. No extensive re-work is required. Hence the term ‘plug and play’ or modular wiring.
- Promote soft wiring plug and play topology combined with ceiling fit lighting control modules as the future approach for sustainable green based commercial lighting and wiring.