CARBON TRUST

Lighting

A guide to equipment eligible for
Enhanced Capital Allowances

Contents

Introduction

Enhanced Capital Allowances (ECAs) are a straightforward way for a business to improve its cash flow through accelerated tax relief. The scheme encourages businesses to invest in energy saving plant or machinery specified in the Energy Technology List (ETL) to help reduce carbon emissions, which contribute to climate change.

The ETL is a register of products that may be eligible for 100% tax relief under the ECA scheme for energy saving technologies[1]. The Carbon Trust manages the list and promotes the ECA scheme on behalf of government.

This leaflet gives an overview of lighting equipment specified on the ETL and illustrates the reductions in energy bills that can be realised by investing in qualifying ETL energy saving equipment over non-qualifying equipment.

Background

The ETL comprises two lists: the Energy Technology Criteria List (ETCL) and the Energy Technology Product List (ETPL). The ETCL defines the performance criteria that equipment must meet to qualify for ECA scheme support; the ETPL is the list of products that have been assessed as being compliant with ETCL criteria.

However, lighting equipment is an exception to the rule and is not listed on the ETPL; spending on lighting plant and machinery which meets the appropriate criteria in the ETCL can qualify for an ECA. Businesses should therefore seek confirmation from their lighting supplier that the equipment complies with ETCL criteria prior to purchase.

Further information

Further information is given in the Chartered Institution of Building Services Engineers (CIBSE) Code for Lighting and SLL Lighting Handbook, and the Carbon Trust's Lighting technology overview (CTV049)). For more information on lighting visit www.carbontrust.com/lighting

Setting the scene

Commercial lighting accounts for over 50TWh/year of electricity consumption in the UK, resulting in over 5 million tonnes of carbon emissions[2]. Around 30%-40% of this could be saved by using more efficient lamps and luminaires together with appropriate lighting controls.

Energy saving opportunities available for lighting, include:

- Compact fluorescent downlights can also be used instead of tungsten halogen lamps, saving 50%-65%[2] in energy use. The biggest energy savings are achievable for compact fluorescent lamps with electronic high frequency ballasts.
- Use of white light emitting diode lighting (LED) units or compact metal halide (for example CDM) lamps instead of tungsten halogen in display lighting.
- Use of high pressure sodium or metal halide lamps instead of old mercury discharge lamps in high bay applications.
- For fluorescent lighting, changing to slimmer T5 and T8 triphosphor tubes with high frequency electronic ballasts can provide energy savings of 20%-25%[3].
- Use of efficient luminaire types with a high light output ratio (LOR).

Use of appropriate lighting controls. These can include daylight linked photoelectric control, presence detection with occupancy sensors, time switching and flexible manual control, for example using hand held remote controls. Controls should be selected that are appropriate to the type of space and whether it is day-lit or rarely occupied. Savings of 30%-40% are common for circumstances where automatic controls are used.

Efficient, well designed lighting can boost a business' productivity and sales as well as saving energy.

Low energy lighting is also one of the most visible ways that an organisation can demonstrate concern for the environment.

1 Eligibility for ECAs is based on a number of factors. Visit http://etl.decc.gov.uk/ to find out more. Data from Market Transformation Programme 'BNCL KO01: Commercial Lighting Government Standards EvidenceBase 2009: Key Outputs' available from http://efficient-products.defra.gov.uk

2 See BRE Report BR415, 'Office lighting'.

3 See BRE Digest 498 'Selecting lighting controls'.

Benefits of purchasing ETL listed products

Lighting products that comply with the criteria on the ETCL are highly energy efficient, particularly when compared to other types of lighting without the use of appropriate controls.

When replacing lighting, businesses are often tempted to opt for fittings with the lowest capital cost, However, such immediate cost savings can prove to be a false economy with the savings over the lifetime of the product not taken into account. Considering the life cycle cost before investing in equipment can help enhance the cash flow benefits still further.

The ECA scheme provides businesses with 100% first year tax relief on their qualifying capital expenditure and the ETCL specifies the criteria for energy saving technologies that are supported by it. This means that businesses can write off the whole cost of the equipment against taxable profits in the year of purchase. This can provide a cash flow boost and an incentive to invest in energy saving equipment which normally carries a price premium when compared to less efficient alternatives.

This leaflet also illustrates the reductions in energy consumption, carbon emissions and energy bills that can be realised by investing in qualifying ETL energy saving equipment over non-qualifying equipment.

Lighting equipment eligible under the ECA scheme[4]

High efficiency lighting units

High efficiency lighting units (HELUs) are a combination of a light fitting (or luminaire), one or more lamps and associated control gear. The fitting itself will generally incorporate reflectors and other optical components to direct the light to where it is required. The control gear comprises the starter and ballast (usually inside the fitting) that run the lamp. Neither the light fitting, lamp or control gear alone can be said to meet the ETL criteria. This means that replacement lamps are not eligible for ECA support on their own. Eligible HELUs may also now incorporate lighting control devices such as dimming or presence controls. Four different categories of HELU are covered by the ECA scheme:

- Amenity, accent and display lighting units.
- General interior lighting units.
- Exterior area lighting units.
- Exterior floodlighting units.

Luminaires with LED lamps are not classified as HELUs although may still be eligible for ECA support (see 'white light emitting diode lighting units' below). In order to be eligible for an ECA, a HELU must meet certain performance requirements. The luminaire must have a high efficacy; the efficacy is the amount of light it provides, divided by the total wattage of the lamp(s) and ballast. Inefficient luminaires are not eligible for support. In addition, fittings and the lamps and control gear inside them, must meet certain safety and performance standards. For example ballasts must be of the more efficient electronic types, except in some high wattage discharge lamp luminaires.

A luminaire supplier will be able to provide confirmation that the installation meets the relevant standards, which you can then use to support an ECA claim.

Using the two following fluorescent lighting scenarios for comparison: (a) installation of two 36W T8 lamps with magnetic ballasts in 25 standard luminaires, versus (b) two 21W T5 lamps in the same number of highly efficient luminaires both installed in a 100m^2 general retail store for 16 hrs/day and seven days per week, the potential financial, energy and carbon savings (assuming electricity at 9p/Kwh and carbon emissions at 0.524kg/kWh) for HELUs has been calculated as:

Potential annual savings for the installation of ECA eligible luminaires over 100m^2 floor area:

- £394
- 4,380kWh
- 2.3 tonnes CO2

[4] The descriptions of the lighting equipment given in this leaflet are examples only. The formal criteria and details governing the ECA scheme can be found at http://etl.decc.gov.uk/

Scenario (b) gives a 42% energy saving compared to (a). The luminaires are smaller and neater and the electronic ballasts used for the T5 lamps make them last longer, resulting in a maintenance saving. Installing appropriate lighting controls can give additional savings (see below).

Lighting controls

The ECA scheme aims to encourage the purchase of lighting controls that realise energy savings by automatically switching or dimming lighting.

Five different categories of lighting control are covered by the ECA scheme:

- Time controllers that automatically switch off lighting at predetermined times.
- Presence detectors with associated switching controllers that monitor occupancy and automatically switch off or dim lighting when the area is unoccupied.
- Daylight detectors with associated switching controllers that monitor daylight availability and automatically switch off lighting when daylight is sufficient.
- Daylight detectors with associated dimming controllers that monitor daylight availability and automatically dim lighting to the level needed.
- Central control units that can manage the operation of electric lighting installations that include some or all of the categories of lighting controls above.

***Figure 1** Ceiling flush mounted PIR Occupancy Switch with adjustable time lag function*

Image courtesy of DANLERS Limited

***Figure 2** Ceiling flush mounted photocell switch*

Image courtesy of DANLERS Limited

The five control categories may be installed either individually or in combination. There are various requirements that controls must meet in order to be eligible for ECA support. For example, controls are not eligible for support in installations where individual users can change the settings of the control to undermine its energy saving operation. A lighting controls supplier will be able to advise on whether the installation of a particular control meets the criteria for support and can provide confirmation of compliance with the products. This can be used to support an ECA claim.

Different types of control are appropriate for different applications. Time controls are appropriate in places with fixed operating hours. For example, a time switch can be used to switch off the lighting in a shop or restaurant outside opening hours, see Figure 1 on page 5.

Occupancy switching using presence detection can give substantial energy savings in intermittently occupied spaces such as warehouses and some display areas. Absence detection, where switching on is done manually but switching off happens automatically, is effective in daylit spaces and is also eligible for ECA support.

The most common form of occupancy detector is based on passive infrared (PIR) sensors. Microwave based switching is effective in larger spaces. The less common ultrasonic sensors are more sensitive and can detect movement in spaces with part-height partitions such as changing rooms. Usually, lighting is switched off after the sensor fails to detect movement, but in areas where safety is very important, some controls can dim the lighting to a low level instead.

For daylight detection or photoelectric control, the lighting is switched or dimmed in response to incoming daylight. Dimming generally saves more energy and will be less obtrusive to the occupants when compared to switching. Switching control usually incorporates some form of time delay, or a gap between the illuminances at which lamps are switched on and off to prevent over-frequent switching. Lamps are switched or dimmed as individual luminaires or in groups, depending on daylight penetration in the space. For example, the row of lamps nearest a window wall would normally be controlled separately from the remainder of the lighting. Photoelectric control should be used in conjunction with another form of control to allow the lighting to be switched off outside of occupied hours.

Using the baseline scenario below, the potential financial, energy and carbon savings have been calculated for the use of lighting controls:

A 400m^2 warehouse with a fluorescent lighting installation that illuminates storage racks has an installed load of 4.8kW. Lights are left on all the time (10 hours per day, five days per week), even though the average rack is only visited a quarter of the time. Installing ECA eligible presence detectors on each of the 10 racks, at a cost of £900, to switch off the lighting when the rack is unoccupied is predicted to save 70% of lighting energy use in this part of the warehouse.

Potential annual savings achieved by installing presence detection (for a 400m^2 floor area) are:

- £786.
- 8,736kWh.
- 4.6 tonnes CO_2.

After the first year, almost £800 of energy savings could be made each year during the lifetime of the installation. There will be a small maintenance cost for the lighting control system, but this is estimated at no more than £20 per annum.

Savings achieved by installing lighting controls are roughly proportional to floor area. Therefore, in a larger warehouse than that indicated by the example, larger savings could be achieved.

Information for purchasers

For further information about the ECA scheme, the Energy Technology List (ETL) and other Technology Information Leaflets in the series please visit http://etl.decc.gov.uk/etl or contact the Carbon Trust on +44 (0)300 330 0657 or email ECAQuestions@carbontrust.co.uk.

White light emitting diode (LED) lighting units

ECA eligible white light emitting diode lighting units are specifically designed to provide white light by means of solid-state lighting devices.

White LED lighting units consist of one or more white LEDs, a light fitting (or luminaire) and associated electrical drive units. Eligible white LED lighting units may also now incorporate lighting control devices such as dimming or presence controls. LED replacement lamps are not eligible for support.

LED lighting can be of the following types:

- Amenity, accent and display lighting units.
- General interior lighting units.
- Exterior area lighting units.
- Exterior floodlighting units.

Investments in white light emitting diode lighting units can only qualify for Enhanced Capital Allowances if the products meet a number of eligibility criteria set out in an 'Energy Technology Criteria List' (ETCL). The individual products purchased do not need to be named on the Energy Technology Product List.

The unit must provide a minimum amount of light (lumens), with at least 90% of its initial light output after 6000 hrs of use (an indicator of product lifetime). The unit as a whole must also have a minimum luminous efficacy (lumen per watt) which is the total amount of light (emitted from the whole unit including any optical components NOT just the LED chip itself) divided by the electrical power used by the whole unit including the control unit (driver). Inefficient LED units that provide less light than required for their wattage are not eligible. There are also criteria relating to colour quality, electrical quality (power factor) of the control unit (driver) and standby power consumption. In addition the fittings and control units (drivers) must be CE marked for safety.

As there is not yet a single nationally or internationally agreed standard for measuring the performance characteristics of LED products, a number of test procedures are specified in the eligibility criteria. These procedures ensure that the correct measurements are made by the manufacturer/ supplier.

The supplier of the LED unit should provide confirmation that the unit conforms to all the required standards and criteria (preferably in the form of a certificate) that can then be used to support an ECA claim.

As they are directional sources, LEDs can be particularly effective for display lighting. The two following display lighting scenarios can be compared:

a) installation of forty 35W mains halogen spot lights, versus b) forty 9W LED lighting units with a total light output of 414 lumen per unit, both installed in a small retail store and used 16 hours a day and seven days a week.

The potential financial (£), energy (kWh) and carbon savings (tonnes CO_2) have been calculated – see box.

Potential annual savings for the installation of 40 ECA eligible LED display light fittings:

- £547.
- 6,073kWh.
- 3.2 tonnes CO_2.

Scenario (b) gives a 75% energy saving compared to (a). The LED lighting units have a nominal life greater than 30,000 hours whereas the mains halogen spot light requires changing every 1500-2000 hours (which is about three times a year at this level of usage) resulting in a significant maintenance saving in addition to the energy saving.

Go online to get more

The Carbon Trust provides a range of tools, services and information to help you implement energy and carbon saving measures, no matter what your level of experience.

↘ Empower Savings Calculator

Calculate your organisation's potential carbon savings with our online calculator. Empower has been configured entirely around the employee, to help them see that through simple behavioural changes, their individual efforts add up to make a bigger difference. **www.carbontrust.com/resources/reports/advice/empower-savings-calculator**

↘ Events and Workshops

The Carbon Trust offers a variety of events and workshops ranging from introductions to our services, to technical energy efficiency training. **www.carbontrust.com/about-us/events**

↘ Publications

We have a library of free publications detailing energy saving techniques for a range of sectors and technologies. **www.carbontrust.com/resources**

↘ SME Network

An online community for SMEs with the aim of increasing the sharing of best practice between SMEs looking to reduce carbon emissions from their estate and operations. **http://smenetwork.carbontrust.com**

* Subject to terms and conditions.

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The Enhanced Capital Allowance Scheme for energy saving equipment is run by the Carbon Trust on behalf of Government.

Published in the UK: February 2014.

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