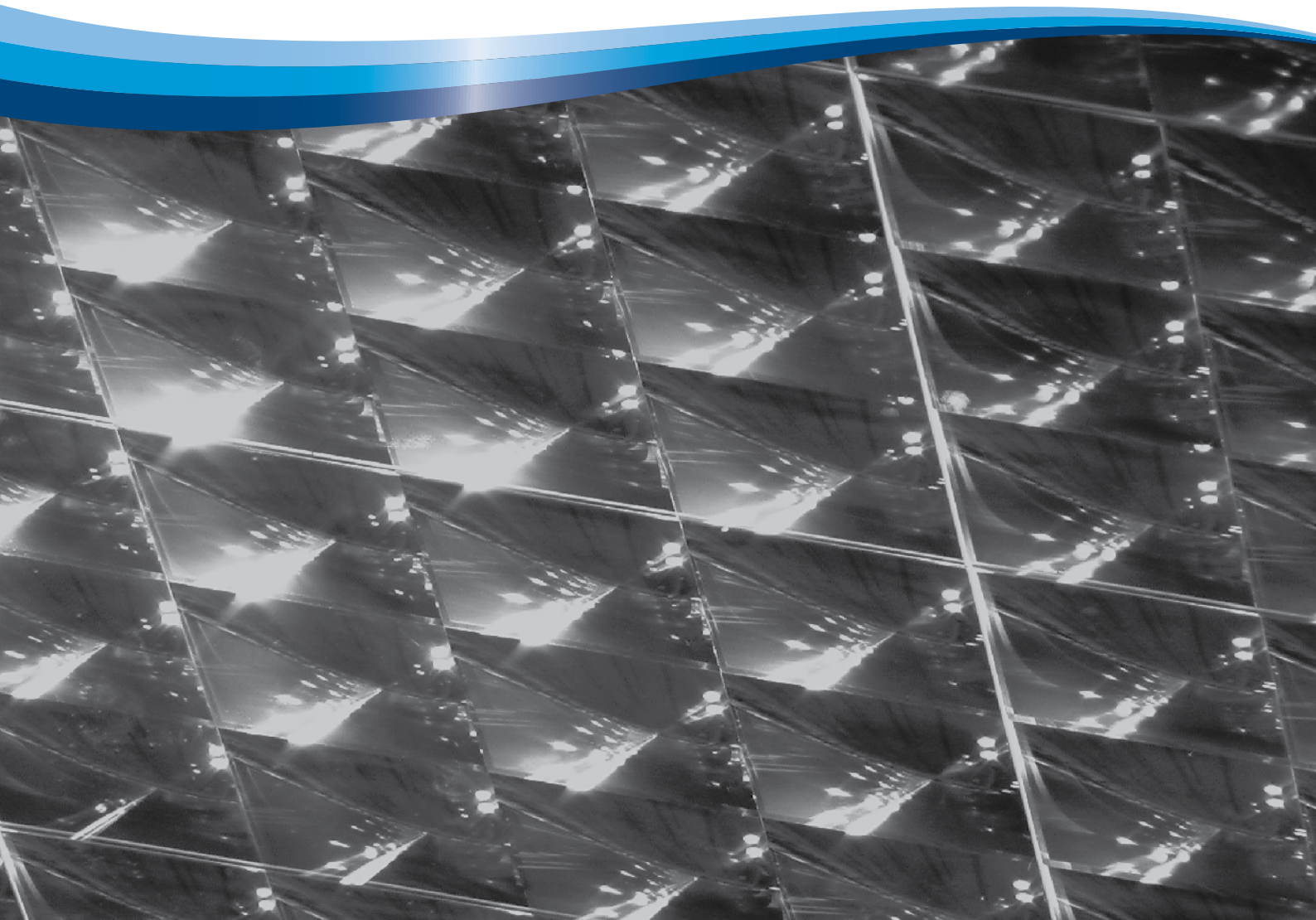


Lighting

A guide to equipment eligible for
Enhanced Capital Allowances



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Introduction

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 ETL to help reduce carbon emissions, which contribute to climate change.

The Energy Technology List (ETL) is a register of products that may be eligible for 100% tax relief under the Enhanced Capital Allowance (ECA) scheme for energy saving technologies¹. 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 aims to help businesses present a sound business case for purchasing energy saving equipment from ETL manufacturers and suppliers.

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 a qualified 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 the Carbon Trust's *Lighting technology overview* (CTV021).

For more information on lighting visit www.carbontrust.co.uk/lighting

Setting the scene

Commercial lighting accounts for 48.3TWh/year of electricity consumption in the UK, resulting in 5.1 million tonnes of carbon emissions². 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:

- Use of compact fluorescent lamps instead of conventional tungsten lamps. These can reduce lighting energy use by 65%-80%. 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 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%⁴ are common for circumstances where lighting 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 www.eca.gov.uk/energy to find out more.

² Figures based on an analysis of circuit Watts consumed for lamps of similar lumen output.

³ See BRE Report BR415, 'Office lighting'

⁴ 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 such as tungsten 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. 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.

Using this leaflet you can calculate the benefits of investing in qualifying ETL energy saving equipment over non qualifying equipment. The calculation includes accelerated tax relief, reduced running costs, increased efficiency, lower energy bills and reduced Climate Change Levy payments (if applicable), which in turn helps reduce payback periods.

Lighting equipment eligible under the ECA scheme⁵

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 ineligible for ECA support on their own.

Six different categories of HELU are covered by the ECA scheme:

- Triphosphor compact fluorescent lamps (CFL) and light fittings, including electronic control gear.
- T8 triphosphor linear fluorescent lamp(s) and light fittings with electronic control gear.
- T5 triphosphor linear fluorescent lamp(s) and light fittings with electronic control gear.
- High-pressure sodium lamps, or metal halide lamps, and high-bay, low-bay or horticultural light fittings.
- High-pressure sodium tubular lamps or metal halide lamps and floodlight fittings or post-mounted lanterns for exterior lighting.
- Metal halide lamps and accent or display light fittings.

In order to be eligible for an ECA, the luminaires and the lamps inside a HELU must meet certain performance requirements. The lamp and luminaire must provide a certain amount of light, which is dependent upon the type of lamp and its wattage. Inefficient lamps that provide less light, and luminaires that allow less than a specified proportion of the light from the lamp to reach the task, are not eligible for support. In addition, fittings and the lamps and control gear inside them, must meet certain safety and performance standards.

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 100m² general retail store for 16 hrs/day and seven days per week, the potential financial (£), energy (kWh) and carbon savings (tonnes CO₂) have been calculated for HELUs:

Potential annual savings for the installation of ECA-eligible luminaires over 100m² floor area:

- £396
- 5,213kWh
- 2.2 tonnes CO₂.

⁵ 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 www.eca.gov.uk/energy.

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 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 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 ineligible for support in installations where individual users can override the energy saving operation of the control. 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 applications 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 (Figure 1).

Occupancy switching using presence detection can give substantial energy savings in intermittently occupied spaces such as warehouses and some display areas. 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.

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 difference 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 (kWh) and carbon savings (tonnes CO₂) have been calculated for the use of lighting controls:

A 400m² 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% on lighting energy use in this part of the warehouse.

Potential annual savings achieved by installing presence detection (for a 400m² floor area) are:

- £664
- 8,736kWh
- 3.8 tonnes CO₂.

After the first year, over £600 of 'free' 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 www.carbontrust.co.uk/eca, contact the Carbon Trust on 0800 085 2005 or email customercentre@carbontrust.co.uk

White Light Emitting Diode Lighting Units for Amenity, Accent and Display Lighting

ECA eligible white light emitting diode lighting units are specifically designed to provide white light by means of solid-state lighting devices, for use in amenity, accent and display lighting.

White LED lighting units consist of one or more white LEDs, a light fitting (or luminaire) and associated electrical drive units. The luminaire generally also includes an optical system that reflects and/or focuses the product's light output onto the item(s) being illuminated. Units that rely on existing transformers (or other control units) to regulate the current are not eligible.

Amenity, accent and display lighting can refer to the following lighting types:

- Recessed down lighting units
- Spot lighting units
- Task lighting units
- Other directable lighting units
- Linear display cabinets lighting units
- Exterior flood lighting units.

Investments in products containing white light emitting diode lighting units for amenity, accent and display lighting can only qualify for Enhanced Capital Allowances if the products meet a number of eligibility criteria set out in an 'Eligible 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) after 100 hr and after 4000 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). 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 the proportion of light that must be emitted in the forward direction. In addition the fittings and control units (drivers) must meet certain safety standards.

As there is not yet a 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.

Using the two following display lighting scenarios for comparison:

a) installation of forty 35W mains halogen spot lights, versus b) forty 9W LED lighting unit with total light output 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 CO₂) have been calculated – see box.

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

- £462
- 6,073kWh
- 2.6 tonnes CO₂.

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.

Calculating the payback of your investment

Based on the operating conditions above, indicative savings can be calculated for replacing your existing equipment with either ETL-listed equipment or non-ETL-listed equipment.

The accelerated tax relief and cash flow benefit provided by the ECA, together with the life cycle cost savings from ETL-listed equipment, aid in bridging the price premium and shortening the investment payback period⁶.

To calculate the payback period for ETL-listed equipment and non-ETL-listed equipment for comparison you will need:

- The unit price (kW) of the energy your business consumes.
- Estimated energy usage (kW) for the ETL proposed equipment solution(s), which the manufacturer or supplier should be able to help you with.
- Estimated energy usage (kW) for the non-ETL proposed equipment solution(s), which the manufacturer or supplier should be able to help you with.
- Estimated annual maintenance costs incurred by your business for the ETL-listed equipment (your manufacturer or supplier should be able to help you with estimates).
- Estimated annual maintenance costs incurred by your business for the non-ETL-listed equipment (your manufacturer or supplier should be able to help you with estimates).
- The value of the proposed capital expenditure.
- Your business's corporation tax rate.

In addition, the following information is also required:

- A copy of the Carbon Trust fact sheet *Energy and carbon conversion* (CTL004).
- Incorporation of the fact that capital allowance (CA) tax relief for non ETL equipment is 20% (10% if allocated to the 'special rate' pool) and that enhanced capital allowance (ECA) tax relief for ECA equipment is 100%.

Step 1: To prepare your business case for investment you first need to estimate annual energy consumption of the ETL-listed equipment and non-ETL-listed equipment.

$$\text{Annual energy consumption (kWh/y)} = \text{Equipment consumption (kW)} \times \text{Number of operating hours/year}$$

Additionally, you can calculate the carbon emissions associated with the energy consumption using either the Carbon Trust fact sheet *Energy and carbon conversion* (CTL004) or by using the tool at www.carbontrust.co.uk/conversionfactors by simply multiplying the energy consumption by the carbon emission factor for that fuel type.

$$\text{Carbon emissions} = \text{Annual energy consumption (kW)} \times \text{Emission factor (kg CO}_2\text{/kWh)}$$

Step 2: Calculate the annual running cost (ARC) of ETL-listed equipment and non-ETL-listed equipment.

$$\text{ARC} = \text{Annual energy consumption (kW)} \times \text{Pence/kWh} + \text{Annual maintenance cost}$$

Step 1 and 2 can also be done for your existing equipment to calculate an ARC, in order to allow comparisons of the annual saving (step 3) between the existing equipment, the ETL-listed equipment, and the non-ETL-listed equipment.

Step 3: Calculate the annual saving between the ETL-listed annual running costs and non-ETL-listed annual running costs.

$$\text{Annual saving} = \text{ARC of new equipment} - \text{ARC of existing equipment}$$

Step 4: Calculate the tax allowance for ETL-listed equipment and non-ETL-listed equipment which will be business-specific based on the following:

- The value of your capital expenditure
- Capital allowance (CA) tax relief for non-ETL equipment is 20%. If allocated to the special rate pool it is reduced to 10%.
- Enhanced capital allowance (ECA) tax relief for ECA equipment is 100%
- The rate of corporation or income tax for your business.

⁶ The values used in the examples given are for illustrative purposes only and do not reflect specific case studies. Anyone considering purchasing this type of equipment would be advised to also analyse the benefits that would be available based on their own circumstances. It should also be noted that the use of formally trained lighting equipment technicians can provide significant energy saving benefits.

$$\text{CA tax allowance} = \text{Capital expenditure} \times 20\%^* \times \text{Rate of corporation tax}$$

$$\text{ECA tax allowance} = \text{Capital expenditure} \times 100\% \times \text{Rate of corporation tax}$$

Step 5: Calculate the pay back for ETL-listed equipment and non-ETL-listed equipment.

$$\text{Payback period} = \frac{\left[\text{Capital expenditure} - \text{Tax allowance} \right]}{\text{Annual saving}}$$

To calculate the available CA tax allowance on capital expenditure beyond Year 1 you need to decrease the capital expenditure by 20% per year (10% if allocated to the special rate pool) on a reducing balance basis. Over the nine years the available CA tax allowance are shown in the table below.

Table 1 The cash flow boost to your business of an ECA over a CA for a capital investment of £10,000

	Year								
	1	2	3	4	5	6	7	8	9
Capital Expenditure (£)	10,000	8,000	6,400	5,120	4,096	3,277	2,621	2,097	1,678
Capital Allowance (CA) @ 20% (£)	2,000	1,600	1,280	1,024	819	655	524	419	336
CA Tax Allowance	560	448	358	287	229	184	147	117	94
Enhanced Capital Allowance @100% (£)	10,000	0	0	0	0	0	0	0	0
ECA Tax Allowance	2,800	0	0	0	0	0	0	0	0

Calculations are based on 28% corporation tax/income tax and a capital allowance rate of 20%.

* Replace with 10% if allocated to the special rate pool.

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.

Carbon Footprint Calculator – Our online calculator will help you calculate your organisation's carbon emissions.

→ www.carbontrust.co.uk/carboncalculator

Interest Free Loans – Energy Efficiency Loans from the Carbon Trust are a cost effective way to replace or upgrade your existing equipment with a more energy efficient version. See if you qualify.

→ www.carbontrust.co.uk/loans

Carbon Surveys – We provide surveys to organisations with annual energy bills of more than £50,000*. Our carbon experts will visit your premises to identify energy saving opportunities and offer practical advice on how to achieve them.

→ www.carbontrust.co.uk/surveys

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→ www.carbontrust.co.uk/publications

Need further help?



Call our Customer Centre on 0800 085 2005

Our Customer Centre provides free advice on what your organisation can do to save energy and save money. Our team handles questions ranging from straightforward requests for information, to in-depth technical queries about particular technologies.

The Carbon Trust was set up by Government in 2001 as an independent company.

Our mission is to accelerate the move to a low carbon economy by working with organisations to reduce carbon emissions and develop commercial low carbon technologies.

We do this through five complementary business areas:

Insights – explains the opportunities surrounding climate change

Solutions – delivers carbon reduction solutions

Innovations – develops low carbon technologies

Enterprises – creates low carbon businesses

Investments – finances clean energy businesses.

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