

Radiant heating equipment

A guide to equipment eligible for
Enhanced Capital Allowances



Contents

Introduction	01
Background	01
Setting the scene	01
Benefits of purchasing ETL-listed products	01
Radiant heating equipment eligible under the ECA scheme	02
Radiant tube heaters	02
Radiant plaque and cone heaters	04
Calculating the payback of your investment	05

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 radiant heating 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.

Setting the scene

Typically 35% of the heated air in commercial buildings is lost through ventilation². In large industrial buildings with high ventilation rates, the proportion can be even higher, particularly where there is local exhaust ventilation for fume control. Radiant heating reduces these energy losses by heating the occupants, not the air. This means that the air temperature, and hence the energy lost through ventilation, is significantly lower than in a building heated by fan convectors or low temperature radiators.

Typical applications for radiant heating include retail sheds (particularly DIY outlets), sports centres, warehouses, factories, workshops and animal houses.

Did you know?

As a rule of thumb, every 1°C reduction in air temperature through the use of radiant heating will produce a 5% to 10% reduction in annual energy consumption.

Benefits of purchasing ETL-listed products

To be listed in the ETL, radiant heating products must meet minimum efficiency criteria that are verified by independent test laboratories. This means that they are generally more energy efficient than non-listed products.

When replacing equipment, businesses are often tempted to opt for that 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 reduce costs and improve cash flow in the longer term.

The ECA scheme provides businesses with 100% first year tax relief on their qualifying capital expenditure. 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 the benefits of 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.

Important

Businesses purchasing equipment must check the ETPL at the time of purchase in order to verify that the named product they intend to purchase is designated as energy saving equipment. Radiant heating equipment that meets ETL eligibility criteria but is not listed on the Energy Technology Product List (ETPL) at the time of purchase is not eligible for an ECA.

¹ Eligibility for ECAs is based on a number of factors. Visit www.eca.gov.uk/energy to find out more.

² The Carbon Trust's *Building Fabric* technology overview (CTV014): 35% or thereabouts is a consequence of the application of Part L of the Building Regulations and the ventilation rates recommended in CIBSE Guide B2 Ventilation & air conditioning. Most buildings, including older ones, fall in the range of 30% to 40% ventilation loss, except where higher ventilation rates are applied for health and safety reasons.

Radiant heating equipment eligible under the ECA scheme³

There are three types of radiant heating equipment specified as energy saving under the ECA scheme:

- Radiant tube heaters
 - Unitary radiant tube heaters
 - Multi-burner radiant tube heaters
 - Continuous radiant tube heaters
- Radiant plaque heaters
- Radiant cone heaters.

Using the baseline scenario below, the potential financial (£), energy (kWh) and carbon savings (tonnes CO₂) have been calculated for comparison unless otherwise indicated:

- The ECA product is 5% more efficient than the standard product but 10% more expensive to purchase.
- Replacement of a conventional factory air heating system with a radiant tube heater rated at 800kW.
- The gas price is 3p/kWh with the Climate Change Levy (CCL) at 0.15p/kWh.
- Gas consumption is based on single shift working (10 hours per day during the heating season).

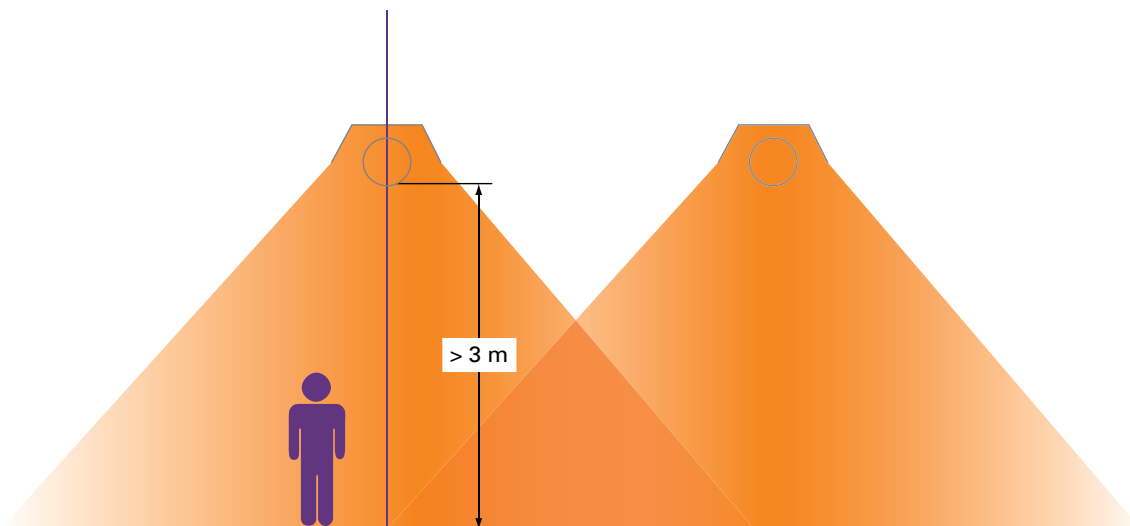
Radiant tube heaters

A radiant tube heater consists of a steel tube with a gas burner at one end of the tube and a flue gas fan at the other, surmounted by a metal reflector. As gas is burned, the temperature of the tube increases (up to 500°C) and it radiates heat. This heat radiation is directed downwards to heat the occupants of the space, much in the same way as light from a fluorescent tube. The radiant heater tubes are usually mounted on the ceiling and must be at least three metres above ground level to be eligible for an ECA.

Did you know?

If your building is subject to high ventilation rates then installing an ETL-listed radiant heating system could help reduce your heating costs by up to 20% compared with conventional air heating systems⁴.

Within the radiant tube heater category, there are three basic types of radiant tube heating included on the ETL. These are described on the next page.



Source: Radiant tube heating, BSRIA

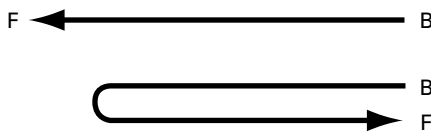
³ The descriptions of the radiant heating equipment given in this leaflet are examples only. The formal criteria and details governing the ECA scheme can be found at www.eca.gov.uk/energy.

⁴ Calculated based on a 2°C reduction in air temperature. Energy consumption for space heating is proportional to the average inside/outside air temperature difference during the heating season, which is around 10°C. A 2°C reduction therefore corresponds to 20%.

Unitary radiant tube heaters

These consist of a single tube with one burner (13kW to 50kW input) and one fan. They are either linear or bent into a U-shape (so that the burner and flue gas fan are at the same end). Different tube lengths correspond to different heat outputs. Up to 20 unitary radiant tubes are commonly used to heat a space, but more may be used.

Plan view of unitary radiant tube heater (not to scale)



B= Burner, F=Flue fan

U-shaped unitary radiant tube heater



Source: Ambirad, Unitary radiant tube heater

Continuous radiant tube heaters

These consist of a long radiant tube fitted with several burners along its length and a common flue gas fan at the end. The multiple burners ensure that the tube's working temperature is maintained along its entire length, which may be more than 100 metres. The tube can be straight or bent in the horizontal plane to fit the space. In some cases, multiple branches of continuous radiant tube may be connected to a single flue gas fan.

Plan view of continuous radiant tube heater (not to scale)



B= Burner, F=Flue fan, and V= Air vent

Continuous radiant tube heaters along the length of a large building

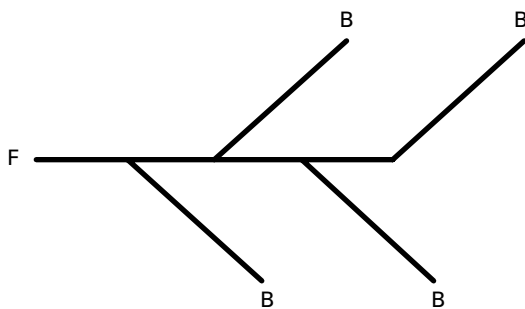


Source: Ambirad, Continuous radiant tube heater

Multi-burner radiant tube heaters

This is an assembly of radiant tubes, each with its own burner but connected to a common flue system. The component tubes and burners are commonly of the same structure as for unitary radiant tube products.

Plan view of multi-burner radiant tube heaters (not to scale)



B= Burner, F=Flue fan

Installing an ETL-listed radiant tube system with a cost of £40,975 rather than a non-specified product with a cost of £37,250, with respective annual running costs of £26,676 and £28,080, the potential annual savings are:

- £1,404
- 46,800kWh
- 8.9 tonnes CO₂.

Radiant plaque and cone heaters

For radiant plaque and cone heaters, a radiant emission is generated by an exposed flame passing over a catalytic matrix, the 'radiant matrix'. This becomes extremely hot (up to 950°C) resulting in an intense radiant source that is used mainly for local or spot heating.

Plaque heaters (8kW to 40kW input) have a plaque shaped radiant matrix (see below). They can be suspended or fixed to walls or pillars surrounding the occupied space.

Cone heaters (6kW-12kW input) have a cone shaped radiant matrix, surmounted by a circular reflector. They are designed for suspension from the roof.

Radiant plaque heater



Source: BSRIA

Installing 100kW of ETL-listed radiant plaque heaters at a cost of £5,500 rather than a non-specified product with a cost of £5,000, with a respective annual running cost of £3,335 and £3,510 the potential annual savings are:

- £175
- 5,850kWh
- 1.1 tonnes CO₂.

Radiant cone heater



Source: BSRIA

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

Further information

For more information visit www.carbontrust.co.uk/heating

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 period⁵.

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

- The unit price (kWh) of the fuel your business consumes.
- Estimated fuel usage (kWh) for the ETL proposed equipment solution(s), which the manufacturer or supplier should be able to help you with.
- Estimated fuel usage (kWh) 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.

$$\text{Annual saving} = \text{ARC of ETL listed equipment} - \text{ARC of ETL non-listed equipment}$$

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.

⁵ 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 radiant heating 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.

$$\text{Payback period} = \frac{\text{Tax allowance} + \text{Annual saving}}{\text{Capital expenditure}}$$

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

Action Plans – Create action plans to implement carbon and energy saving measures.

—▶ www.carbontrust.co.uk/apt

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—▶ www.carbontrust.co.uk/casestudies

Events and Workshops – The Carbon Trust offers a variety of events and workshops ranging from introductions to our services, to technical energy efficiency training, most of which are free.

—▶ www.carbontrust.co.uk/events

Publications – We have a library of free publications detailing energy saving techniques for a range of sectors and technologies.

—▶ 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.

www.carbontrust.co.uk

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