Technology information leaflet ECA767

CARBON TRUST

Warm air heating equipment

A guide to equipment eligible for Enhanced Capital Allowances

Contents

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 technologies[1]. The Carbon Trust manages the list and promotes the ECA scheme on behalf of government.

This leaflet gives an overview of warm air heating equipment specified on the ETL and aims to 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

Warm air heating can be divided into three main categories: indirect-fired, biomass fired and direct-fired.

Indirect-fired warm air heating has been used to provide heating in retail spaces and factory environments for many years. It can be an efficient heating solution as long as attention is paid to minimising ventilation rates and heat losses through the building fabric, effective controls and, where appropriate, the addition of heat recovery plant and destratification fans. Most stand-alone warm air heating units recirculate air, but indirect heating modules are intended to be incorporated within air handling units for heating fresh air.

Biomass fired warm air heaters are used to provide heating, and are most commonly found in spaces such as shops or warehouses, where a source of biomass fuel is readily available.

Direct-fired warm air heating provides both heating and ventilation through the same unit. It is most often found in factories that need continuously high ventilation rates for fume extraction.

Did you know?

ETL-listed indirect-fired warm air heating products can use up to 9% less energy than non ETL-listed products based on the minimum efficiency requirement of EN 1020 (84%) compared to the ETL criteria (91%).

Benefits of purchasing ETL-listed products

Warm air heating products listed in the ETL must meet minimum efficiency and/or functional criteria that are then verified by independent test laboratories. This means that they are generally more energy efficient than products which are not on the list.

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. Warm air heating equipment that meets the 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.

Warm air heating equipment eligible under the ECA scheme[2]

There are two types of warm air heating equipment specified as energy saving under the ECA scheme:

- Indirect-fired warm air heaters
  - Indirect gas and oil-fired packaged warm air heaters
  - Indirect gas and oil-fired packaged air heater modules for air handling units
- Biomass fired warm air heaters
- Direct gas-fired packaged warm air heaters.

Note: Hot water and portable warm air heating appliances are not eligible under the ECA scheme.

Using the baseline scenario below, the potential financial (£), energy (kWh) and carbon savings (tonnes CO_2) have been calculated for comparison unless otherwise indicated:

- The ETL-listed indirect-fired air heater product is 9% more efficient than the standard product but 11% more expensive to purchase.
- 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).
- Improved controllability of the ETL-listed direct-fired air heater relative to a basic product provides 10% fuel saving.

Indirect-fired warm air heating

Indirect-fired packaged warm air heaters consist of a gas or oil burner, heat exchanger and hot air fan. Air from the room is recirculated through the heat exchanger and back into the room at high velocity. The hot air may be discharged directly from the unit or ducted into the room. Flue gases are discharged to atmosphere outside the building. Both floor standing and suspended units are available.

Indirect-fired packaged warm air heater modules use a similar set of burners and heat exchangers, but are designed to fit within air handling units to heat the fresh air being introduced to the building. Only the module is eligible for an ECA and not the air handling unit in which it is mounted, or the associated ductwork.

Suspended indirect-fired warm air heater

Source: Reznor

Floor standing indirect-fired cabinet warm air heater

Source: AmbiRad

[2] The descriptions of the warm air 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**.

In addition to low operating costs and reduced carbon emissions, further advantages of indirect air heating include:

- Low or high-level mounting possible
- Relatively inexpensive
- High thermal outputs available
- More efficient than using a boiler and convector
- Modulating burners and condensing heat exchangers are available.

Installation or replacement of indirect-fired warm air heating should always be considered in conjunction with possible building fabric improvements and minimising uncontrolled air leakage. There may also be benefits from the installation of ventilation heat recovery in some circumstances.

Installing an ETL-listed indirect warm air heating system at a total cost of £13,920 rather than a non-specified product at a cost of £13,200, with a respective annual running cost of £13,163 and £11,978 the potential annual savings are:

- £1,185
- 39,500kWh
- 7.5 tonnes CO_2.

Biomass fired warm air heaters

Using a biomass fired warm air heat can reduce the heating costs of your business and, because biomass fuels are considered carbon neutral, it can also reduce your carbon footprint. Biomass fired warm air heaters are suitable for heating workshops, warehouses, and similar spaces where a source of biomass fuel is readily available. Using air heaters fired by this material will deliver additional financial and environmental benefits by replacing purchased fuels and reducing disposal costs.

Products of varying thermal efficiency are available. Those listed on the ETL use automatically controlled combustion and a good quality heat exchanger to ensure high efficiency, and can be up to 20-30% more efficient than non-listed products.

Businesses considering installing any solid fuel fired appliance should be aware that these are covered by the Clean Air Act. This requires that the local authority is notified of the installation and, depending on location, other requirements may need to be met.

Using the baseline scenario below, the potential financial (£), energy (kWh), and carbon savings (tonnes CO_2) have been calculated for comparison:

- The ETL-listed biomass fired air heater product is 25% more efficient than a non listed unit but 29% more expensive to purchase.
- A Comparison gas fired unit operates at 84% efficiency.
- The gas price is 3p/kWh with the Climate Change Levy (CCL) at 0.15p/kWh.
- The improved efficiency of the ETL-listed direct-fired air heater relative to a basic product provides a 22% wood fuel saving.

Installing a specified ETL listed unit at a cost of £35,000 will generate 350,000 kWh per year of heat energy. If waste wood at zero cost is used as a fuel the potential annual savings are:

- £12,500
- 154,651kWh
- 66.5 tonnes CO_2.

Source: AmbiRad

Direct-fired warm air heater

Direct-fired warm air heating

In direct-fired warm air heaters, combustion occurs within the inlet ventilation air stream, resulting in a thermal efficiency of 100% (net calorific value). Direct-fired warm air heating discharges the products of combustion into the surrounding space. It is therefore only possible in situations where there is good ventilation. For example, the classic application of direct-fired warm air heating is in factory buildings with high ventilation rates for fume control. The technology is also commonly used as part of the heating system for warehouses, large retail sheds and sports arenas.

ETL-listed direct-fired warm air heaters include variable speed fans and high turndown ratio burners to provide a flexible and efficient heating solution that can result in

Warehouse application

Source: Nordair Niche

Installing a specified energy saving ETL direct-fired air heating at a cost of £14,000 rather than a non specified product with a cost of £13,100, with a respective annual running cost of £9,256 and £10,284 the potential annual savings are:

- £1,028
- 34,280kWh
- 6.5 tonnes CO_2.

significant fuel savings compared to a basic heater. The variable speed fans in direct-fired warm air heaters can also provide efficient summer ventilation.

In addition to low capital costs and reduced carbon emissions, further advantages of direct-fired warm air heating include:

- Ventilation and heating in winter and ventilation in summer
- Low discharge temperature eliminates the risk of stratification
- Fast provision of heat from start up
- A single unit can serve a large area
- Low maintenance requirements.

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**

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 period[3].

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.

Annual energy consumption (kWh/y)	=	Equipment consumption (kW)	x	Number of operating hours/year

[3] 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 warm air heating equipment technicians can provide significant energy saving benefits.

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.

Carbon emissions = Annual energy consumption (kW) x Emission factor (kg CO_2/kWh)

Step 2: Calculate the annual running cost (ARC) of

ARC = Annual energy consumption (kW) x Pence/kWh + Annual maintenance cost

ETL-listed equipment and non-ETL-listed equipment.

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.

Annual saving = ARC of ETL listed equipment - 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.

CA tax allowance = Capital expenditure x 20%* x Rate of corporation tax

ECA tax allowance = Capital expenditure x 100% x Rate of corporation tax

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.

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

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

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**

Case Studies – Our case studies show that it's often easier and less expensive than you might think to bring about real change.

→ **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.

* Subject to terms and conditions.

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
0800 085 2005

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