ENERGY TECHNOLOGY CRITERIA LIST (2007)

July 2007

The Energy Technology List comprises the technologies which qualify for the UK government's Energy-Saving Enhanced Capital Allowance (ECA) scheme and their energy-saving eligibility criteria. The Energy Technology List is divided into 2 parts:

- The **Energy Technology Criteria List** which contains details of the energy-saving criteria that must be met for each of the technology classes;
- The **Energy Technology Product List** which contains a list of products that have been certified as meeting those standards.

The Energy Technology Criteria List is updated and published annually. *This document is a copy of the ETCL as published in June 2007.*

The Energy Technology Product List is published annually and is updated at the beginning of each month on the ECA website.

For the most up to date copies of the ETL and for further information about the ECA scheme please refer to the ECA website http://www.eca.gov.uk/etl/.

The ECA scheme is being developed by the Department for Environment, Food and Rural Affairs (DEFRA) and HM Revenue & Customs and promoted by the Carbon Trust. The Carbon Trust manages the Energy Technology List.

CONTENT

Air to Air Energy Recovery

Date added to ETL 2004.

1. Definition of Technology

Air to air energy recovery is the transference of heat energy from one air stream (stale exhaust air) to another (incoming fresh air), within a building ventilation systems. It is applicable in both heating and cooling situations.

2. Technology Description

Air to air energy recovery technology utilises heat exchanger technology to reduced loads on heating and cooling plant by recovering or 'salvaging' heat that would otherwise be lost to atmosphere. Within the context of buildings, heat exchangers are incorporated between supply and extract ventilation ducts to enable air-to-air heat recovery.

There are three common types of heat exchanger technology eligible for Enhanced Capital Allowances:

- **Plate heat exchangers**
  These devices are sometimes referred to as recuperators. These usually comprise of a cubical plate heat exchanger with alternate channels for the supply and exhaust airflows, which are separated by thin metal or plastic plates.

- **Thermal wheels**
  These comprise a circular heat transfer medium that slowly rotates within an airtight container. The exhaust air stream flows over one section of the wheel, and the supply air stream flows in counter flow direction over the remaining section. As the wheel rotates it transfers energy between the two streams. Some designs can recover latent as well as sensible energy.

- **Run-around coils**
  These comprise finned air to water heat exchangers in the supply and exhaust air ducts. A water or water/glycol circuit connects the two heat exchangers and transfers energy between the air streams.

Investments in air-to-air energy recovery can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To achieve product approval, individual product performance must be confirmed by testing to the standards of the Eurovent Voluntary Certification programme (to EN308 – Heat Exchanger: Test procedures for establishing performance of air to air and flue gases heat recovery devices).

A definition of terms commonly used in air-to-air heat recovery are shown here for reference only, as they are used within the eligibility criteria for each technology type below:

- Heat recovery effectiveness (or 'efficiency') – This is the key parameter that determines the thermal performance of the above devices. It is defined as follows:

Effectiveness = actual energy transferred / maximum possible energy transfer

- Cross leakage (between supply and exhaust air) – This is expressed as a percentage of the leakage from the exhaust stream across the heat exchanger and into the supply air stream. It does not include cross leakage between the exit and inlet grills of the air-handling unit.
- Pressure drop – It is important to minimise pressure drop across the device so that energy savings are not reduced by the increased fan power consumption. It is also important that overall electrical power consumption for ventilation does not exceed the guidelines under part L2 of the Building Regulations as a result of installing energy recovery devices.
- Relative air flows – The performance of the energy recovery devices is usually specified under balanced flow conditions. This means that the exhaust and supply air mass flow rates are equal, although in operation this may not always be the case.
- Sensible energy - is defined as the heat energy stored in a substance as a result of an increase in its temperature

Plate heat exchangers (recuperators)

- A minimum effectiveness of 50% (based on sensible energy transfer under balanced flow conditions).
- Internal leakage < 1% (for units >0.2m^3/second rating)
- Pressure drop <250 Pascal (Pa) NOTE: where pressure drop data is not documented, the fan power consumption must be consistent with a pressure drop within this limit.

Thermal wheels

- A minimum effectiveness of 70% (based on sensible energy transfer under balanced flow conditions).
- Internal leakage < 5%
- Pressure drop <200 Pa

Run around coils

- A minimum effectiveness of 45% (based on sensible energy transfer under balanced flow conditions).
- Pressure drop <100 Pa across each coil
- Water side pressure drop < 25 kPa per coil

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Automatic Monitoring & Targeting (AMT)

Portable AMT Equipment

Date added to ETL 2003.

1. Definition of Technology

Automatic Monitoring & Targeting (AMT) Equipment helps to save energy by identifying energy wastage and ensuring the long-term effectiveness of other energy saving investment measures.

2. Technology Description

Portable monitoring equipment allows temporary monitoring of energy use in different locations. The technology prevents energy wastage by highlighting unusual patterns of consumption. Qualifying equipment must measure, record, report and communicate energy management information to enable the business to manage the energy it uses.

Investments in portable AMT equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

P – Portable Meters & Other Sensing Devices

Must meet BS EN61010-1:2001 - Safety requirements for electrical equipment for measurement, control, and laboratory use for safety and have a CE marking.

Must have the following features:

- Meter & transducers to confirm energy consumption & the 'key factors' that influence that consumption.
- Some means of capturing, retrieving & storing the data electronically.
- Analysis, production & communication of 'consumption' management reportage.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Component Based AMT Systems

Date added to ETL 2003.

1. Definition of Technology

Automatic Monitoring & Targeting (AMT) Equipment helps to save energy by identifying energy wastage and ensuring the long-term effectiveness of other energy saving investment measures.

2. Technology Description

A component AMT system allows energy use information to be automatically gathered so that users can gain an understanding of energy consumption. Such a system must include the installation of components that measure, record, transmit, analyse, report and communicate energy management

information to enable the business to manage its energy use by highlight unusual patterns of energy consumption. To that end an AMT system consists of the following components:

- **Meter(s) (component A)**: Meter and transducers to confirm energy consumption and the 'key factors' that influence that consumption.

- **Automatic Meter Reading (component B)**: Some means of capturing, retrieving & storing the data electronically.

- **Analytical Software (component C)**: Analysis, production & communication of 'consumption' management reportage.

Investment in component based automatic monitoring and targeting (AMT) systems for Enhanced Capital Allowances are not required to be named on the Energy Technology Product List. To be eligible for Enhanced Capital Allowances component based AMT systems must meet the eligibility criteria set out below.

3. Eligibility Criteria

Component Based AMT System

A complete component based AMT system comprises meter(s), a meter reading system and analytical software. All three components need to be present to create an AMT system. If new components are added to pre-existing, but otherwise qualifying components (i.e., components installed in a previous tax year) to create a component AMT system then only those newly installed components will be eligible for ECAs.

Where an AMT system contains qualifying components A and C, but the means of capturing, retrieving & storing the data that serves the function of component B is not solely for the purpose of monitoring consumption for energy management purposes (e.g. the AMT component B is integrated within a BEMS, an IT network or the internet), then the equipment that contains components A and C can qualify for ECAs. Whilst component B is not eligible for ECAs, it completes the AMT equipment installation (i.e. components A, B, C are in place).

In some instances component C will be provided as an internet-based service. Whilst this component is not eligible for ECAs, it serves the function of component C within a complete system, and under these circumstances components A and B can qualify for ECAs.

Spending on a component AMT systems can qualify for ECAs provided the Department for Environment Food and Rural Affairs (DEFRA) has issued a 'certificate of energy efficiency' to confirm that it meets the qualifying eligibility criteria set out below. Such certificates can be issued at the designed stage, but any subsequent change in the component AMT system design needs to be confirmed with DEFRA.

The applications for a DEFRA 'certificate of energy efficiency' to confirm compliance should contain details of each of the installed qualifying components, A, B and C, and a declaration that the equipment has been, or will be, purchased for the purpose of managing energy consumption.

A - Requirements for AMT Metering

- **Electricity Meters:**
  Meters must be either:
  a) Class 2 accuracy: BS 8431 Code of Practice for electrical static metering for secondary or sub-metering
  OR

b) Class 2 accuracy: meeting the accuracy of BS EN62053-21:2003 - Static meters for active energy (classes 1 and 2) or BS EN 61036:1997 - Alternating current static watt-hour meters for active energy (classes 1 and 2).

- **Gas Meters:**
  To meet the ACCURACY requirements of one of the following standards:
  - BS EN12261:2002 Gas Meters. Turbine gas meters.
  - BS EN12480:2002 Gas Meters. Rotary displacement gas meters.
  - BS EN1359:1999 Gas Meters. Diaphragm gas meter.

- **Heat Meters:**
  - Conform to BS EN 1434 part 1: 1997 covering the general requirements for heat meters

B - Requirements for Automatic Meter Reading (AMR)

The Automatic Meter Reading component (B) collates raw data from a combination of meters, sensors and other field devices (A) solely for the purpose of AMT. Measuring devices will range from meters providing a pulse output to those with internal registers and accumulators and those producing coded data streams. The frequency of access and requirements for data accumulation will vary from application to application. In some instances the data will be collected using internet based products.

Automatic Meter Reading must include the following attributes as a minimum:

- Automatic collection of metered data from a utility device(s) at regular intervals and transmission of data to the AMT software for processing.
- Collection intervals should be user adjustable to match the different types of meter and application requirements.
- Automatic identification of data collection failures, missing data and the failure of communication to any meter or other sensing device (this function may be carried out within the AMT software for some installations).
- Delivery of data in standard format for use in other applications (such as ASCII files or common formats for standard office applications).
- For pulse outputs from meters**,** the accuracy of integration and transmission should be within 0.5% of the total variable measured.
- Data other than pulse outputs shall be transmitted to the AMT software with no loss of accuracy.

C - Requirements for AMT Software

The AMT software collates and analyses the data provided from meters, sensors and manual input and produces outputs enabling energy managers to identify instances of waste, changes in operational characteristic and to compare energy performance between different sites of a similar type and against established benchmarks.

The AMT software should have the following minimum capability:

- Real-time or scheduled transfer of data into the user's AMT database.
- Store and process interval meter readings to at least a minimum of 30-minute intervals.
- Present data in both a graphical and tabular format i.e. histograms, line plots, etc. Selectable time bases with periods of 30 minutes, 1 day, 1 week, 4 weeks, 1 calendar month, and 1 year.
- Ability to select datasets and manipulate them by combining, comparing and calculating in order to analyse, identify and evaluate instances of energy waste.
- Regression analysis on data streams using two variables in whatever frequency the dataset obtained. Display in graphical form with correlation coefficient.
- Automatic exception reporting where period consumption is outside a selected variance from a standard or selected data set.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Boiler Equipment
Automatic Boiler Blowdown Control Equipment

(Formerly Automatic TDS Control)
Date added to ETL 2001.

1. Definition of Technology

Automatic boiler blowdown control equipment covers products that are specifically designed to adjust the blowdown rate from a boiler in a manner that ensures the level of dissolved solids within the water being heated by the boiler is kept below a pre-set limit, whilst avoiding unnecessary blowdown.

2. Technology Description

Automatic boiler blowdown control is more accurate than manual control (or simple timer based control) and provides better control of the total dissolved solids (TDS) level in steam boilers. It also helps to minimise energy losses due to blowdown and use of water treatment chemicals.

Investments in automatic boiler blowdown control equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must incorporate:

- A sensor that continuously measures the level of dissolved solids in the boiler water; and
- A controller, that may be standalone or capable of incorporation into a boiler control system, that automatically adjusts the rate of blowdown from the boiler, in response to changes in the level of dissolved solids in the boiler water, in order to maintain the level of total dissolved solids (TDS) in the boiler below a pre-defined limit; and
- An actuator to control the operation of the blowdown valve.

Packaged products that also include a suitable valve to control the blowdown water flow are also eligible provided that the components meet the specific requirements set out above.

Packaged products that incorporate the multiple sensors, actuators, and valves needed to control multiple blowdown streams with a single control unit are also eligible provided that the components meet the specific requirements set out above.

Eligible products must also:

- Conform to the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of their design, manufacture and testing procedures.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Biomass Boilers and Roomheaters

(Formerly Biomass Boilers up to 300kW and Biomass Fired Boilers over 300kW and below 15,000kW') Date added to ETL 2001/2003.

1. Definition of Technology

Biomass boilers are products specifically designed to burn wood chips, logs, pieces or pellet fuels, and other clean biomass materials to produce hot water or steam.

Biomass roomheaters are products specifically designed to burn wood logs or pellet fuels for space heating by means of radiation and convection. They may also produce hot water.

2. Technology Description

Biomass boilers are used to provide hot water or steam for process or space heating. The biomass fuels used in these products are renewable so their use will replace 100% of the carbon dioxide that would have been emitted by a fossil fired alternative. They are chosen by companies that wish to reduce their carbon emissions, or who have access to biomass fuel. Biomass boilers and room heaters are available in a wide range of thermal efficiencies; the Enhanced Capital Allowance scheme aims to encourage the purchase of higher efficiency designs.

Fuel for boilers is normally supplied in the form of 15 – 50 mm wood chips, occasionally logs. In recent years boilers have become available that have been designed for pellet fuel, which consists of short cylinders of extruded and compressed sawdust, typically 10mm in length and 6 – 8 mm in diameter.

Roomheaters are closed combustion appliances typically with a glass door to the front. They heat the room they are placed in by radiation, and by convection around the body of the heater. Some models can supply hot water to radiators or DHW (domestic hot water) cylinders. Normally roomheaters are fuelled through the front door by logs but in recent years automatic stokers using pellet fuel have become increasingly popular.

Investments in biomass boilers and roomheaters can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must;

- Be a recognised product bearing a CE Marking and be accompanied by a Certificate of Conformity, and;
- Meet the minimum performance criteria set out below.

Performance criteria

- **Biomass roomheaters**

Biomass roomheaters/ stoves (up to 15kW) must achieve a Class 1 rating when tested in accordance with EN 13240:2001.

- **Biomass boilers**
  Biomass boilers with rated heat outputs up to 300kW must achieve a Class 2 rating (i.e. thermal efficiency >= 53 + 6 log Nominal Heat Output) when tested in accordance with EN 303-5:1999.

  Biomass boilers with rated heat outputs in excess of 300kW must reach a thermal efficiency of at least 80% (based on net calorific value) when tested at maximum combustion rate in accordance with the procedures below.

Required test procedures

- **Biomass roomheaters**
  Biomass roomheaters (up to 15kW) must be tested in accordance with EN 13240:2001. For mechanically fed appliances the test fuel and test period should be in accordance with EN303-5:1999.

- **Biomass boilers**
  All tests must be carried out by an independent, accredited laboratory or contractor using a biomass test fuel (designated A1, A2, B1, B2, C & D) in accordance with Table 8 of EN 303-5:1999.

  Biomass boilers with maximum rated outputs below 300kW must be tested in accordance with EN 303-5:1999.

  For biomass boilers with maximum rated heat outputs in excess of 300kW, manufacturers should use the procedures for assessing the thermal performance of boilers set out in BS 845:Part 1:1987 or other equivalent procedures in European standards, or in the national standards of any EU Member State. Where BS 845:Part 1:1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of 40%. The boiler must be operating at its maximum continuous rating (i.e. 100% MCR) during the tests.

  Where applications are being made for a family of boilers (of the same constructional design) to be included on the Energy Technology Product List, manufacturers should:

  a) Supply evidence that each boiler has been individually tested OR
  b) Follow the type testing procedures as set out in of EN 303-5:1999 section 5.1.3, thus reducing the overall number of performance tests that must be completed.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Burners with Controls

(Criteria amended August 2004)

1. Technology Description

The functions of a burner control system are to maintain the quality of combustion over the complete firing range, to optimise efficiency and to minimise emissions. Precise and repeatable control of the air/fuel ratio is essential to minimise the level of excess combustion air and to reduce heat losses in the exhaust gases. Modulating burner output improves the boiler temperature or pressure control, and thus increases fuel efficiency.

The traditional mechanical method of controlling the air and fuel ratio of modulating burners, using adjustable cams and linkages to position fuel valves and air dampers, is susceptible to mechanical wear and hysteresis and is no longer considered the optimum solution for efficient burner operation.

Electronic and microprocessor control systems offer more precise and repeatable control (which improves fuel efficiency), and other benefits including improved reliability and reduced maintenance requirements.

Burners with controls currently covered under the ECA scheme are forced draught burners with a control system that accurately modulates thermal output and offers close control of the air/fuel ratio.

Investments in Burners with Controls can only qualify for ECAs if the product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet minimum performance criteria as set out below.

2. Eligibility Criteria

Burners with Controls are divided into 4 main groups for the purposes of the ECA scheme. Specific criteria cover burners with a thermal output above 1,200kW and burners with a thermal output rated at or below 1,200kW. Additionally the specific requirements for gas/dual fuel fired burners and oil fired burners are different.

Performance criteria

- **Burners rated above 1,200kW – Gas or Dual Fuel Fired**

  - Gas fired burners with a thermal output above 1,200kW must have microprocessor-based controls that continuously modulate burner output in response to measured boiler temperature or pressure values, over a turndown ratio of at least four to one. The microprocessor must use PID control, or more advanced equivalents to control fuel and air flows. It must also control the air/fuel ratio, so oxygen levels in the exhaust gases can be set at a maximum of 3% at 100% rating, 4% at 50% rating and 5.5% at 25% rating. Carbon monoxide (CO) levels in the exhaust gases must not exceed 50 ppm throughout the range.

  - All gas burner control elements including combustion air dampers and fuel valves must be fitted with a precision servomotor, which must be separately controlled and include positional or flow based feedback control. All burners must be fitted with air dampers that fully close on burner shutdown.

  - In addition, all gas fired and dual fired burners rated above 1,200kW must have a variable speed drive fitted to the forced draught fan.

- **Burners rated above 1,200kW – Oil Fired**

  - Oil fired burners with a thermal output above 1,200kW must have microprocessor-based controls that modulate burner output in response to measured boiler temperature or pressure values, either continuously over a turndown ratio of at least 2.5 to one, or step wise across at least three stages of output. The microprocessor must use PID control, or

more advanced equivalents to control fuel and air flows. It must also control the air/fuel ratio, so oxygen levels in the exhaust can be set at a maximum of 3% at 100% rating, 4% at 50% rating and 4.5% at 40% rating. Carbon monoxide (CO) levels in the exhaust gases must not exceed 100 ppm throughout the range.

- For oil burners, combustion air dampers and continuously modulating fuel values (where used) must be fitted with a precision servomotor, which must be separately controlled and include positional or flow based feedback control. All burners must be fitted with air dampers that fully close on burner shutdown.

- **Burners rated at or below 1,200kW – Gas or Dual Fuel Fired**

  - Gas fired burners with a thermal output at or below 1,200kW, must be fully modulating over a turndown range of at least three to one, and be continuously modulated in response to measured boiler temperature or pressure values using PID control or more advanced equivalents. The burner must be equipped with pneumatic or electronic air/fuel ratio controls, so oxygen levels in the exhaust gases can be set at a maximum of 3% at 100% rating, 4% at 50% rating and 4.8% at 33% rating. Carbon monoxide (CO) levels in the exhaust gases must not exceed 50 ppm throughout the range.

  - All burners must be fitted with air dampers that fully close on burner shutdown.

  - In addition, all gas fired burners rated above 400kW must have microprocessor- based controls, a variable speed drive fitted to their forced draught fans, and all burner control elements (including combustion air dampers and fuel valves) must be fitted with precision servomotors. These servomotors must be separately controlled and be fitted with positional or flow based feedback control.

- **Burners rated at or below 1,200kW – Oil Fired**

  - Oil fired burners with a thermal output at or below 1,200kW must have at least three stages of output or be fully modulating over a turndown ratio of at least two to one. They must be equipped with controls that enable oxygen levels in the exhaust to be set at a maximum of 3% at 100% rating and 4% at 50% rating. Carbon Monoxide (CO) levels in the exhaust gases must not exceed 100 ppm throughout the range.

  - All burners must be fitted with air dampers that fully close on burner shutdown.

- **Required test procedures**

  - For all gas or dual fuel fired burners, performance must be measured using the procedures in EN676.

  - For all oil fired burners, performance must be measured using the procedures in EN267.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Combustion Trim Controls

1. Technology Description

Combustion trim systems (e.g. Oxygen Trim Systems) monitor the combustion process and use feedback control to closely regulate and maintain programmed air and fuel flows. The precise control of excess air levels across the entire modulating range of the burner improves efficiency by reducing boiler flue losses. Combustion trim systems can improve boiler efficiency by 1% to 2%.

Investments in combustion trim controls can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Manufacturers should provide a detailed specification of the product, an explanation of how it saves energy and details of any independently audited installations where fuel savings have been measured.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Condensate Pumping Equipment

(Formerly part of Condensate Recovery and Return Systems)
Date added to ETL 2001.

1. Definition of Technology

Condensate pumping equipment is specifically designed to actively pump condensate to the boiler feed water system under a wide range of steam system operating conditions.

2. Technology Description

The indirect use of steam produces condensate, which contains useful heat. This condensate can be returned to the boiler house and used to heat the boiler feed water supply and to reduce the amount of make up water needed. This increases the overall efficiency of the steam system, and reduces water treatment costs.

Investments in condensate pumping equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must incorporate:

- A powered pumping mechanism whose operation is not solely reliant on steam pressure at the condensate inlet;
- A control mechanism that automatically prevents live steam entering the condensate return line;
- A valve that prevents reverse flow of condensate through the product.

Eligible products must also:

- Conform with the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of their design, manufacture and testing procedures.

Performance criteria
All products must be able to return condensate to the boiler house when the pressure at the product's condensate inlet does not exceed 0 barg and there is a backpressure on the product's condensate outlet of at least 1 barg.

Required test procedures
Product pumping performance must be confirmed at 2% and 100% of design flow capacity using a test procedure agreed with an accredited certification body.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Condensing Economisers

Date added to ETL 2001

1. Definition of Technology

Condensing Economisers are products specifically designed to improve boiler net thermal efficiency by recovering both sensible and latent heat from boiler flue gases.

2. Technology Description

Condensing economisers are a type of heat exchanger that enables some of the sensible heat and latent heat from boiler flue gases to be recovered. This heat is normally used to preheat the boiler's feedwater and to supply low grade heating requirements. Typically a condensing economiser will improve boiler net thermal efficiency (expressed in percentage terms) by at least 9 points (i.e. a boiler with efficiency of 84% is improved to at least 93%).)

Investments in condensing economisers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Performance criteria
The product must be able to increase the net thermal efficiency (expressed in percentage terms) of the boiler system to which it is designed to be fitted by at least 9 points when the boiler system is operating at 30%, 50% and 100% of its maximum continuous rating (MCR).

Required test procedures
The required minimum performance must be demonstrated using Method A or Method B:

Method A: Indirect measurement
Product performance must be demonstrated by measuring the improvement in net thermal efficiency of a test boiler resulting from the addition of the condensing economiser. Net thermal efficiency must be measured at test points that are equivalent to 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed.

Boiler net thermal efficiency must be measured in accordance with the procedures set out in BS 845:Part 1:1987, BS EN 303-3:1999 or BS EN 304:1992.

Where BS 845:Part 1:1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of 15%.

Method B: Direct measurement
Product performance must be demonstrated by calculating the improvement in boiler net thermal efficiency that will occur at 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed. This calculation must be based on an assessment of the transfer of heat power that will occur at each of these test points.

The assessment of transfer of heat power must be done in accordance with the procedures set out in EN 305:1997, EN 306:1997 and/or EN308:1997.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Flue Gas Economisers

Date added to ETL 2001.

1. Definition of Technology

Flue Gas Economisers are products that are specifically designed to improve boiler net thermal efficiency by recovering sensible heat from boiler flue gases.

2. Technology Description

Flue gas economisers are a type of heat exchanger that enables some of the sensible heat in boiler flue gases to be recovered. This heat is normally used to preheat the boiler's feedwater. Typically a flue gas economiser will improve boiler net thermal efficiency (expressed in percentage terms) by at least 3 points (i.e. a boiler with efficiency of 84% is improved to at least 87%).

Investments in flue gas economisers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Performance criteria
The product must be able to increase the net thermal efficiency (expressed in percentage terms) of the boiler system to which it is designed to be fitted by at least 3 points when the boiler system is operating at 30%, 50% and 100% of its maximum continuous rating (MCR).

Required test procedures
The required minimum performance must be demonstrated using Method A or Method B:

Method A: Indirect measurement
Product performance must be demonstrated by measuring the improvement in net thermal

efficiency of a test boiler resulting from the addition of the flue gas economiser. Net thermal efficiency must be measured at test points that are equivalent to 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed.

Boiler net thermal efficiency must be measured in accordance with the procedures set out in BS 845:Part 1:1987, BS EN 303-3:1999 or BS EN 304:1992.

Where BS 845:Part 1:1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of 15%.

Method B: Direct measurement

Product performance must be demonstrated by calculating the improvement in boiler net thermal efficiency that will occur at 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed. This calculation must be based on an assessment of the transfer of heat power that will occur at each of these test points.

The assessment of transfer of heat power must be done in accordance with the procedures set out in EN 305:1997, EN 306:1997 and/or EN308:1997.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Gas-Fired Condensing Water Heaters

Date added to ETL 2004

1. Technology Description

The Energy Technology List covers two types of gas fired condensing water heater – gas fired condensing storage water heaters and gas fired condensing non-storage water heaters.

Investments in gas fired condensing water heaters can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

1) Gas Fired Condensing Storage Water Heaters

All gas fired condensing storage water heaters of nominal heat input not exceeding 150kW (net calorific value) are eligible for inclusion on the Energy Technology List, provided they:

- Have thermal efficiencies of at least 102% (based on net calorific value);
- Are built and tested in accordance with BS EN 89:2000;
- Are included in the Water Regulations Advisory Scheme's Water Fittings and Materials Directory, or otherwise demonstrate compliance with the requirements of The Water Supply

(Water Fittings) Regulations 1999, Water Byelaws 2000 Scotland and Water Regulations Northern Ireland.

Thermal efficiency must be determined in accordance with the procedures set out in BS EN 89:2000 or other, similarly agreed, procedures for testing thermal efficiency within equivalent National Standards in Member States of the European Union.

The manufacturer must provide documentary evidence of product performance, including written confirmation from an accredited certification body that the above test procedures have been followed. Where relevant, this should be submitted together with EC-Type examination certificates.

2) Gas Fired Condensing Non-Storage Water Heaters

All gas fired condensing non storage water heaters with thermal efficiencies of at least 102% (based on net calorific value), will be eligible for inclusion on the Energy Technology List, provided they are:

- Built and tested in accordance with BS EN303-3: 1999, or other applicable British Standards or European Standards (or pre-standards);
- Capable of providing 'instantaneous' domestic hot water;
- Are included in the Water Regulations Advisory Scheme's Water Fittings and Materials Directory, or otherwise demonstrate compliance with the requirements of The Water Supply (Water Fittings) Regulations 1999, Water Byelaws 2000 Scotland and Water Regulations Northern Ireland.

Additionally condensing non-storage water heaters over 400KW (net thermal input) must use burners that meet the requirements of the burners category on the ETL, or incorporate burners and controls that offer equivalent standards of performance.

Thermal efficiency must be determined in accordance with the procedures set out in BS EN303-3: 1999 or other, similarly agreed, procedures for testing thermal efficiency within applicable European Standards (or pre-standards), or National Standards from Member States of the European Union.

The manufacturer must provide documentary evidence of product performance, including written confirmation from an accredited certification body that the above test procedures have been followed. Where relevant, this should be submitted together with EC-Type examination certificates.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Heat Recovery from Condensate and Boiler Blowdown

(Formerly Heat Recovery from Boiler Blowdown and part of Condensate Recovery and Return Systems)
Date added to ETL 2001

1. Definition of Technology

Heat recovery from condensate and boiler blowdown covers products that are specifically designed

to recover heat present in steam condensate and / or water from boiler blowdown by means of flash steam recovery vessels and/or heat exchangers.

2. Technology Description

Significant amounts of heat can be recovered from the water extracted during boiler blowdown and from steam condensate. Heat can also be recovered from 'flash steam', i.e. steam which is generated when the boiler blowdown and steam condensate is depressurised. Droplets of water are entrained with flash steam; these droplets reduce the efficiency of heat transfer and can lead to premature failure of steam system components. The most effective systems for recovery of flash steam are therefore designed to minimise liquid droplet carry over whilst maximising flash steam formation.

Both boiler blowdown and steam condensate can contain significant levels of contaminants which lead to problems in heat transfer equipment. The most appropriate heat exchangers for recovery of heat from blowdown and condensate are therefore designed for ease of cleaning so that fouling from contaminants in the water can be easily removed, enabling heat exchanger efficiency to be maintained.

Investments in equipment for heat recovery from condensate and boiler blowdown can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must incorporate:

- Flash steam recovery vessels designed with maximum vapour velocities that minimise droplet carry-over with the flash steam and must include de-entrainment sections.

AND / OR

- Heat exchangers that are specifically designed to be dismantled for cleaning, and that meet the performance criteria outlined below.

Performance criteria
All heat exchangers must have efficiencies of at least 85% at 30% and 100% design flow capacity.

Required test procedures
All heat exchangers must be tested in accordance with the procedures and test conditions laid down in BS EN 305: 1997 and BS EN 306: 1997.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Hot Water Boilers over 400kW

Date added to ETL 2001

1. Definition of Technology

Hot water boilers are products that are specifically designed to heat water by means of a heat exchanger that transfers heat from combustion into the water as it passes through the product. Over 400kW means products that have a rated output in excess of 400kW.

2. Technology Description

Hot water boilers are used to produce hot water for space heating, process heating and domestic uses. They are available in a wide range of different designs and efficiencies.

The Enhanced Capital Allowance scheme aims to encourage the purchase of the higher efficiency, modulating, gas and oil fired hot water boilers (at rated outputs over 400kW), which typically offer fuel savings of around 7% when compared with gas and oil fired hot water boilers of average efficiency.

Investments in Hot Water Boilers over 400kW can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be gas and/or oil fired;
- Use a forced draught burner (or burners);
- Have a nominal rated output in excess of 400kW at an average boiler-water temperature of 70°C;
- Automatically respond to changes in hot water demand by modulating their output in a continuous manner across the turndown ratio, as set out in the performance criteria below, without initiating a purge cycle;
- Conform to the requirements of the Pressure Equipment Directive 97/23/EC in respect of their design, manufacturer and testing procedures;
- Exceed the minimum performance set out below.

In addition:

- Where individual burners are gas fired and have a thermal output in excess of 400kW, their forced draught fans must be operated by a variable speed motor controller or drive.

- Where the burner's air-fuel ratio is controlled by means of mechanical air flow dampers and/or modulating gas valves these must be adjusted by a precision servomotor fitted with positional or flow based feedback controls that automatically adjust their operation to correct for mechanical wear, valve stiction and hysteresis.

Performance criteria

Products must have a minimum net thermal efficiency of 93% at the full and part load conditions as set out in Table 1 below, which depend on the type of fuel used.

Table 1 – Current performance test points for hot water boilers >400kW

Boiler rating	Fuel	Turndown ratio	Test point % MCR	Net thermal efficiency %
Over 400kW	Gas fired or dual fuelled	3.33:1	30	>=93.0
			50	>=93.0
			100	>=93.0
Over 400kW	Oil fired	2:1	50	>=93.0

			100	>=93.0

">=" means "greater than or equal to"

For the avoidance of doubt test data should be presented to 1 decimal place. As an example a Net Thermal Efficiency of less than 93.0 would be deemed to be a fail.

Products must also have a standby loss of less than 0.02 kW per kW of thermal rating.

Required test procedures

The required minimum performance must be demonstrated using Method A or Method B:

Method A may only be used where the product incorporates an appropriately matched burner (or burners) with a thermal output in excess of 400kW from the "burners with controls" sub-technology of the Energy Technology Product List. This method may **not** be used to demonstrate the performance of modular boilers. In this context, a modular boiler is defined as an assembly of two or more similar (but not necessarily identical) modules, each of which consists of a heat exchanger, burner, and control and safety devices. The assembly must have common flow and return water connections.

Method B must be used for all other products.

Method A:

Product performance must be demonstrated by measuring the net thermal efficiency at 100% of its maximum continuous rating (MCR) in accordance with the procedures set out in BS 845:Part 1:1987, BS EN 303-3:1999 or BS EN 304: 1992 (as amended).

Under this Method the boiler and burner performance are demonstrated separately and the performance of the boiler shell at 100%MCR can be assessed using any burner that can provide the heat input and operational stability needed to complete the test.

Under this Method, there is no requirement to measure the net thermal efficiency at part loads or standby losses, since performance at part load will be inferred from test data collected as part of the application procedure for ETPL listed burners with controls.

Where BS 845:Part 1:1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of 15%.

Method B:

Product performance must be demonstrated by measuring the net thermal efficiency at the test points specified in the performance criteria Table 1 (above), and the standby loss rate in accordance with the procedures set out in BS EN 303-3: 1999 or BS EN 304: 1992 (as amended).

Where applications are being made for boilers of the same constructional design to be included on the Energy Technology Product List, the type testing procedures set out in Annex F of BS EN 303-3:1999 or Annex C.2.1 of BS EN 304: 1992 (as amended) may be used to reduce the overall number of performance tests that must be completed.

Where it is not practical to test the performance of the product in a laboratory (due to boiler size or thermal output), manufacturers may use the procedures for assessing the thermal performance of boilers set out in BS 845:Part 1:1987. The standby loss rate should be estimated from the amount of fuel required to restore the output water temperature to its starting temperature after a suitable shutdown period.

Where BS 845:Part 1:1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of 15%.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Hot Water Boilers up to 400kW

Date added to the ETL July 2001.

1. Definition of Technology

Hot water boilers are products that are specifically designed to heat water by means of a heat exchanger that transfers heat from combustion into the water as it passes through the product. Up to 400kW means products that have a rated output up to, and including, 400kW.

2. Technology Description

Hot water boilers are used to produce hot water for space heating, process heating and domestic uses. They are available in a wide range of different designs and efficiencies.

The Enhanced Capital Allowance scheme aims to encourage the purchase of those higher efficiency, condensing, gas and oil fired hot water boilers (at rated outputs up to, and including 400kW), that typically offer fuel savings of around 10% when compared with gas and oil fired boilers whose efficiencies just meet the minimum efficiencies needed to comply with Part L2 of the Building Regulations.

Investments in hot water boilers up to, and including 400kW can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must;

- Be gas-fired and/or oil-fired;
- Have a nominal rated output less than or equal to 400kW;
- Conform with the requirements of Boiler (Efficiency) Regulations 1993, as amended by the Boiler (Efficiency) (Amendment) Regulations 1994.

Performance Criteria

Products must have the minimum net thermal efficiencies at the full and part load conditions as set out in Table 1 below, which depend on the type of fuel used.

Table 1 Performance test points for hot water boilers up to 400kW

Fuel	Test point (% of Rated Output)	Net thermal efficiency %

Gas	100	>= 95.0
	30	>= 105.0
Oil	100	>= 95.0
	30	>= 101.0

">=" means "greater than or equal to"

For the avoidance of doubt test data should be presented to 1 decimal place. As an example a Net Thermal Efficiency of less than 95.0 would be deemed to be a fail.

Required test procedures

Products performance must be demonstrated in accordance with the Boiler (Efficiency) Regulations 1993, as amended by the Boiler (Efficiency) (Amendment) Regulations 1994.

Note

The Boiler (Efficiency) Regulations 1993 (as amended) implement the EU Boiler Efficiency Directive 92/42/EEC within the United Kingdom.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Localised Rapid Steam Generators

Revised August 2003

1. Technology Description

Localised rapid steam generators provide a useful way of generating small amounts of steam for local process heating. They are compact, lightweight units that produce high-pressure steam very quickly from a cold start up and can be used to eliminate old inefficient centralised steam boilers and distribution systems.

Investments in localised rapid steam generators can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Localised rapid steam generators must have a thermal efficiency of at least 88% (based on net calorific values). Additionally localised rapid steam generators over 400kW must use burners from the Energy Technology Product List, or incorporate burners and controls that offer equivalent standards of performance.

Thermal efficiency must be determined under the following standard test conditions in accordance with BS845: Part 1:1987 or similarly agreed procedures within European Standards (or pre-standards). Where BS845: Part 1: 1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of 15%. The boiler must be operating at its maximum continuous rating (i.e. 100% MCR) during the tests.

The manufacturer must provide evidence of product performance either by testing in accordance with above standard procedures, or by obtaining evidence from an accredited certification body that they would meet the above criteria if tested to BS845: Part 1:1987. Test data should be submitted using the format specified in the relevant standards.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Optimising Controllers for Wet Heating Systems

Date added to ETL August 2003

1. Technology Description

Optimising controllers realise fuel savings by adapting boiler firing and heat distribution patterns to match variations in heat demand. They are available either as standalone units for retrofitting to existing boilers, or as modular units that can be integrated into boiler, burner or other control systems.

Investments in standalone and modular type optimising controllers for wet heating systems can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Be microprocessor based and incorporate the following minimum features:

- Independent zone, timing and temperature controls such that the space temperature of each functional area can be separately controlled in accordance with occupation patterns
- Facilities for users to "temporarily override" pre-set timings during unusual occupation hours
- "Automatic night set back" and controls to prevent condensation and frost damage
- Optimum start and weather compensation for each zone controlled
- Tamper-proof protection to prevent the optimiser from being switched off
- An algorithm that periodically optimises controller operation automatically

Additionally, optimising controllers may include many other useful features such as:

- Independent control of domestic hot water circuits
- Boiler inhibit, sequencing and/or burner controls
- Interlocks to prevent simultaneous heating and cooling
- Remote monitoring and control interfaces

Manufacturers should provide a detailed specification of the product, and an explanation of how it saves energy including evidence of its ability to control the operation and firing of the boilers in the system, and details of any independently audited installations where fuel savings have been measured.

Applicants must state clearly whether the optimising controller is designed for standalone use only or as modular unit that can be incorporated in other systems, and the specific features of each model sold.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Retrofit Burner Control Systems

Criteria amended August 2004

1. Technology Description

The functions of a burner control system are to maintain the quality of combustion over the complete firing range, to optimise efficiency and to minimise emissions. Precise and repeatable control of the air/fuel ratio is essential to minimise the level of excess combustion air and to reduce heat losses in the exhaust gases. Modulating burner output improves the boiler temperature or pressure control, and thus increases fuel efficiency.

The traditional mechanical method of controlling the air and fuel ratio of modulating burners, using adjustable cams and linkages to position fuel valves and air dampers, is susceptible to mechanical wear and hysteresis and is no longer considered the optimum solution for efficient burner operation.

Retrofit burner control systems currently covered under the ECA scheme are microprocessor based control systems, which offer more precise and repeatable control. They can be retrofitted to existing burners to improve fuel efficiency and to deliver other benefits including improved reliability and reduced maintenance.

Investments in retrofit burner control systems can only qualify for ECAs if the retrofit burner control system is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet minimum performance criteria as set out below.

2. Eligibility Criteria

Eligible products must be microprocessor based and able to continuously modulate burner output in response to measured boiler temperature or pressure values. The microprocessor must use PID control or more advanced equivalents to control fuel and air flows. All burner control elements including combustion air dampers and fuel valves must be fitted with a precision servomotor, which must be separately controlled and include positional feedback control. The burner control system must incorporate facilities to fully close air dampers on burner shutdown.

- **Performance criteria**

  - Retrofit burner control systems must be able to continuously modulate burner output in response to measured boiler temperature or pressure values, over the turn down ratio listed in the appropriate section of the “Burners with Controls” ETL criteria (which depend on the thermal rating of the burner and type of fuel used).

  - Retrofit burner control systems must also precisely control the air/fuel ratio, so oxygen and carbon monoxide (CO) levels in the exhaust gases can be set at the values listed in the

appropriate section of the “Burners with Controls” ETL criteria.

- **Required test procedures**

  - For all gas or dual fuel fired burners, performance must be measured using the procedures in EN676.

  - For all oil fired burners, performance must be measured using the procedures in EN267.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Sequence Controls

Revised August 2003

1. Technology Description

Sequence controls realise fuel savings by optimising the number of boilers used and/or burner firing rates to meet the required heat load. They are available either as standalone units for retrofitting to existing boilers, or as modular units that can be integrated into boiler, burner or other control systems.

Investments in sequence controls can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Both standalone and modular type sequence controls are eligible providing they are microprocessor based and incorporate an algorithm that measures and adapts the sequence to match changes in heat demand, whilst maintaining minimum set temperatures.

Manufacturers should provide a detailed specification of the product, and an explanation of how it saves energy including evidence of its ability to control the operation and firing of the boilers in the system, and details of any independently audited installations where fuel savings have been measured.

Applicants must state clearly whether the sequence controller is designed for standalone use only or as modular unit that can be incorporated in other systems, and the specific features of each model sold.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Steam Boilers

Revised August 2003

1. Technology Description

Steam boilers are used to produce steam for process heating, space heating and water heating. They are available in a range of different designs and efficiencies. The Enhanced Capital Allowance scheme aims to encourage the purchase of the higher efficiency, modulating gas and oil fired steam boilers.

Investments in steam boilers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Gas and oil fired steam boilers are eligible providing they have net thermal efficiencies of at least 89%. Steam boilers over 400kW must also use burners from the Energy Technology Product List, or incorporate burners and controls that offer equivalent standards of performance.

Thermal efficiency must be determined in accordance with BS845: Part 1:1987 or other similarly agreed procedures within European Standards (or pre-standards e.g. prEN12953-11). Where BS845: Part 1: 1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of 15%. The boiler must be operating at its maximum continuous rating (i.e. 100% MCR) during the tests.

The manufacturer must provide evidence of product performance either by testing in accordance with above standard procedures, or by obtaining evidence from an accredited certification body that they would meet the criteria if tested in accordance with BS845: Part 1: 1987. Test data should be submitted using the format specified in the relevant standards.

3 Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Combined Heat and Power

Combined Heat and Power is the simultaneous generation of heat and power (usually electricity) in a single process. CHP Schemes are by there nature bespoke and approval of a given CHP manufacturer or product would not provide sufficient assurance of environmental benefit. With CHP, case by case Certification is needed to ensure support is provided for 'good quality' CHP. Certification is achieved using the CHP Quality Assurance programme (CHPQA). Further information about CHP eligibility criteria and the CHPQA programme can be found at www.chpqa.com.

Compact Heat Exchangers

Date added to ETL 2004.

1. Definition of Technology

The purpose of heat exchangers is to transfer heat from one fluid (either gas or liquid) to another. Compact heat exchangers (CHEs) have a significantly greater surface area per unit volume than more conventional types of heat exchanger. For the purposes of the ETL a CHE is defined as a heat exchanger with a surface to volume ratio of > 200 m^2/m^3.

2. Technology Description

CHEs are characterized by a high surface area per unit volume, which can result in a higher efficiency than conventional heat exchangers, in a significantly smaller volume (typically CHEs can achieve efficiencies of over 95% cf. 80% for non-compact heat exchangers). Hence CHEs transfer more energy in a cost-effective manner than other heat exchangers and save more energy when compared to standard technology.

Three types of compact heat exchanger are covered by the ETCL. These are:

- plate heat exchangers;
- plate-fin heat exchangers;
- compact heat exchangers with precision formed surfaces.

Investments in CHEs can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Have a surface area to volume ratio greater than 200m^2/m^3, based on the dimensions of the heat transfer surface alone, and not including other components of the heat exchanger (for example end plates used solely for structural purposes, or flanges and headers).
- Have a minimum design efficiency of at least 85% at 100% capacity.
- Be described by a detailed technical specification or sales brochure, clearly showing individual model numbers/exchanger name.
- Conform with the requirements of the EU Pressure Equipment Directive PED 97/23/EC.
- Be one of the following types:
  1. Plate heat exchangers
     - Gasketed plate units
     - Brazed plate units
     - Partially welded plate units
     - Welded plate units (including laser-welded types)
  2. Plate-fin heat exchangers
     - Brazed units
     - Welded units
  3. Compact heat exchangers with precision formed surfaces
     - Brazed units
     - Welded units
     - Diffusion bonded units
     - Metal foam heat exchangers

Performance criteria
Products must have a minimum design efficiency (E) of at least 85.0% for at least one fluid stream when the CHE unit is operating at 100% capacity.

For the avoidance of doubt test data should be presented to 1 decimal place. As an example a minimum design efficiency (E) of less than 85.0 would be deemed to be a fail.

The design efficiency is defined as follows:

$$E = \frac{\text{Quantity of heat extracted from or added to a stream}}{\text{Theoretical maximum amount of heat that could be extracted from or added to the stream}}$$

Required test procedures
The method used to calculate the design efficiency must be validated by testing selected products in accordance with BS EN 305: 1997 and BS EN 306: 1997

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Compressed Air Equipment

Energy Saving Controls for Desiccant Air Dryers

(Formally Condition Monitoring Control Systems)

Date added to ETL 2002.

1. Definition of Technology

Energy saving controls for desiccant air dryers are products that are specifically designed to control the operation of desiccant air dryers in a manner that eliminates unnecessary desiccant regeneration cycles.

2. Technology Description

Desiccant air dryers use a desiccant material to remove moisture from compressed air and this material has to be regenerated when it becomes saturated. The regeneration cycle of a desiccant air dryer is an energy intensive process that is often controlled by a timer that wastes energy by initiating unnecessary regeneration cycles under varying load conditions.

These unnecessary regeneration cycles can be eliminated by fitting energy saving controls that measure the moisture content of the desiccant, or the air leaving the dryer, and only initiate a regeneration cycle when the desiccant is no longer able to remove sufficient moisture to enable the desiccant air dryer to deliver air at the required dryness.

Investments in energy saving controls for desiccant air dryers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible

for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- **Either** be pre-configured for installation on a specified desiccant air dryer or range of desiccant air dryers, **or** be capable of being installed on any desiccant air dryer with a suitable control interface through the application of a clearly defined commissioning procedure;

- Incorporate a sensor that is capable of measuring the moisture content of the compressed air leaving a desiccant air dryer, or the moisture content of the desiccant material within a desiccant air dryer;

- Incorporate a controller that automatically adjusts the regeneration cycle of the desiccant air dryer to which it is fitted, in a manner that:

  a) Ensures that the desiccant in the desiccant air dryer is only regenerated when it is unable to remove sufficient moisture to allow the desiccant air dryer to deliver air at the required dryness; and

  b) Reduces the energy consumption of the desiccant air dryer, or the amount of air purged by the desiccant air dryer, when the load on the dryer is reduced;

- Incorporate a software or hardware based anti-tamper protection mechanism that prevents operators from permanently disabling the controller's ability to automatically adjust the regeneration cycle;

- Conform to the requirements of the EU EMC Directive 89/336/EEC or its replacement EU EMC Directive 2004/108/EC.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Refrigerated Air Dryers with Energy Saving Controls

(Date added to ETL 2003).

1. Definition of Technology

Refrigerated air dryers are products that are specifically designed to extract water vapour from industrial compressed air systems by means of cooling with a refrigeration cycle.

2. Technology Description

Refrigerated air dryers are commonly fitted to compressed air systems, so as to prevent moisture from condensing within pipe work and equipment. They work by cooling the air to a desired dewpoint temperature, thus forcing moisture to condense out of the air. This resulting condensate is then drained from the compressed air system.

A refrigerated air dryer typically increases the energy used in compressed air generation by between 2% and 5% depending on the type of product selected and how it is controlled. The pressure drop across the refrigerated air dryer is also a key factor in the amount of additional energy consumed as a result of the use of refrigerated air dryers. The aim of the ECA scheme is to encourage the purchase of higher efficiency models, which have low pressure drops across them.

Investments in refrigerated air dryers with energy savings controls can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate energy saving controls that automatically reduce the cooling output of the refrigerated air dryer as the average flow rate and temperature of the inlet air decreases in a manner that reduces the energy consumption of the product.
- Modulate their output between 20% to 100% in response to changes in the flow rate and/or temperature of the inlet air and/or outlet air temperature.
- Not exceed the limits set out in the performance criteria below for pressure drop corrected composite specific energy consumption (SEC) at 50%, 75% and 100% load (i.e. rated air flow).
- Conform with the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of their design, manufacture and testing procedures.

Performance criteria

Products must not exceed the values for pressure drop corrected composite specific energy consumption (SEC) set out in the table below at the specified percentage of full load.

Table 1 Maximum Allowable Composite SEC in kWh/m^3/min

50 % Load	75% Load	100% Load
0.36	0.48	0.60

The pressure drop-corrected composite SEC should be calculated as follows:

$$SEC = \frac{P + (1.67 \times \Delta p \times Q)}{Q}$$

Where:

P = Total electrical power consumed by air dryer, kW
Δp = Pressure drop across air dryer, bar
Q = Flow rate of air, m^3/min

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in ISO7183:1986 to measure the electrical power consumed by the product at full load, pressure drop across the dryer and the flow rate of air through the product. The test results should be presented in the format laid down in Annex A of ISO7183-2:1996.

Products must also meet the specification for moisture removal in ISO8573-1, "Table 3 Humidity Classes".

In addition, manufacturers should use the above procedures to evaluate the pressure drop corrected composite SEC of their products at two part load conditions (50% and 75%)

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Ultrasonic Leak Detectors

(Date added August 2003)

1. Technology Description

Hand held ultrasonic leak detectors (HHULDS) provide information on the location of leaks: this is accomplished by an electronic process that translates the ultrasonic signal from the leak into the audible range where it can be heard and recognised by the user.

When a gas leaks, it moves from the high-pressure side through the leak site to the low-pressure side, where it expands rapidly and produces a turbulent flow. The turbulence has strong ultrasonic components. The intensity of the ultrasonic signal falls off rapidly from the source, allowing the exact spot of a leak to be located by the detector.

Investments in Ultrasonic Leak Detectors can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

The ultrasonic leak detector should consist of a basic hand held unit with a sensor operating in the region of 40kHz, a signal processor, a display proportional to the ultrasonic energy detected and an audio output (e.g. speaker, head set). Leak detectors that qualify must be capable of detecting a leak at a pressure of 7 barg at a distance of 20 metres. The applicant must provide evidence that the company is quality accredited and provide the calibration data with the application for each product. If the unit is intrinsically safe, then the safety standard and a copy of the test certificate must be provided.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Heat Pumps

Air Source: Gas Engine Driven Split and Multi-Split (Including Variable Refrigerant Flow)

Date added to ETL August 2004.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

An air source gas engine driven split or multi-split heat pump is a device which uses a gas-fuelled internal combustion engine driving a refrigeration system to transfer heat from outdoor air to the space to be heated. Additionally, it may be able to provide cooling by means of reversing the refrigeration cycle, in which case it is also referred to as a reversible 'air cooled' air conditioning unit. Units can be:

- Single split (one 'outdoor' unit connected to one 'indoor' unit)
- Dual split (one 'outdoor' unit connected to 2 'indoor' units)
- Multi-split (one 'outdoor' unit connected to 2 or more 'indoor' units)

The 'outdoor' and 'indoor' units are supplied as a matched set.

Investments in air source gas engine driven split and multi-split (including variable refrigerant flow) heat pumps can only qualify for Enhanced Capital Allowances if the specific product identified by the outdoor unit and the matching indoor unit(s) is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

Investments in air source gas engine split and multi-split (including variable refrigerant flow) heat pumps can only qualify for Enhanced Capital Allowances if the specific product identified by the outdoor unit and the matching indoor unit(s) is named in the ETL Heat Pump Master List. To be eligible for inclusion on the ETL Heat Pump Master List, products must meet the eligibility criteria as set out below AND the Heat Pump Master List Listing Mechanism.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) across the range of connected capacities and including 100% (full) load and cooling measured by the Energy Efficiency Ratio (EER) across the range of connected capacities including 100% (full) load where cooling is provided.

The CoP and the EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (CoP)	**>1.30**	JIS B 8627	EN14511-2 Table 3 or 13 Standard rating conditions, Outdoor air/recycled air. Equivalent standards may be considered where equivalence can be scientifically proved.
Cooling mode (EER)	**>1.10**	JIS B 8627	EN14511-2 Table 4 or 14 Standard rating conditions, Comfort (outdoor air/recycled air). Equivalent standards may be considered where equivalence can be scientifically proved.

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 1.31 would be deemed to be a fail.

Note: For Air source gas engine driven units the CoP and EER stated are lower than for electrically driven equipment due to the carbon conversion factors required for comparison between equipment types.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Air Source: Single-Duct and Packaged "Double-Duct"

(Formerly Air source: single-duct Heat Pumps)
Date added to ETL August 2002.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

A single-duct and a packaged "double duct" heat pump are devices which use an electrically operated refrigeration system to transfer heat from outdoor air to the space to be heated. Additionally, they may be able to provide cooling by means of reversing the refrigeration cycle, in which case they are also referred to as a reversible 'air cooled' air conditioning units. They are both mounted in the conditioned space. In a single-duct unit the evaporator (in heating mode) air intake is introduced from the space containing the unit and discharged outside the space. In a double-duct unit the evaporator (in heating mode) air intake and air discharge are connected to the outside by means of two ducts.

Investments in single-duct and packaged "double duct" heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) at full load and cooling measured by the Energy Efficiency Ratio (EER) at full load where cooling is provided. The CoP and EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (CoP)	**>2.80**	EN14511	EN14511-2 Table 3 Standard rating conditions, Outdoor air/recycled air
Cooling mode (EER)	**>2.40**	EN14511	EN14511-2 Table 4 Standard rating conditions, Comfort (outdoor air/recycled air)

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 2.81 would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Air Source: Packaged

(formerly Air source: packaged "double duct" Heat Pumps)
Date added to the ETL August 2002.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

An air source packaged heat pump is a device which uses an electrically operated refrigeration system to transfer heat from outdoor air to the space to be heated. Additionally, it may be able to provide cooling by means of reversing the refrigeration cycle, in which case it is also referred to as a reversible 'air cooled' air conditioning unit. A packaged unit is a single unit.

Investments in air source packaged heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) at full load and cooling measured by the Energy Efficiency Ratio (EER) at full load where cooling is provided.

The CoP and EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (COP)	**>3.20**	EN14511	EN14511-2 Table 3 Standard rating conditions, Outdoor air/recycled air
Cooling mode (EER)	**>2.80**	EN14511	EN14511-2 Table 4 Standard rating conditions, Comfort (outdoor air/recycled air)

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 3.21 for would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Air Source: Split and Multi-Split (Including Variable Refrigerant Flow)

Date added to the ETL August 2002.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

An air source split or multi-split heat pump is a device which uses an electrically operated refrigeration system to transfer heat from outdoor air to the space to be heated. Additionally, it may be able to provide cooling by means of reversing the refrigeration cycle, in which case it is also referred to as a reversible 'air cooled' air conditioning unit. Units can be:

- Single split (one 'outdoor' unit connected to one 'indoor' unit)
- Dual split (one 'outdoor' unit connected to 2 'indoor' units)
- Multi-split (one 'outdoor' unit connected to 2 or more 'indoor' units)

The 'outdoor' and 'indoor' units are supplied as a matched set.

Investments in air source split and multi-split (including variable refrigerant flow) heat pumps can only qualify for Enhanced Capital Allowances if the specific product identified by the outdoor unit and the matching indoor unit(s) is named in the ETL Heat Pump Master List. To be eligible for inclusion on the ETL Heat Pump Master List, products must meet the eligibility criteria as set out below AND the Heat Pump Master List Listing Mechanism.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) across the range of connected capacities and including 100% (full) load and cooling measured by the Energy Efficiency Ratio (EER) across the range of connected capacities including 100% (full) load where cooling is provided.

The CoP and the EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (CoP)	**>3.40**	EN14511	EN14511-2 Table 3 or 13 Standard rating conditions, Outdoor air/recycled air. Equivalent standards may be considered where equivalence can be scientifically proved.

Cooling mode (EER)	**>3.00**	EN14511	EN14511-2 Table 4 or 14 Standard rating conditions, Comfort (outdoor air/recycled air). Equivalent standards may be considered where equivalence can be scientifically proved.

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 3.41 would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Ground Source: Brine to Air

Date added to the ETL August 2004.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

A ground source brine to air heat pump is a device which uses an electrically operated refrigeration system to transfer heat from the ground (usually collected via a buried loop of pipe containing brine or another transfer medium that has a freezing point depressed relative to water) to the space to be heated. Additionally, it may be able to provide cooling by means of reversing the refrigeration cycle.

Investments in ground source brine to air heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) at full load and cooling measured by the Energy Efficiency Ratio (EER) at full load where cooling is provided.

The CoP and EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (COP)	**>3.40**	EN14511	EN14511-2 Table 5 Standard rating conditions, Brine
Cooling mode (EER)	**>3.30**	EN14511	EN14511-2 Table 6 Standard rating conditions, Comfort

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 3.41 would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Ground Source: Brine to Water

Date added to the ETL August 2004.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

A ground source brine to water heat pump is a device which uses an electrically operated refrigeration system to transfer heat from the ground (usually collected via a buried loop of pipe containing brine or another transfer medium that has a freezing point depressed relative to water) to a water based heating system. Additionally, it may be able to provide cooling by means of reversing the refrigeration cycle.

Investments in ground source brine to water heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) at full load and cooling measured by the Energy Efficiency Ratio (EER) at full load where cooling is provided.

The CoP and EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (CoP)	**>3.70**	EN14511	EN14511-2 Table 7 Standard rating conditions, Brine (for floor or similar application)
Cooling mode (EER)	**>3.00**	EN14511	EN14511-2 Table 8 Standard rating conditions, Water to water and brine to water (for floor cooling or similar application)

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 3.71 would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Water Source: Packaged

Date added to the ETL August 2002.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

A water source packaged heat pump is a device which uses an electrically operated refrigeration system to transfer heat from a water source (internal water loop) to the space to be heated. Additionally, it may be able to provide cooling by means of reversing the refrigeration cycle, in which case it is also referred to as a reversible 'water cooled' air conditioning unit. A packaged unit is a single unit.

Investments in water source packaged heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) at full load and cooling measured by the Energy Efficiency Ratio (EER) at full load where cooling is provided.

The CoP and EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (CoP)	**>4.40**	EN14511	EN14511-2 Table 5 Standard rating conditions, Water loop
Cooling mode (EER)	**>4.10**	EN14511	EN14511-2 Table 6 Standard rating conditions, Comfort

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 4.41 would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Water Source: Split and Multi-Split (Including Variable Refrigerant Flow)

Date added to the ETL August 2002.

1. Definition of technology

A heat pump is a device that uses refrigeration technology to transfer heat from a source to the space to be heated.

2. Description of technology

A water source split or multi-split heat pump is a device which uses an electrically operated refrigeration system to transfer heat from a water source (internal water loop) to the space to be heated. Additionally, it may be able to provide cooling by means of reversing the refrigeration cycle, in which case it is also referred to as a reversible 'water cooled' air conditioning unit. Units can be:

- Single split (one 'outdoor' unit connected to one 'indoor' unit)
- Dual split (one 'outdoor' unit connected to 2 'indoor' units)
- Multi-split (one 'outdoor' unit connected to 2 or more 'indoor' units)

The 'outdoor' and 'indoor' units are supplied as a matched set.

Investments in water source split and multi-split (including variable refrigerant flow) heat pumps can only qualify for Enhanced Capital Allowances if the specific product identified by the outdoor unit and the matching indoor unit(s) is named in the ETL Heat Pump Master List. To be eligible for inclusion on the ETL Heat Pump Master List, products must meet the eligibility criteria as set out below AND the Heat Pump Master List Listing Mechanism.

3. Eligibility criteria

Eligible products are required to meet the following performance criteria for both heating measured by the Coefficient of Performance (CoP) across the range of connected capacities and including 100% (full) load and cooling measured by the Energy Efficiency Ratio (EER) across the range of connected capacities including 100% (full) load where cooling is provided.

The CoP and EER where applicable must be determined in accordance with the test procedures for the relevant product group as shown below.

	Performance	Test standard	Rating condition
Heating mode (CoP)	**>3.70**	EN14511	EN14511-2 Table 5 Standard rating conditions, Water loop. Equivalent standards may be considered where equivalence can be scientifically proved.
Cooling mode (EER)	**>3.30**	EN14511	EN14511-2 Table 6 Standard rating conditions, Comfort . Equivalent standards may be considered where equivalence can be scientifically proved.

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal place. As an example a COP of less than 3.71 would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Heating, Ventilation and Air Conditioning (HVAC) Zone Controls

Date added to ETL 2004. (Revised August 2007)

1. Definition of Technology

HVAC Zone Controls are building services control devices that facilitate individual control of independent building zones to achieve required environmental conditions whilst minimising the energy requirements of those building services.

2. Technology Description

HVAC Zone Controls enable areas or zones within a building to be independently controlled to temperature and to occupation times required by each zone, thereby reducing energy loadings for building services equipment. The technology is applicable to all building types and sizes. HVAC Zone Controls typically control:

- Ventilation - dampers, fans and window ventilation
- Air conditioning (A/C) and ventilation - central, split, packaged, terminal & heat recovery units
- Wet heating systems - boilers, pumps, heating circuits and DHW systems
- Chilled water systems - chillers, pumps and heat rejection/recovery units
- Underfloor or storage heating - wet systems and electric heating.

Plant regulation can be via on/off control as well as continuous modulation and may be achieved using outputs integral with the unit or peripheral regulation modules.

Investments in HVAC Zone Controls can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To qualify, HVAC Zone Controls must demonstrate inclusion of the following functions either in one unit or co-ordinated between qualifying units using a communication network:

1. Perform a fixed function with appropriate user selections/adjustments i.e. dedicated to a particular aspect of building services control.
2. Include a demand driven system to ensure that energy consuming devices only operate when required and operate at a level suitable for just satisfying the energy demand from the zone. These components may be driven by a demand signal, by presence occupation or both.
3. The operation of a zone may be directly triggered by a demand signal, such as a presence, CO_2 or heat detector, by preset occupation times or by a combination of both.
4. If operation is occupation time based then:

I. Operating times for occupation must provide at least two occupied time periods per day and be settable by users at least 7 days ahead. Adjustment must revert to normal setting after use.
II. Operating time extensions per controlled zone are to be settable by occupants/users. Occupation times to revert to normal settings after use.
III. An optimum start function is available for each heating or cooling zone.

5. Units with fixed functions for wet heating are to provide weather compensation related to outside air temperature and/or inside air temperature e.g. reset. Slope to be settable by building manager/operator.
6. Zone temperature control to be provided based on temperature sensors NOT thermostats.
7. Qualifying controls must demonstrate an ability to provide demand signals for the control of boilers, chillers and/or A.C/ventilation fans. Controls must ensure that any one zone is prohibited from calling heating and cooling at the same time.
8. Plant regulation can be via:
   - On/off control
   - Continuous modulation – this may be achieved using outputs integral with the unit or by the use of peripheral regulation modules
   - Both on/off control and continuous modulation – this may be achieved using outputs integral with the unit or by the use of peripheral regulation modules.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Lighting

High Efficiency Lighting Units

Date added to ETL 2001.

1. Definition of Technology

High efficiency lighting units are products that are specifically designed to illuminate efficiently particular activities or features of a business.

2. Technology Description

High efficiency lighting units (HELUs) are a combination of a light fitting (or luminaire), one or more lamps, and associated control gear that have been assembled into a single packaged unit that can be readily deployed in any sector of industry or business. All three components need to be present to make up a HELU which complies with the ETL.

HELUs have been included in the Enhanced Capital Allowance (ECA) scheme because they offer substantial energy and carbon savings. A wide variety of products are available with a range of performance levels. The ECA scheme aims to encourage the purchase of high efficiency products that meet certain minimum design and performance standards.

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

1 Triphosphor compact fluorescent lamps (CFL) and lighting fittings (including associated control gear)

2 T8 triphosphor linear fluorescent lamp(s) and lighting fittings with associated electronic control gear

3 T5 triphosphor linear fluorescent lamp(s) and lighting fittings with associated electronic control gear

4 High-pressure Sodium 'Plus' lamps, or Metal Halide lamps, and high-bay, low-bay or horticultural lighting fittings with associated control gear

5 High-pressure Sodium 'Plus' tubular lamps or Metal Halide lamps and Floodlight fittings or Post-mounted lanterns for exterior lighting

6 Metal Halide lamps and Accent or Display lighting fittings with associated control gear

Investments in HELUs can only qualify for Enhanced Capital Allowances if the product meets the criteria as set out below and if the installation can be classified as plant. A HELU can be classified as plant if it mainly supplies the particular lighting requirements of the business activities carried on in the space where it is installed. Detailed information on the qualification plant should be sought from a company accountant or company tax advisor.

3. Eligibility Criteria

To be eligible, products must comply with specific eligibility criteria for the relevant category of High Efficiency Lighting Unit as set out in Tables 1 to 6. These tables include separate criteria for each component of a HELU: namely: the light fitting (or luminaire), lamps and associated control gear. For a product to be eligible, the HELU and each of its components must comply with all relevant eligibility criteria.

Performance criteria

Products must deliver the minimum nominal initial lumens per lamp value for the relevant category of High Efficiency Lighting Unit as set out in Tables 1 to 6, whilst not exceeding the corresponding maximum Lighting Fitting Efficiency Code (LFEC) value.

Products must also comply with all relevant performance requirements in respect of their component light fitting, lamps or associated control gear, as set out in Tables 1 to 6.

Note: Appendix 1 explains how the LFEC value can be determined.

Required test procedures

All products must be tested in accordance with the procedures and test conditions in the standards for the category of High Efficiency Lighting Unit as set out in Tables 1 to 6.

Photometry must be undertaken in compliance with either BS 5225-1:1975 or BS EN 13032-1:2004. Lamp lumens are those obtained when operated with the specified control gear.

Table 1	**High Efficiency Lighting Units comprising triphosphor compact fluorescent lamps and lighting fittings (including associated control gear) for indoor and outdoor applications.**
SECTION 1A –ELIGIBILITY CRITERIA	

To be eligible under this category of High Efficiency Lighting Unit:

- All CFLs must comply with BS EN 61199:2000 (safety) and BS EN 60901:1996 (performance).
- Light fittings must comply with BS EN 60598-1:2004 and the relevant Part 2 of EN 60598.
- Light fittings installed indoors must comply with the glare requirements of HSG 38 (1998).
- High frequency (HF) control gear must be fitted.

The high frequency (HF) control gear must be either 'dimmable' (regulating) or non-dimmable 'warm start' types. If non-dimmable then `warm start` versions of HF electronic control gear must be used. This is to avoid potential lamp life problems arising if "cold start" HF electronic controls are used and lighting controls are installed so that lamps are switched on and off fairly frequently.

Where fitted, 'warm start' high-frequency control gear must comply with BS EN 61347-1:2001 (safety) and BS EN 60929:2006 (performance). It must also conform to the appropriate CELMA Class A1, A2 or A3 requirement for maximum input power, if it is included in the current CELMA Guide (2005).

SECTION 1B –PERFORMANCE THRESHOLDS

Triphosphor lamps				Lighting fitting	
				Maximum LFEC value	
Type	Watts as labelled	Actual lamp watts when using HF control gear	Required minimum nominal initial (100h) lumens per lamp	General interior lighting fittings	Amenity, display & accent lighting fittings
Compact 2 tubes	18W	16W	1,150	*n/a*	F2
	24W	22W	1,750	F0	F3
	36W	32W	2,800	F1	F4
	40W	40W	3,500	F1	F4
	55W	55W	4,800	F1	F4
	80W	80W	6,000	*n/a*	F2
Compact 4 tubes flat	18W	16W	1,100	*n/a*	F2
	24W	22W	1,700	*n/a*	F2
	36W	32W	2,800	F1	F4
Compact 4 tubes	10W	9.5W	600	*n/a*	F1
	13W	12.5W	900	*n/a*	F1
	18W	16.5W	1,200	*n/a*	F1
	26W	24W	1,800	*n/a*	F2
Compact 6 & 8 tubes	18W	16W	1,200	*n/a*	F1
	26W	24W	1,800	*n/a*	F2
	32W	32W	2,400	*n/a*	F2
	42W	42W	3,200	*n/a*	F2
	57W	57W	4,300	*n/a*	F2
	70W	70W	5,200	*n/a*	F2
Compact 2D	10W	9W	590	*n/a*	F1
	16W	14W	950	*n/a*	F1
	21W	19W	1,250	*n/a*	F1
	28W	25W	1,850	F0	F3
	36W	34W	2,580	F0	F3
	55W	55W	3,900	F0	F3

SECTION 1C –NOTES

1. n/a (not achievable) indicates that the lighting unit is not sufficiently efficient to be eligible for use in general lighting installations. The circuit efficacies of most types/wattage ratings of CFLs are such that it is rarely possible to achieve an acceptable overall Lighting Unit efficiency to allow them to be used for General Lighting applications. However their use in Amenity, Accent, and Display lighting applications is permissible because it provides a more efficient alternative to the frequently used but less efficient options, e.g. tungsten filament or tungsten halogen lamps or CFLs in inefficient lighting fittings with standard 50Hz control gear. Hence there are two sets of LFEC requirements.

2. Some fluorescent lamps are labelled and branded with the wattage (power) consumed when operated on standard 50Hz (i.e. not high-frequency) control gear. When operated on high-frequency control gear the watts consumed are less (see columns 2 & 3 of Table).

3. These High Efficiency Lighting Units comprise non-integral compact fluorescent lamps (i.e. those types that do not incorporate the control gear in the lamp cap) and lighting fittings with high frequency (HF) electronic control gear contained in the lighting fitting or accompanying enclosure.

4. Lighting fittings that incorporate lighting control devices such as light regulation (dimming) and 'presence' controls are considered eligible provided that they comply with the other eligibility criteria and the performance thresholds set out in Table 1 above.

Table 2 High Efficiency Lighting Units comprising T8 triphosphor linear fluorescent lamp(s), and lighting fitting with associated electronic control gear.

SECTION 2A –ELIGIBILITY CRITERIA

To be eligible under this category of High Efficiency Lighting Unit:

- Light fittings must comply with BS EN 60598-1:2004 and the relevant Part 2 of EN 60598.
- Light fittings installed indoors must comply with the glare requirements of HSG 38 (1998).
- Lamps must comply with BS EN 61195:2000 (safety) and BS EN 60081:1998 (performance).
- Lamps must have a Colour Rendering Index no lower than Ra85.
- High frequency (HF) control gear must be fitted.

The high frequency (HF) control gear must be either 'dimmable' (regulating) or non-dimmable 'warm start' types. If non-dimmable then `warm start` versions of HF electronic control gear must be used. This is to avoid potential lamp life problems arising if "cold start" HF electronic controls are used and lighting controls are installed so that lamps are switched on and off fairly frequently.

Where fitted, 'warm start' high-frequency control gear must comply with BS EN 61347-1:2001 (safety) and BS EN 60929:2006 (performance). It must also conform to the appropriate CELMA Class A1, A2 or A3 requirement for maximum input power, if it is included in the current CELMA Guide (2005).

SECTION 2B –PERFORMANCE THRESHOLDS

T8 Triphosphor fluorescent lamps					Lighting fittings
Watts as labelled	**Actual lamp watts when used with HF control gear**	**Length (m)**	**Tube diameter (mm)**	**Required minimum nominal initial (100h) lumens per lamp**	**Maximum value of LFEC**
18	16	0.6	26	1,350	F1
36	32	1.2	26	3,200	F3
58	50	1.5	26	5,000	F3
70	60	1.8	26	6,000	F3

SECTION 2C –NOTES

1. Lighting fittings that incorporate lighting control devices such as light regulation (dimming) and 'presence' controls are considered eligible provided that they comply with the other eligibility criteria and the performance thresholds set out in Table 2 above.

Table 3 High Efficiency Lighting Units comprising T5 triphosphor linear fluorescent lamp(s), and lighting fitting with associated electronic control gear.

SECTION 3A –ELIGIBILITY CRITERIA

To be eligible under this category of High Efficiency Lighting Unit:

- Light fittings must comply with BS EN 60598-1:2004 and the relevant Part 2 of EN 60598.
- Light fittings installed indoors must comply with the glare requirements of HSG 38 (1998).
- Lamps must have a Colour Rendering Index no lower than Ra85.
- Lamps must comply with BS EN 61195:2000 (safety) and BS EN 60081:1998 (performance).

The high frequency (HF) control gear must be either 'dimmable' (regulating) or non-dimmable 'warm start' types. Where fitted, "Warm start" high-frequency control gear must comply with BS EN 61347-1:2001 (safety) and BS EN 60929:2006 (performance). It must also conform to the appropriate CELMA Class A1, A2 or A3 requirement for maximum input power, if it is included in the current CELMA Guide (2005).

SECTION 3B –PERFORMANCE THRESHOLDS

T5 Triphosphor fluorescent lamps				Lighting fittings
Lamp watts as labelled and when used with electronic HF control gear	**Length (m)**	**Tube diameter (mm)**	**Minimum required nominal initial (100h) lumens per lamp @25°C**	**Maximum value of LFEC**
14	0.55	16	1,200	F2
24	0.55	16	1,750	F1
21	0.85	16	1,900	F3
39	0.85	16	3,100	F2
28	1.15	16	2,600	F3
54	1.15	16	4,450	F2
35	1.45	16	3,300	F3
49	1.45	16	4,300	F2
80	1.45	16	6,150	F1

SECTION 3C –NOTES

1. Lighting fittings that incorporate lighting control devices such as light regulation (dimming) and 'presence' controls are considered eligible provided that they comply with the other eligibility criteria and the performance thresholds set out in Table 3 above.

Table 4 High Efficiency Lighting Units comprising High-pressure Sodium 'Plus' lamps or Metal Halide lamps and high-bay, low-bay or horticultural lighting fittings with associated control gear.

SECTION 4A –ELIGIBILITY CRITERIA

To be eligible under this category of High Efficiency Lighting Unit:

- Light fittings must comply with BS EN 60598-1:2004 and the relevant Part 2 of EN 60598.
- Light fittings installed indoors must comply with the glare requirements of HSG 38 (1998).
- Lamps must comply with BS EN 62035:2000 (safety).

Where standard 50 Hz control gear is fitted:

- Ballasts must comply with BS EN 60923:2005 (performance) and BS EN 60922:1997 (safety).
- Capacitors must comply with BS EN 61049:1993 (performance) and BS EN 61048:2006 (safety).
- Starting devices must comply with BS EN 60927:1997 (performance and BS EN 61347-2-1 :2001 (safety).

Electronic control gear (where fitted) must comply with BS EN 55015:2001, EN61000-3-2:2006, BS EN 61547:1996, BS EN 61347-2-1:2001, BS EN 61347-2-12:2005, BS EN 60927:1997 and BS EN 60929:2006.

SECTION 4B –PERFORMANCE THRESHOLDS

Lamps			Lighting fittings
Type(s)	**Watts as labelled**	**Minimum required nominal initial (100h) lumens per lamp**	**Maximum value of LFEC**
High-pressure sodium 'Plus' versions	150	16,000	F2
	250	30,500	F2
	400	52,000	F2
	600	90,000	F2
Metal Halide	150	12,000	F2
	250	17,000	F2
	400	30,500	F2

SECTION 4C –NOTES

1. Lighting fittings with either standard 50Hz control gear or electronic control gear are eligible.
2. The lamp control gear may be incorporated in the lighting fitting or in a separate accompanying enclosure.
3. Lighting fittings that incorporate lighting control devices such as light regulation (dimming) and photoelectric controls are considered eligible provided that they comply with the other eligibility criteria and the performance thresholds set out in Table 4 above.

Table 5 High Efficiency Lighting Units comprising High-pressure Sodium 'Plus' tubular lamps or Metal Halide lamps and Floodlight fittings or Post-mounted lanterns for exterior lighting.

SECTION 5A –ELIGIBILITY CRITERIA

To be eligible under this category of High Efficiency Lighting Unit:

- Light fittings must comply with BS EN 60598-1:2004 and the relevant Part 2 of EN 60598.
- Lamps must comply with BS EN 62035:2000 (safety).

Where standard 50 Hz control gear is fitted:

- Ballasts must comply with BS EN 60923:2005 (performance) and BS EN 60922:1997 (safety).
- Capacitors must comply with BS EN 61049:1993 (performance) and BS EN 61048:2006 (safety).
- Starting devices must comply with BS EN 60927:1997 (performance and BS EN 61347-2-1 :2001 (safety).

Electronic control gear (where fitted) must comply with BS EN 55015:2001, EN61000-3-2:2006, BS EN 61547:1996, BS EN 61347-2-1:2001, BS EN 61347-2-12:2005, BS EN 60927:1997 and BS EN 60929:2006.

SECTION 5B –PERFORMANCE THRESHOLDS			
Lamps			**Floodlight or Post-top lantern**
Type	**Watts as labelled**	**Minimum required nominal initial (100h) lumens per lamp**	**Maximum value of LFEC**
High-pressure sodium 'Plus' tubular lamps	70	6,500	F3
	100	10,000	F3
	150	17,500	F3
	250	33,000	F3
	400	56,500	F3
Metal halide lamps	70	5,300	F3
	150	11,500	F3
	250	17,000	F3
	400	30,500	F3

SECTION 5C –NOTES

1. Lighting fittings with either standard 50Hz control gear or electronic control gear are eligible.
2. The lamp control gear may be incorporated in the lighting fitting or in a separate accompanying enclosure.
3. Lighting fittings that incorporate lighting control devices such as light regulation (dimming) and photoelectric controls are considered eligible provided that they comply with the other eligibility criteria and the performance thresholds set out in Table 5 above.

Table 6 High Efficiency Lighting Units comprising Metal Halide lamps and Accent or Display lighting fittings with associated control gear.

SECTION 6A –ELIGIBILITY CRITERIA

To be eligible under this category of High Efficiency Lighting Unit:

- Light fittings must comply with BS EN 60598-1:2004 and the current Part 2 of EN 60598.
- Lamps must comply with BS EN 62035:2000 (safety).

Where standard 50 Hz control gear is fitted:

- Ballasts must comply with BS EN 60923:2005 (performance) and BS EN 60922:1997 (safety).
- Capacitors must comply with BS EN 61049:1993 (performance) and BS EN 61048:2006 (safety).
- Starting devices must comply with BS EN 60927:1997 (performance and BS EN 61347-2-1:2001 (safety).

Electronic control gear (where fitted) must comply with BS EN 55015:2001, EN61000-3-2:2006, BS EN 61547:1996, BS EN 61347-2-1:2001, BS EN 61347-2-12:2005, BS EN 60927:1997 and BS EN 60929:2006.

Lamps with integral reflectors (PAR) must comply with the LFEC requirements.

SECTION 6B –PERFORMANCE THRESHOLDS	
Lamps	**Floodlight or Post-top lantern**

Type	Watts as labelled	Minimum required nominal initial (100h) lumens per lamp	Maximum value of LFEC
Metal Halide, including ceramic types	35	3,300	F3
	70	6,200	F3
	150	14,000	F4

SECTION 6C –NOTES

1. Lighting fittings with either standard 50Hz control gear or electronic control gear are eligible.
2. Lighting fittings that incorporate lighting control devices such as light regulation (dimming) are considered eligible provided that they comply with the other eligibility criteria and the performance thresholds set out in Table 6 above.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

APPENDIX 1 - Determining the Lighting Fitting Efficiency Code (LFEC)

1.1 LFEC code for indoor lighting fittings from the utilisation factor

The Lighting Fitting Efficiency Code (LFEC) of a lighting fitting is determined from the Utilisation Factor (UF) normally provided by the manufacturer for a standard room of surface reflectance of 0.7 (ceiling), 0.5 (walls) and 0.2 (floor), and a Room Index of 3.0. The table below gives values of LFEC for different ranges of UF.

Table 1.1 Lighting Fitting Efficiency Codes (LFEC)

LFEC Code	'K' or UF
F0	>0.89
F1	0.80 - 0.88
F2	0.72 - 0.79
F3	0.65 - 0.71
F4	0.59 - 0.64
F5	0.53 - 0.58

1.2 LFEC code for indoor lighting fittings by calculation

For some types of lighting fitting a manufacturer may be unable to provide a UF table, e.g. recessed 'downlight', 'wall-washer' and amenity lighting fittings as well as outdoor lighting fittings, including floodlights. In such cases they will state, or can provide, what are known as the Light Output Ratios, i.e.

ULOR = Upward light output ratio	This is the portion of the light produced by the lamp(s) that is emitted from the lighting fitting in an upward direction.

DLOR = Downward light output ratio	This is the portion of the light produced by the lamp(s) that is emitted from the lighting fitting in a downward direction.
LOR = Light output ratio	This is the portion of the light produced by the lamp(s) that is emitted from the lighting fitting in all directions.

ULOR + DLOR = LOR which will be less than 1.0 because the lighting fitting does not emit all of the light produced by the lamp(s).

The LFEC can be determined by using this information to calculate an approximation (denoted as 'K') of the UF for reflectance of 0.70, 0.50 & 0.20 and a Room Index of 3.0 in the following manner:

K = DLOR + (0.5 x ULOR)

The result of this calculation is used to obtain the LFEC by referring to table AP1.1

Examples:

If DLOR = 0.5 & ULOR = 0.2, then K = 0.5 + (0.5 x 0.2) = 0.6 **(LFEC = F4)**

If DLOR = 0.75 & ULOR = 0, then K = 0.75 + (0.5 x 0) = 0.75 **(LFEC = F2)**

1.3 Outdoor lighting fittings

Floodlights are unlikely to be positioned as indoor lighting fittings, i.e. pointing straight down, therefore the ULOR and DLOR value cannot be defined. For floodlight fittings it is acceptable to assume that 'K' = the light output ratio **(LOR)** value, which is normally quoted for such lighting fittings.

For example, the LOR for a floodlight fitting is stated to be 0.68.

Referring to table 1.1 shows that the LFEC is **F3**

Post top outdoor lighting fittings: DLOR and ULOR values are quoted for such fittings, therefore **'K'** can be calculated by the same method as defined in section 1.2, above.

Lighting Controls

Date added to ETL 2001.

1. Definition of Technology

Lighting controls are products that are specifically designed to switch artificial lighting on or off, and/or to dim its output.

2. Technology Description

Lighting controls switch lighting on and off and enable artificial lighting levels within specific areas to be adjusted, as and when required by changes in daylight or occupancy, or individual activities.

A wide variety of lighting control products are available, and these range from simple manual switches to fully automatic control systems that adjust artificial lighting levels to reflect planned operating hours, occupation levels and the availability of daylight in specific areas.

The Enhanced Capital Allowance scheme aims to encourage the purchase of lighting controls that realise energy savings by automatically switching or dimming lighting in these ways.

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

1 Time controllers that automatically switch off lighting at predetermined times.

2 Presence detectors with associated switching controllers that monitor occupancy or movement of personnel, and automatically switch off lighting when the area is unoccupied.

3 Daylight detectors with associated switching controllers that monitor daylight availability, and automatically switch off lighting when daylight is sufficient to illuminate the area.

4 Daylight detectors with associated dimming controllers that monitor daylight availability, and automatically dim lighting, by reducing its power consumption, to the level needed to sufficiently illuminate the area.

5 Central control units that provide the facility to manage the overall operation of artificial lighting installations that include some or all of the categories of lighting controls above.

The above categories of controls may be installed either individually or in combination.

Investments in lighting controls can only qualify for Enhanced Capital Allowances if the product meets the criteria as set out below.

3. Eligibility Criteria

To be eligible, products must incorporate one or more of the categories of lighting controls set out in Tables 1 to 5 below, and comply with the specific eligibility criteria in the relevant table(s). .
Note

Products may also incorporate the facility that permits the automatic switching of lights to be overridden on a central basis for maintenance or security purposes, or to ensure the safety of occupants during particular events or activities.

Table 1 Time Controllers.
SECTION 1A –ELIGIBILITY CRITERIA
To be eligible under this category of Lighting Controls: • The product must automatically switch the lighting off at predetermined times.
SECTION 1B –Notes
3. The product may also be set to automatically switch on the lighting at predetermined times. 4. Products may incorporate the facility for users to manually switch on and off lighting in a local area and thus to override the predetermined lighting levels at that particular time. However products that allow users to locally override subsequent predetermined times for the lighting to be automatically switched off are not eligible. 5. Time delay switches that simply switch off the lighting after a set time interval are not eligible.

Table 2 Presence detectors with associated switching controllers

SECTION 2A –ELIGIBILITY CRITERIA

To be eligible under this category of Lighting Controls:

- The product must automatically switch off the lighting after the area has become unoccupied.

SECTION 2B –Notes

1. The product may also automatically switch on the lighting when the space becomes occupied. Alternatively local users may manually switch on the lighting at the start of occupancy.

2. Products may incorporate the facility for local users to manually override the presence detector/controller and to switch the lighting off at any particular instance. However products that allow users to override the ability of the presence detector/controller to automatically switch off the lighting are not eligible.

Table 3 Daylight detectors with associated switching controllers

SECTION 3A –ELIGIBILITY CRITERIA

To be eligible under this category of Lighting Controls:

- The product must monitor the availability of daylight and automatically switch the lighting off when sufficient daylight is available to illuminate the area.

SECTION 3B –Notes

1. The product may also automatically switch on the lighting when daylight has fallen below the required level. Alternatively local users could be allowed to switch on the lighting manually, when daylight has fallen below the required level.

2. Products may incorporate the facility for users to manually override daylight detector/controller and switch the lights off at any particular instance. However products that allow users to override the ability of the daylight detector/controller to automatically switch off the lighting are not eligible.

Table 4 Daylight detectors with associated dimming controllers

SECTION 4A –ELIGIBILITY CRITERIA

To be eligible under this category of Lighting Controls:

- The product must monitor the availability of daylight and automatically dim the artificial lighting to the level just needed to sufficiently illuminate the area.
- The product must be able to reduce the power consumption of the lamps being controlled by at least 50% through dimming.

Where fluorescent lighting is being controlled, it must incorporate high frequency control gear with dimmable ballasts. Other forms of lighting may incorporate either mains frequency or high frequency control gear with dimmable ballasts.

SECTION 4B –Notes

1. The product may also automatically switch on the lighting when daylight has fallen below the required level. Alternatively local users could be required to switch on the lighting manually, as and when needed.

2. Products may incorporate the facility for users to manually override the dimming controller at any particular instance and to set the lighting to a lower level that it would be under automatic control, or switch it off. However products that allow users to override the ability of the daylight detector/controller to automatically dim the lighting are not eligible.

Table 5 Central control units (for lighting)
SECTION 5A –ELIGIBILITY CRITERIA
To be eligible under this category of Lighting Controls: • The product must be able to manage the overall operation of the artificial lighting installation that includes some or all of the categories of lighting controls set out in Tables 1 to 4 above.
SECTION 5B –Notes
1. The product may make use of pre-programmed "scenes" that configure the lighting levels in different areas for a particular activity or daylight level or occupancy status in the most energy efficient manner. However products that are only capable of manual scene setting are not eligible.

Performance criteria

Eligible products must comply with: the requirements of the following standards:

- **Either** EN61000-6-2: 2001/2005 and EN61000-6-4: 2001/2007 (in industrial environments), **or** EN61000-6-1: 2001/2007 and EN61000-6-3: 2001/2007 (in all other environments); and:

- The relevant sections of **either** EN 60669: 1998-2006, **or** EN 60730: 1992-2001.

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in the standards specified in the performance criteria above.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Motors and Drives

Single Speed Motors

(criteria last amended July 2001; text revised January 2005)

1. Technology Description

Single speed motors currently included under the ECA scheme are cage induction fixed speed three phase motors between 200 and 750 Volts / 50Hz, that meet or exceed the criteria (below), regardless of application.

Investments in single speed motors can only qualify for ECAs if the single speed motor is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet minimum performance criteria as set out below.

2. Eligibility Criteria

Single speed motors must meet or exceed the following standards in order to be eligible for inclusion on the Energy Technology Product List:

- All 2 and 4 pole motors between 1.1 - 90kW must meet the CEMEP EFF1 efficiency ratings.
- All 2 and 4 pole motors between 110 - 400kW, and 6 and 8 pole motors between 5.5-315kW must meet the Water Industry Motor Efficiency Standards (WIMES) for 6 pole motors.

The minimum efficiencies are detailed below. Note that if the power of a single speed motor is not standard, and as such not listed below, the criteria for the next higher power will apply

Performance criteria

Products must meet the following minimum efficiencies at full load:

Power(kW)	2 Pole	4 Pole	6 Pole	8 Pole
1.1	82.8	83.8		
1.5	84.1	85.0		
2.2	85.6	86.4		
3.0	86.7	87.4		
4.0	87.6	88.3		
5.5	88.6	89.2	86.0	86.0
7.5	89.5	90.1	89.0	89.0
11.0	90.5	91.0	89.0	89.0
15.0	91.3	91.8	90.0	90.0
18.5	91.8	92.2	90.0	90.0
22.0	92.2	92.6	91.5	91.5
30.0	92.9	93.2	92.0	92.0
37.0	93.3	93.6	93.0	93.0
45.0	93.7	93.9	93.4	93.4
55.0	94.0	94.2	93.8	93.8
75.0	94.6	94.7	94.3	94.3
90.0	95.0	95.0	94.5	94.5
110.0	95.0	95.1	94.8	94.8
132.0	95.0	95.5	95.0	95.0
150.0	95.8	95.7	95.5	95.5
185.0	96.1	95.9	95.6	95.6
200.0	96.0	95.8	95.5	95.5
250.0	96.0	96.0	95.9	95.9
280.0	96.3	96.3	96.0	96.0
315.0	96.4	96.4	96.0	96.0
355.0	96.4	96.5		
400.0	96.5	96.5		

Required test procedures

- Single speed motors shall be tested in accordance with IEC34-2 procedures.
- The manufacturers themselves or a 'test house' may carry out the IEC34-2 procedures

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Variable Speed Drives

Date added to the ETL July 2001

1. Definition of Technology

A variable speed drive is specifically designed to drive an ac induction motor in a manner that rotates the motor's drive shaft at a variable speed dictated by an external signal.

2. Technology Description

A variable speed drive is essentially an electronic power converter that generates a multi-phase, variable frequency output that can be used to drive a standard ac induction motor, and to modulate and control the motor's speed, torque and mechanical power output.

Variable speed drives may be purchased either as a stand-alone product or purchased as part of another item of plant or machinery. They are included on the Energy Technology Product List because they can realise substantial energy savings when used to control the speed of non-positive-displacement type machinery, instead of traditional methods of flow regulation such as mechanical dampers or throttle valves.

Investments in variable speed drives can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must:

- Incorporate an electronic VSD that uses a pulse width modulation method to generate a variable frequency, 3 phase power output (with each phase displaced by 120 degrees) that is suitable for operating a 3 phase ac induction motor.

- Provide an adjustable variable-voltage, variable-frequency output that can be matched to the torque-speed characteristic of the load (being driven by the motor), including both loads with a quadratic torque-speed and linear torque-speed characteristics. The relationship between the voltage and frequency of the product's output must either be:

    a) Predefined prior to sale to match a number of specific motor loads, which can be selected during commissioning; OR
    b) Programmed into the product during installation using a multi-point approximation as part of a clearly defined commissioning procedure; OR
    c) Determined during commissioning by a self tuning algorithm that automatically minimises the energy consumption of the drive; OR

d) Automatically adjusted during operation in a manner that ensures the product's output matches the characteristics of the motor and its load; OR

e) Any combination of (a) to (d) above.

- Be able to automatically vary, in response to an external control signal, the motor's speed between 100% and 50% (or less) of its maximum continuous speed rating.

- Be configured for direct connection to the UK public electricity supply system, or a private alternating current supply of nominally fixed frequency and voltage.

- Conform to the requirements of the EU EMC Directive 89/336/EEC, or its replacement EU EMC Directive 2004/108/EC or be CE Marked.

- **Not** incorporate any type of mechanical apparatus that derives its motive force from the product's variable frequency output, including any form of electric motor or fluid movement mechanism, except for fans incorporated for product cooling.

Exclusions

Optional extras and detachable components (e.g. transducers and communications cards) shall not be considered to be part of the product unless they are required to deliver the functionality outlined above, or to ensure the safe and reliable operation of the product, and must be clearly identified in the product's description, unique model or part number.

Performance criteria

Eligible products must comply with the requirements of the following standards:

- BS EN 61800-3:2004 (or IEC 61800-3:2004) "Adjustable speed electrical power drive systems - EMC product standard including specific test methods"

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in the standards specified in the performance criteria above.

The range of speed over which the product can continuously operate motors with quadratic and linear torque speed characteristics must be determined in accordance with the procedures and test conditions laid down in:

- BS EN 61800-2:1998 (or IEC 61800-2:1998) "Adjustable speed electrical power drive systems - General requirements - rating specifications for low voltage adjustable frequency AC power drive systems" or equivalent procedures in European or International Standards.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Switched Reluctance Drives

Date added to ETL 2001.

1. Definition of Technology

A switched reluctance drive is specifically designed to drive a switched reluctance motor (also referred to as a variable reluctance motor) in a manner that rotates the motor's drive shaft at a variable speed dictated by an external signal.

2. Technology Description

A switched reluctance drive is a type of electronic variable speed drive (VSD) that is specifically designed to drive a switched reluctance motor (also referred to as variable reluctance motor) by sequentially activating a series of stator coils arranged around the rim of the motor. The motor's rotor consists of iron laminates that rotate to align with the activated stator coil. By changing the rate at which stator coils are switched on and off, motor speed can be varied. These products are included on the Energy Technology Product List because they can realise substantial energy savings when used to control fluid movement, instead of traditional methods of flow regulation such as mechanical dampers and throttle valves.

Investments in switched reluctance drives can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must:

- Incorporate an electronic variable speed drive that uses a pulse width modulation method to generate a variable frequency output suitable for operating a variable or switched reluctance motor.
- Be configured for direct connection to the UK public electricity supply system, or a private alternating current supply of nominally fixed frequency and voltage.
- Be able to automatically vary, in response to an external control signal, the motor's speed between 100% and 20% (or less) of its maximum continuous speed rating.
- Conform to the requirements of the EU EMC Directive 89/336/EEC or its replacement EU EMC Directive 2004/108/EC.
- **Not** incorporate any type of mechanical apparatus that derives its motive force from the product's variable frequency output, including any form of electric motor or fluid movement mechanism, except for fans incorporated for product cooling.

Exclusions

Optional extras and detachable components (e.g. transducers and communications cards) shall not be considered to be part of the product unless they are required to deliver the functionality outlined above, or to ensure the safe and reliable operation of the product, and must be clearly identified in the product's description, unique model number or part number.

Performance criteria

Eligible products must comply with the requirements of the following standards:

- IEC 61800-2 "Adjustable speed electrical power drive systems - Part 2: General requirements - rating specifications for low voltage adjustable frequency AC power drive systems"

- IEC 61800-3 "Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods"

Required test procedures
All products must be tested in accordance with the procedures and test conditions laid down in the standards specified in the performance criteria above.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Integrated Motor Drive Units

Date added to the ETL July 2001 (Revised August 2007)

1. Definition of Technology

An integrated motor drive unit is a product that is specifically designed to rotate a drive shaft and vary its speed in a controlled manner in response to an external signal, by means of an electronic variable speed drive (VSD) and 3 phase ac induction motor. The VSD and motor are permanently mechanically and electrically connected in a manner that does not require an external connection to be made between the VSD and the motor prior to use.

2. Technology Description

An integrated motor drive unit is a combination of an electronic variable speed drive (VSD) and an ac induction motor. The VSD is physically mounted on the motor, and is specifically designed to drive that particular motor and thus is optimally matched to it. This makes an integrated motor drive unit easier to deploy than purchasing two separate components.

An integrated motor drive unit may be purchased as a stand-alone product or purchased as part of another item of plant or machinery. These products are included on the Energy Technology Product List because they can realise substantial energy savings when used to control the speed of non-positive-displacement type machinery, instead of traditional methods of flow regulation such as mechanical dampers and throttle valves.

Investments in integrated motor drive units can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must:

- Incorporate a 3 phase ac induction motor.
- Incorporate an electronic VSD that uses a pulse width modulation method to generate a variable frequency, 3 phase power output (with each phase displaced by 120 degrees) that is suitable for operating the 3 phase ac induction motor.
- Be configured for direct connection to the UK public electricity supply system, or a private alternating current supply of nominally fixed frequency and voltage.

- Provide an adjustable, controlled variable-torque output that can be matched to the torque-speed characteristic of the load (being driven by the product's motor), including both loads with a quadratic torque-speed and linear torque-speed characteristics. The relationship between the speed of the product's output and the torque applied to the load must either be:
    a) Predefined prior to sale to match a number of specific motor loads, which can be selected during commissioning; OR
    b) Programmed into the product during installation using a multi-point approximation as part of a clearly defined commissioning procedure; OR
    c) Determined during commissioning by a self tuning algorithm that automatically minimises the energy consumption of the drive; OR
    d) Automatically adjusted during operation in a manner that ensures the product's output matches the characteristics of the motor and its load; OR
    e) Any combination of (a) to (d) above.

- Be able to automatically vary, in response to an external control signal, the motor's speed between 100% and 50% (or less) of its maximum continuous speed rating.

- Conform with the requirements of the EU Machinery Directive 89/392/EEC (as amended by Directives 91/368/EEC, 93/44/EEC and 93/68/EEC).

- Not incorporate any type of mechanical apparatus that derives its motive force from the product's motor, including any form of fluid movement mechanism.

Exclusions

Optional extras and detachable components (e.g. transducers and communications cards) shall not be considered to be part of the product unless they are required to deliver the functionality outlined above, or to ensure the safe and reliable operation of the product, and must be clearly identified in the product's description, unique model or part number.

Performance criteria

Eligible products must comply with the requirements of the following standards:

- BS EN 61800-3:2004 (or IEC 61800-3:2004) "Adjustable speed electrical power drive systems - EMC product standard including specific test methods"

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in the standards specified in the performance criteria above.

The range of speed over which the product can continuously operate motors with quadratic and linear torque speed characteristics must be determined in accordance with the procedures and test conditions laid down in:

- BS EN 61800-2:1998 (or IEC 61800-2:1998) "Adjustable speed electrical power drive systems - General requirements - rating specifications for low voltage adjustable frequency AC power drive systems" or equivalent procedures in European or International Standards.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of

the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Pipework Insulation

Date added to ETL 2001.

1. Definition of Technology

Pipework insulation is defined in terms of those products applied to the outer circumference of a pipe with the primary objective of reducing thermal flow into or out of the pipe.

2. Technology Description

The primary sectors of the pipework insulation market covered by the enhanced capital allowance scheme are:

- Commercial hot water
- Commercial heating and cooling
- Process Pipework

Typical insulation materials are rock fibre, glass fibre, phenolic foam, nitrile rubber and polyethylene foam. These are usually supplied in preformed cylindrical shapes based on the pipe diameter being insulated and the thickness of insulation required. Some products are flexible in nature which allows them to follow pipe runs easily. Others are more rigid and a greater degree of prefabrication is required to ensure 'seamless' insulation.

Investments in pipe insulation for Enhanced Capital Allowances are not required to be named on the Energy Technology Product List. To be eligible for Enhanced capital allowances products must meet the eligibility criteria set out below.

3. Eligibility Criteria

The eligibility criteria for pipework insulation are based on the product being installed in compliance with the environmental tables of BS5422 (2001). The following table defines eligibility criteria:

Reference in Standard	Environmental Table
Clause 6	Table 6
Clause 7	Table 9
Clause 8	Tables 12 & 13
Clause 9	Table 14
Clause 10	Table 15
Clause 11	Table 18
Annexes	Annexes A & F

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.
Claimants should ask manufacturer/installer to provide verification documentation that the pipework insulation installation is to a standard which qualifies for ECAs.

Radiant and Warm Air Heaters

Radiant Heating

Date added to ETL 2001.

1. Definition of Technology

Overhead radiant heaters operate by heating the spaces beneath them by infrared radiation. This radiation does not warm the surrounding air directly, but is absorbed by solid objects such as building occupants and surrounding fabric. Radiant heating is particularly suited to the heating of large volume buildings with high air change rates and for localised spot heating.

Note: Electric radiant heaters, portable radiant heaters and radiant heaters designed primarily for domestic applications are not eligible for Enhanced Capital Allowances.

2. Technology Description

There are five categories of radiant heater appliance included within the ECA scheme:

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

The first three categories - comprising tube heaters - operate by means of a confined gas or oil flame inside a long steel tube. High temperature combustion products heat the tube directly and a reflector focuses radiant heat downwards towards the floor.

Radiant plaque and cone heaters - often referred to as luminous radiant heaters - operate at a very high temperature, with a flame sitting directly on a porous ceramic or wire mesh surface. The resulting high intensity radiant heat is once again focussed downwards towards the floor by way of a reflector.

This technology category also includes optimising controllers, which can realise fuel savings of up to 10%. They can be purchased either as standalone units for retrofitting to existing heaters, or as modular units that can be integrated into other control systems.

Investments in Radiant Heating can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible product must

- Be designed for mounting above head height (typically 3 to 13m)
- Include a reflector with end caps that directs the heat down and reduces convection losses.
- Combustion products should be either externally vented via an individual flue or a combined flue system or be exhausted into the building provided the required air change rate is ensured.

Manufacturers will be required to test their radiant heaters using the methodologies outlined in the standards listed below, with cross-reference to the application checklist:

- **Unitary radiant tube heaters**

  Unitary radiant heaters with radiant efficiencies above **55%** will be eligible for ETL listing. Testing should be conducted in accordance with the methodology defined in EN416-2.

  Unitary radiant tube heaters that have individual flues must **also** have a net thermal efficiency above **86%** to be eligible for ETL listing. Testing should be conducted in accordance with the methodology defined in EN1020 for air heaters with fan-assisted combustion.

- **Multi burner radiant tube heaters**

  In the case of multi-burner radiant tubes (with combined flues), two methods of demonstrating compliance for ETL listing are acceptable:

  - Individual radiant tube heaters that comprise a multi-burner installation must have a net radiant efficiency above **55%** and be currently listed on the ETL as discrete unitary tubes.

  or

  - The overall net thermal efficiency of the multi-burner installation must be above **90%** to be eligible for ETL listing. Testing should be conducted in accordance with the methodology defined in EN1020 for air heaters with fan-assisted combustion.

- **Continuous radiant tube heaters**

  Continuous radiant tube installations must have a net thermal efficiency above **90%** to be eligible for ETL listing. Testing should be conducted in accordance with the methodology defined in EN1020 for air heaters with fan-assisted combustion.

- **Radiant plaque and cone heaters**

  Radiant plaque and cone heaters with radiant efficiencies above **60%** will be eligible for ETL listing. Testing should be conducted in accordance with the methodology defined in EN419-2.

Optimising Controllers for radiant heaters

Optimising controllers sold with radiant heaters, as part of a package or as a standalone for retrofit to existing radiant heaters, are eligible products providing they incorporate as a minimum the features listed below:

- Be tamper proof.
- Have independent zone, timing and temperature control such that each functional area can be separately controlled in accordance with occupation patterns.
- Facilities for users to "temporarily override" pre-set timings during unusual occupation hours.
- Automatic night set back that turns the heating on to prevent condensation and frost damage.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Warm Air Heating

Date added to ETL 2001.

1. Definition of Technology

Warm air packaged heaters use either gas or oil fuel to generate warm air for building space heating.

Note: Electric warm air heaters, portable warm air heaters and warm air heaters designed primarily for domestic applications are not eligible for Enhanced Capital Allowances.

2. Technology Description

There are three types of warm air heater supported by the ECA scheme:

- **Indirectly fired packaged warm air heaters**
  These incorporate a burner, combustion chamber, heat exchanger and fan with drive motor. Heat from the combustion of the fuel is transferred by the heat exchanger to the air being supplied to the heated space. The fan moves the air to be heated through the heater and distributes it into the heated space. In this type of heater the combustion gases are kept separate from the air being heated and are vented to atmosphere through a flue.

- **Indirectly fired packaged air heater modules**
  These incorporate a burner, combustion chamber and heat exchanger and are designed specifically for installation into an air handling unit and as such are supplied without an air side fan.

- **Directly fired packaged warm air heaters**
  These incorporate a burner, combustion chamber and fan with drive motor. The air supplied to the building is heated by direct mixing with the products of combustion. This type of product is generally employed in buildings that require higher ventilation rates.

This technology category also includes optimising controllers, which can realise fuel savings of up to 10%. They can be purchased as an integral part of the heater package or as standalone units either for retrofitting to existing heaters, or as modular units that can be integrated into other control systems.

Investments in warm air heating can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria set out below.

3. Eligibility Criteria

To be eligible products must:

- Be installed as suspended, wall mounted or floor-standing units or as air heater modules to be installed in an air handling unit.
- Incorporate a fan to distribute the warm air within the heated space except for indirectly fired packaged air heater modules where the fan is part of the air handling unit.

Indirectly fired products

To be eligible indirectly fired warm air heaters must:

- Have a thermal efficiency exceeding **91%**, based on net calorific value.

- The product's thermal efficiency must be established in accordance with the procedures set out in EN1020 (gas fired products) or EN13842 (oil fired products) and independently verified by an accredited laboratory or, where applicable, by a Notified Body (as defined by the Boiler Efficiency Regulations 1993).

Direct fired products
To be eligible direct fired warm air heaters must:

- Be CE approved under EN525
- Incorporate either a variable speed controller on the air-side fan or a variable air volume control, to cater for periods of low occupancy. This must continuously vary the fresh air input to the building by a factor of at least two to one, whilst complying with statutory requirements and standards e.g. BS6230 for fresh air ventilation rates and allowable Occupational exposure limits (Reference HSE publication EH40, Occupational exposure limits, 2002).
- Use burners with a turn down ratio of at least ten to one.
- Use microprocessor based controls to ensure accurate control of air temperature within the building.

Optimising Controllers for warm air heating systems
Optimising controllers sold with warm air heaters, as part of a package or as a standalone for retrofit to existing warm air heaters, are eligible products providing they incorporate as a minimum the features listed below:

- Be tamper proof.
- Have independent zone, timing and temperature control such that each functional area can be separately controlled in accordance with occupation patterns.
- Facilities for users to "temporarily override" pre-set timings during unusual occupation hours.
- Automatic night set back that turns the heating on to prevent condensation and frost damage.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Refrigeration Equipment
Absorption & Other Heat Driven Cooling & Heating Equipment

This category only covers products installed as part of a CHP scheme that has been awarded a certificate from the CHP Quality Assurance (CHPQA) Programme. The absorption chiller's useful chilling effect must be driven by heat derived from the CHP plant. The absorption plant is assessed with the CHP plant under CHPQA programme - for further go to www.chpqa.com.

Air-Cooled Condensing Units

(added August 2004)

1. Technology Description

A condensing unit is defined as "an assembly of a condenser and one or more compressors, complete with interconnecting pipe work. Other components such as liquid receivers, filter driers and oil separators can also be included."

Investments in air-cooled condensing units can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Condensing units have to be fitted with positive displacement hermetic and semi hermetic compressors, and be air-cooled. They can be with and without sub-cooling coils/ economisers.

Testing shall be in accordance with an adapted version of EN13771-1 "Compressor and condensing units for refrigeration. Performance testing and test methods. Refrigerant compressors". Adaptations are detailed in Appendix 1 below.

Note: prEN13771-2 will cover the testing of condensing units in due course. The test methodology described in these criteria is consistent with the expected content of prEN13771-2.

Condensing unit / refrigerant combination

Eligibility is assessed for a condensing unit combined with a specific stated refrigerant, for its performance at a particular temperature rating point (see also "Data Presentation and Rating Points" below). The condensing unit/refrigerant and temperature combinations for which Energy Technology List categories have been set up are:

- High temperature with R407C
- Medium temperature with R404A
- Low temperature with R404A.

Note: A condensing unit may be proposed for inclusion under one or more of these headings.

Data presentation and rating points

Data submitted shall be presented in accordance with EN13215:2000 "*Condensing units for refrigeration – Rating conditions, tolerances and presentation of manufacturer's performance data"*.

Test data shall be from typical production condensing units as sold for end-use.

The Coefficient of Performance (COP) is the measure of efficiency to be used, as defined in EN13215:2000: COP = refrigerating capacity / power absorbed

The power absorbed shall be measured at full load, without condenser pressure control.

As the qualifying condensing units are for use in the UK, they are required to meet the stated COP thresholds as measured at conditions representing typical UK conditions. Hence capacity and COP data shall be assessed at the rating points given in the table below.

Temperature range	Evaporating temperature	Ambient (condenser air-on) temperature	Compressor suction gas temperature
H (high)	+5°C	20°C	20°C
M (medium)	-10°C	20°C	20°C
L (low)	-35°C	20°C	20°C

Data for medium and low temperature ranges must be derived from physical testing at a suction gas temperature of 20°C. Data for a suction gas temperature of 20°C may be obtained by thermodynamic translation of data physically tested at 10K for the high temperature category only.

Note: Capacity and COP data is also required to be submitted for a 32°C ambient rating point for the purposes of data verification.

Refrigerant thermodynamic properties

Refrigerant properties used as the basis for compressor performance analysis are to be as defined in the US National Institute of Standards & Technology (NIST) Standard Reference Database 23 Thermodynamic and Transport Properties of Refrigerants and Refrigerant Mixtures Database: Version 6.0 or later. See http://fluidproperties.nist.gov/or http://www.nist.gov/

Contact details: Standard Reference Data Program, National Institute of Standards and Technology, 100 Bureau Dr., Stop 2310, Gaithersburg, MD 20899-2310, USA (301) 975-2008 (VOICE)(301) 926-0416 (FAX), srdata@nist.gov

Alternatively, the ASERCOM properties database may be used as defined in the ASERCOM Certification scheme, which is based closely on the NIST database (see http://www.asercom.org/).

Required evidence of compliance

1. The onus is on the manufacturer or supplier to prove that their product meets the criteria.

2. Applications must include submission of all data as required on the on-line application form. This information must be generated in accordance with these criteria.

3. Applications must enclose a test report for the condensing unit that includes a statement of achieved performance at the required UK rating point. If the test report is not from an independent body, the applicant must submit evidence that a representative sample of the data for all their products is independently verified or cross-checked.

4. The manufacturer or supplier must provide evidence that the products are subject to adequate quality assurance procedures to ensure consistency of performance between one production item and any other. (For example, a copy of the relevant parts of the applicant's Quality Manual and a copy of the ISO 9000 series certificate).

5. The data supporting any product's application shall be reasonably up to date. Once a product is on the Energy Technology List, the Carbon Trust reserve the right to require refresh of old or obsolete data.

6. The data submitted for the Energy Technology List must be the same as that published in the manufacturer's technical data.

Representative model condensing units

To minimise the burden of testing, where two or more condensing unit models differ only slightly, test data from one condensing unit may be used as a proxy for that from the similar model(s). For fairness, it is necessary to limit what can be deemed as a 'representative model', as described below.

Representative models shall:

- Be tested with the same refrigerant and
- Have the same compressor type (i.e. manufacturer, method of compression (e.g. reciprocating or scroll) and type of enclosure (e.g. hermetic or semi-hermetic)) and body size (e.g. semi-hermetic K, L, or R) and
- Have the same number of condenser fans and

- Have the same sub cooling arrangement and
- Have energy efficiency the same, or inferior (ie the 'representative model' chosen for a family of models should be that with the worst energy performance)

…as/to those of the model(s) being represented.

Performance thresholds for eligibility

The COP at the stated conditions must exceed the values in the table below:

High temperature with R407C	>3.930
Medium Temperature with R404A	>2.835
Low Temperature with R404A	>1.610

">" means "greater than "

For the avoidance of doubt test data should be presented to 3 decimal places. As an example a COP of less than 3.931 for a high temperature with R407C would be deemed to be a fail.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

APPENDIX 1

Test Specification for Air-cooled Condensing Units

Testing of condensing units shall be in accordance with EN13771-1 "*Compressor and condensing units for refrigeration. Performance testing and test methods. Refrigerant compressors"* with the following amendments:

1. In addition to the basic test conditions and their allowable deviations listed in table 2 (EN13771-1 section 4.9), the following condition should be included: Air onto condenser, ±0.5°C.
2. The condensing unit must be located in an area where the temperature is controlled. This must be of a sufficient volume for an unrestricted air flow through the condenser (EN13771-1 section 5.1).
3. Test method C (water cooled condenser on the discharge side) cannot be used (EN13771-1 section 5.2.1.2.1).
4. Condenser refrigerant inlet and exit temperatures and condensing unit refrigerant inlet and outlet must also be recorded (EN13771-1 sections 5.3.5, 5.4.5, 5.6.4, 5.7.4).
5. Condenser fan motor power must also be measured. The total power consumption of the compressor and fan motors must be measured with an accuracy of ±1% (EN13771-1 section 6.1).
6. The fan motor power is added to the compressor power to give total power consumption of the condensing unit (EN13771-1 section 6.2).

7. The test report basic data will also include condensing unit model and serial number and number of condenser fans (EN13771-1 section 7.2).

8. The test report additional data will also include the temperature of air onto the condenser (EN13771-1 section 7.3).

9. The test report test results will include refrigerating capacity of the condensing unit at the basic test conditions in place of that for the compressor, and the power absorbed by the compressor and the condenser fans at the basic test conditions (EN13771-1 section 7.4).

Automatic Air Purgers

Date added to ETL 2001.

1. Definition of Technology

Automatic air purgers are products that are specifically designed to remove air and other non-condensable gases from an industrial or commercial refrigeration system, with minimum loss of refrigerant.

2. Technology Description

Air and other non-condensable gases leak into refrigeration systems through faulty equipment, particularly seals, and during maintenance operations, especially charging of the refrigerant. In addition, slow breakdown of the refrigerant can also add to the build-up of non-condensable gases.

The presence of air and other non-condensable gases in the condenser and receiver increases system head pressure, which results in excessive compressor power consumption and reduces refrigeration system capacity.

Automatic air purgers remove air and other non-condensable gases from the refrigeration system, resulting in substantial energy savings.

Investments in automatic air purgers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be designed for permanent connection to a refrigeration system;
- Automatically extract air and other non-condensable gases from a refrigeration system;
- Incorporate a means to separate any entrained refrigerant from the extracted air and non-condensable gases;
- Incorporate a control mechanism that actively minimises the amount of refrigerant lost with the extracted air and non condensable gases;
- Conform with the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of their design, manufacture and testing procedures.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying

the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Automated Permanent Refrigerant Leak Detection Systems

Date added to ETL 2001.

1. Definition of Technology

Automated permanent refrigerant leak detection systems are products that are specifically designed to continuously monitor the atmosphere in the vicinity of refrigeration equipment and, in the event of detection of refrigerant, give an alarm.

2. Technology Description

An automated permanent refrigerant leak detection system continually and permanently monitors the atmosphere in the vicinity of refrigeration equipment. 'Refrigeration equipment' is any component or pipework which contains refrigerant. The detection system must be permanently fixed in place at the site of the refrigeration equipment. The aim of the technology is to give an early warning of refrigerant leaks, to allow their early repair, and thus improve the energy efficiency of the refrigeration system and reduce carbon emissions.

Investments in automated permanent refrigerant leak detectors can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Continuously and permanently monitor the refrigeration system for refrigerant leakage;
- Detect the presence of one or more refrigerants (which must be clearly named in the information supporting the application) and raise an audible alarm when a pre-set level of refrigerant is reached;
- Have fittings to allow fixing to the wall or floor;
- Be able to operate in conditions of between 0 to 50°C and humidities of up to 90%;
- Meet the minimum level of performance set out in the performance criteria below.

Automated permanent refrigerant leak detectors must be calibrated for each refrigerant named in the application. The product must be capable of detecting at least one of the following types of refrigerant: CFC, HCFC, HFC, or HC.

Exclusions

Automated permanent leak detection systems dedicated to ammonia detection are excluded.

Performance criteria

Products must:

- Generate an alarm signal when the level of refrigerant in the atmosphere exceeds 100 ppm (parts per million);
- Have a measurement accuracy of 20 ppm and be able to detect the presence of 10 ppm of refrigerant in the atmosphere.

Required test procedures

The performance of the equipment must be tested in a UKAS (United Kingdom Accreditation

Service), or equivalent, accredited laboratory and a calibration certificate must be supplied that demonstrates the product's sensitivity, accuracy and alarm setting using test gases.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Cellar Cooling Equipment

Date added to ETL 2003.

1. Definition of Technology

Cellar cooling equipment is a type of refrigeration equipment that is specifically designed to maintain an indoor environment at a condition suitable for the storage of chilled beverages below 12°C.

2. Technology Description

Cellar cooling equipment is permanently installed and uses the standard refrigeration cycle of evaporation, compression and condensation to cool a cellar or other storage space.

The categories of cellar cooling equipment covered are:

- Packaged units where all components mounted on one base for "through the wall" installation.
- Split systems with the equipment supplied in two parts (evaporator and condensing unit) to be connected on installation.
- Remote systems with equipment supplied in three parts (evaporator, compressor/receiver, and condenser) to be connected on installation.

The energy efficiency of cellar cooling equipment can vary by more than 25% and the aim of the ECA scheme is to encourage the purchase of high efficiency models.

Investments in cellar cooling equipment can only qualify for ECAs if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet minimum eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Have a cooling capacity of between 2 kW and 12 kW at the standard rating conditions for ambient air temperature of 32°C and a cellar air temperature of 10°C.
- **Either** be a single packaged unit, **or** consist of two or three factory-built sub-assemblies that are designed to be connected together during installation.
- Conform with the requirements of EU Pressure Equipment Directive PED 97/23/EC.

Performance Criteria

Products must have a coefficient of performance (COP) equal to or greater than the figures shown in Table 1 below.

Table 1. Performance thresholds for cellar cooling equipment

Cooling capacity	COP
Less than 8 kW	>= 2.90
8 kW and over	>= 3.20

">=" means "greater than or equal to"

Where COP = net cooling capacity (kW) / effective power input (kW).

For the avoidance of doubt test data should be presented to 2 decimal places. As an example a COP of less than 2.90 for a unit of less than 8 kW would be deemed to be a fail.

Required test procedures
Testing must be carried out in accordance with BSI Publicly Available Specification PAS 57. In the case of self-certified test data, applicants must submit evidence of how the quality of their test data is independently verified or cross-checked.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Commercial Service Cabinets

Date added to ETL August 2003. (Revised August 2004, August 2007)

1. Definition of Technology

Commercial service cabinets are products that are specifically designed to store, but not to display, chilled and frozen foodstuffs.

2. Technology Description

Commercial service cabinets are widely used in the catering industry to store frozen or chilled foodstuffs and a range of different designs are available. In all cases access to the contents is gained by opening a door, lid or drawer.

The Enhanced Capital Allowance scheme aims to encourage the purchase of energy efficient commercial service cabinets. These can typically offer energy savings of 10-20% when compared to commercial service cabinets of average efficiency.

Investments in commercial service cabinets can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be designed to store chilled or frozen foodstuffs, whilst maintaining them within prescribed temperature limits.
- Be fitted with solid-faced lids, drawers or doors that:
    a) Are normally kept closed, but can be opened to access the contents;
    b) Obscure the contents of the cabinet from view when closed;
    c) Enable users to access the contents of any part of the interior without stepping into the refrigerated space.
- Be a 'plug in' type cabinet with an integral refrigeration system (i.e. incorporating a compressor and condensing unit).
- Have a gross internal volume equal to that specified in Table 1; where the gross internal volume is defined as the volume within the inside walls of the cabinet without internal fittings and with all doors (and drawers) closed.
- Be CE marked.

Performance criteria

Products must have an Energy Efficiency Index (EEI) that is less than, or equal to, the thresholds set out in Table 1 below, which depend on the type of cabinet.

Table 1. EEI performance thresholds for commercial service cabinets.

		Energy efficiency index performance threshold (kWh/48hrs/m^3)	
Type	Gross internal volume (litres)	Chilled (M1)	Frozen (L1)
Single door	400 and 600 (+/-15%)	EEI <= 16.0	EEI <= 38.0
Double door	1,300 (+/-15%)	EEI <= 12.0	EEI <= 34.0
Under counter and counter cabinets with solid doors or drawers	150 to 800 (+/-15%)	EEI <= 21.6	EEI <= 40.0

"<=" means "less than or equal to"

For the avoidance of doubt test data should be presented to 1 decimal place. As an example, an energy efficiency index of greater than 38.0 for a Frozen-Single Door commercial service cabinet would be deemed to be a fail.

Where the EEI (Energy Efficiency Index) is defined as the Total Electrical Energy Consumption (in kWh) of the product over a 48 hour test period, and:

- V = net volume (m^3), which equals: shelf (or drawer base) area x loading height
- Total Electrical Energy Consumption is as defined in EN441-9:1996.

Required test procedures

All cabinets must be tested in a test room conforming to BS EN441:1995/1996.
All cabinets must conform to the following temperature classifications (as defined in BS EN 441-6 1995) when tested to EN441:1995/1996 in climate class IV (30°C, 55% RH):

- For chilled cabinets: M1 (all measurement packs must be between –1 and 5°C).
- For frozen cabinets: L1 (the highest temperature of the warmest measurement pack must be less than or equal to –15°C and the lowest temperature of the warmest measurement pack must be less than or equal to –18°C).

All cabinets must be tested according to the requirements for closed refrigerated cabinets contained in EN441:1995/1996 with the following test conditions:

- **Loading:** as described in EN441-5:1996. Cabinets with shelves, to be fitted with a minimum of 1 shelf per 300 mm of open height at equal distances apart. For upright units this equates to a minimum of 4 shelves and for under counter units to a minimum of 2 shelves. The lowest height shelf should be located at the lowest available height fitting.
- **Temperature test:** as described in EN441-5:1996, specifically section 3.6.
- **Energy consumption/DEC (Direct Energy Consumption):** as described in section EN441-9:1996 for cabinets fitted with integral condensing unit.

Where applications are being made for two or more cabinet models that are variants of the same basic design, test data may be submitted for a single 'representative model'. The rules in table 2 must be used to select the representative model that should be performance tested.

Table 2. Rules for selecting the representative model for performance testing.

Variation between models	Selection rule
Cosmetic differences to the exterior	Any model may be selected to be the representative model.
Heaters (door, trim etc.), fans, defrosts, lighting and other accessories	The model with the greatest energy consumption must be the representative model.
Cabinets with the same refrigeration system components but different refrigerants	The model with the greatest energy consumption must be the representative model.
Two or more of the above variations	The rules set out above must be combined when selecting the representative model.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the ETPL then other products linked with that representative model may be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested; then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Curtains, Blinds, Sliding Doors and Covers for Refrigerated Display Cabinets

1. Technology Description

Curtains, blinds, sliding doors and covers are fitted to retail display cabinets to reduce infiltration of ambient air into the cabinets. Energy savings of 40-75% of the pre-installation energy consumed are possible.

Investments in strip curtains, blinds, sliding doors and transparent chest freezer covers for refrigerated display cabinets can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Strip curtains, blinds, sliding doors and transparent chest freezer covers for refrigerated display cabinets:

- **Strip curtains** are transparent overlapping strips that are permanently fitted to open cabinets. They significantly reduce the ingress of warm air into the cabinet, and thus reduce the heat load on the cabinet.

- **Night blinds** are roller type blinds that cover the cabinet open area to significantly reduce the ingress of warm air during shop closure.

- **Transparent chest freezer covers**, known as 'bubble lids', are rigid plastic covers that fit over the top of the freezer. They are usually domed, and have access holes so that product can be removed without removing the cover.

- **Transparent sliding doors** are glass doors which are permanently fitted to open type chest cabinets, open fronted multi deck cabinets and combination cabinets for chilled and frozen food. They significantly reduce the ingress of warm air into the cabinet and also use specially coated glass to reduce heat gains from radiated heat.

Night blinds must fit accurately with a minimum gap between the blinds and no gap at the sides to give maximum benefit. Strip curtains must fit correctly to prevent ingress of warm air, and to prevent formation of condensation on the curtains that then forms pools on the floor below the cabinet.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Evaporative Condensers

1. Technology Description

A condenser is used in a refrigeration or air conditioning system to condense refrigerant gas discharged by the compressor. During the condensing process heat is rejected from the refrigerant. The condenser can be cooled by

- ambient air - an air cooled condenser;

- water - a water cooled condenser, usually using water from a cooling tower;

- both air and water - an evaporative condenser.

Investments in evaporative condensers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Evaporative condensers, i.e. cooled by both air and water, that operate in the manner described here can qualify for ECAs. In an evaporative condenser, refrigerant gas is circulated through a condensing coil. The outside of the coil is continually wetted by a recirculating water system. Air is simultaneously blown over the coil, causing a small proportion of the re-circulated water to evaporate. This evaporation removes heat from the refrigerant, allowing it to condense.

Evaporative condensers are available from about 40 kW to 7000 kW heat rejection (at a rating condition of 40°C condensing temperature and 25°C wet bulb ambient temperature). The most commonly used are in the range 400 kW to 3,500 kW. They are used on large commercial and industrial applications, e.g. food processing, large cold stores, chemical plants, large central air conditioning systems.

Manufacturers need to submit a detailed specification of their product as evidence of its ability to save energy in the manner described above.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Forced Air Pre-Coolers

Date added to ETL 2003.

1. Definition of Technology

Forced air pre-coolers are products that are specifically designed to cool water or process liquid by means of a heat exchanger, over which air is forced by a fan, prior to transfer to a refrigeration system.

2. Technology Description

A forced air pre-cooler is normally a finned tube heat exchanger through which water or other process liquid is passed and over the fins of which air is forced by a fan. This air is used to pre-cool the water, or other process liquid, prior to its transfer to a refrigeration system. The result of the action of the pre-cooler is to reduce load on the refrigeration system. The maximum cooling capacity of the equipment will vary with the ambient air temperature and the inlet fluid temperature.

The ECA scheme covers all forced air pre-coolers that are free standing and incorporate a by-pass mechanism that automatically redirects the water/fluid around the pre-cooler and turns off the cooling fan when ambient air temperature is higher than water/fluid inlet temperature.

Forced air pre-coolers that are sold as an integrated part of a mechanical chiller are not included in this category, but are covered by the 'Packaged Chillers' sub-technology of the ETL.

Investments in forced air pre-coolers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate a heat exchanger and a fan which forces air over the heat exchanger;
- Incorporate a heat exchanger designed to cool air/process liquid;
- Incorporate a series of control valves (or "by-pass mechanism") that re-direct the water around the pre-cooler in response to a control signal;

- Incorporate a controller that operates the by-pass mechanism and controls the fan at times when the ambient air temperature is higher than the water/process liquid inlet temperature;
- Conform with the requirements of the EU Pressure Equipment Directive 97/23/EC.

Performance criteria
The manufacturer must demonstrate that:

- The forced air pre-cooler is able to cool water/ process liquid more efficiently than would be the case if the water/ process liquid was cooled in a reasonably efficient refrigeration unit (COP ≥ 2.9).
- The controller correctly operates the by-pass mechanism and turns off the fan when the ambient air temperature is equal to or higher than the water/process liquid temperature.

This performance should be demonstrated by calculating the variation in product cooling capacity with ambient temperature and inlet water/process liquid temperature, and this calculation must take account of the electricity used by the fan and controller. The performance of the heat exchanger must be assessed using the test procedures below.

Required test procedures
The performance of the product's heat exchanger must be assessed in accordance with the procedures set out in EN 305:1997 and EN 306:1997.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Liquid Pressure Amplification

1. Technology Description

All Liquid Pressure Amplification for refrigeration or air conditioning systems that fit the description below will qualify for support under the ECA scheme.

Investments in liquid pressure amplification can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

With LPA operating, as the ambient temperature drops, the condensing pressure is allowed to fall because the pressure of the refrigerant entering the LPA pump is amplified without raising the refrigerant temperature. Thus the refrigerant reaching the expansion device is still in a sub-cooled liquid state. Since the condensing pressure is allowed to float with ambient temperature, so the power requirement of the compressor reduces as the condensing pressure falls.

The LPA system comprises a liquid pump and controller. The pump is located at the outlet of the condenser or receiver and so increases the pressure of the liquid refrigerant at the beginning of the liquid line. The liquid pump is electrically driven, but uses significantly less power to increase the liquid pressure than the compressor would use to achieve the same pressure.

LPA can be used on all direct expansion systems that would normally operate with a fixed head pressure. It can also cure problems related to liquid flashing caused by excessive pressure drops in the liquid line. LPA devices can be fitted to new or existing systems.

The cost-effectiveness for LPA systems is greatest when:

- the refrigeration system operates 24 hours per day and absorbs at least 20 kW of compressor power;
- an air conditioning systems that operates during the hours of building occupancy and which absorbs at least 40 kW of compressor power.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Packaged Chillers

Revised August 2004

1. Technology Description

There are some 30,000 to 40,000 packaged chillers in use in the UK, used in large "central" air conditioning systems and for industrial process cooling, delivering chilled water or other process fluid.

Investments in packaged chillers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

A packaged chiller is defined as

> *"A factory assembled unit, designed to cool liquid, using a compressor(s), an evaporator and built-in or remote condenser and appropriate controls."*

Types and sizes of chiller included

Chillers included are those for use in air conditioning and for refrigeration, which includes process cooling. Cooling only or reverse cycle machines with both heating and cooling modes. Any type of compressor may be used, but only electrically driven chillers are included. Chillers may be either air or water cooled with remote or onboard condenser.

The capacity ranges covered are:

- Air conditioning and process cooling up to 3.5 MW
- Medium temperature brine up to 300 kW

The specific classes of chiller included in this category are listed in table 1 in the *Performance thresholds for eligibility* section below.

Performance testing and data presentation requirements

The test standards to be used for testing packaged chillers are:

- Cooling capacity - pr EN 12055
- Heating capacity - EN 255

Rating conditions for capacity tests are shown in table 2.

The objective is to compare efficiency or energy per unit of useful function for the user and the measures used are:

- Cooling - EER (energy efficiency ratio)
- *EER = net cooling capacity (kW) / effective power input (kW) in cooling mode.*
- Heating - COP (coefficient of performance)
- *COP = net heating capacity (kW) / effective power input (kW) in reverse cycle heating* mode.

Required Evidence of Compliance

The onus is on the manufacturer or supplier to prove that their product meets the Criteria.

1. Applications must include submission of all data as required on the application form and generated in accordance with this specification.
2. Applications must include submission of all data as required on the application form and generated in accordance with this specification.
3. Applications must enclose the appropriate test report for each chiller prepared in accordance with prEN12055 and/or EN 255. In the case of self-certified data, applicants must submit evidence of how the quality of their data is independently verified or cross checked.
4. The manufacturer or supplier must show that the products are subject to adequate quality assurance procedures to ensure consistency of performance between one production item and any other.
5. The performance data supporting any product's application shall be reasonably up to date. Once a product is on the Energy Technology List, the Carbon Trust reserve the right to require a refresh of old or obsolete data.

Performance thresholds for eligibility

Separate performance thresholds are set for each type of chiller. Reverse cycle heat pumps must meet the threshold value for both EER and COP.

Table 1. Performance thresholds for packaged chillers

Size range	Chiller type	Performance threshold	
		Cooling EER	Heating COP
Up to 100 kW	Air cooled package, cooling only	>=2.50	
	Air cooled package, reverse cycle	>=2.50	>=2.68
	Water cooled package, reverse cycle	>=3.30	>=3.40
	Water cooled package, cooling only	>=3.78	

	Remote condenser, cooling only	>=3.32	
	Water cooled package, medium temperature brine	>=3.78	>=4.04
101 to 500 kW	Air cooled package, cooling only	>=2.50	
	Water cooled package, reverse cycle	>=3.60	>=3.75
	Water cooled package, cooling only	>=3.78	
	Remote condenser, cooling only	>=3.32	
501 to 750 kW	Air cooled package, cooling only	>=2.60	
	Remote condenser, cooling only	>=3.45	
	Water cooled package, cooling only	>=4.11	
751 kW to 3.5MW	Air cooled package, cooling only	>=2.72	
	Water cooled package, cooling only	>=4.92	
	Water cooled package, reverse cycle	>=4.04	>=3.68

">=" means "greater than or equal to"

For the avoidance of doubt test data should be presented to 2 decimal places. As an example a COP of less than 2.50 for an air cooled package, cooling only unit of up to 100 kW would be deemed to be a fail.

All air cooled, cooling only packaged chillers fitted with an integral forced (ambient) air pre-cooler rated at 50% or greater of the total mechanical refrigeration cooling capacity of the unit are eligible. Full details of EER improvement to be submitted.

Table 2. Rating conditions for capacity testing of packaged chillers

		Temperatures °C			
		Cooling		Heating	
Application	**Heat Rejection**	**Evaporator**	**Condenser**	**Evaporator**	**Condenser**
Air Conditioning	Air Cooled Air/Water	12/7	35	40/45	7(6)
	Water Cooled Water/Water	12/7	30/35	40/45	10/*
	Remote Condenser Without “flash economiser”	12/7	45/40	-	-
	Remote Condenser “with flash economiser”	12/7	45	-	-
Medium Brine	Air Cooled Air/Water	0/-5	35	40/45	7(6)
	Water Cooled Brine/Brine or Brine/Water	0/-5	30/35	40/45	10
	Remote Condenser Without “flash economiser”	0/-5	45-40	-	-
	Remote Condenser with “flash economiser”	0/-5	45	-	-
Low Brine	Air Cooled Air/Water	-10/-15	35	40/45	7

	Water Cooled Brine/Brine or Brine/Water	-10/-15	30/35	40/45	10
	Remote Condenser without "flash economiser"	-10/-15	45/40	-	-
	Remote Condenser "with flash economiser"	-10/-15	45	-	-

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Refrigeration Compressors

(Revised August 2004)

1. Technology Description

A refrigeration compressor at the heart of every refrigeration system, from small fridge to multi-MegaWatt brewery cooling systems. They have many types and sizes, but similar working principles and similar test methods for all but the largest.

Essentially, a compressor is a mechanical pump that compresses gaseous refrigerant as part of the standard "vapour-compression" refrigeration cycle. The majority are sold as part of a larger system, but a significant number of the larger models are bought as components. Total energy consumption is dependent upon many factors in the system, but a 1% more efficient compressor will generally result in a 1% more efficient system.

Investments in hermetic & semi-hermetic refrigerated compressors can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

2. Eligibility Criteria

Sizes & types of compressor to be included

1. This category includes positive displacement hermetic and semi-hermetic compressors. This includes reciprocating, scroll & screw compressors.
2. The category is open to compressors of displacements above 9 cubic metres per hour.
3. The products are categorised as either high (H), medium (M) or low (L) temperature, as defined in EN12900 *Refrigerant compressors – Rating conditions, tolerances and presentation of manufacturer's performance data.*
4. Compressors sold as a set with economiser are also included ("economiser packages", see below), but listed separately to non-economised compressors on the Energy Technology List.
5. Only "new and unused" products may qualify, due to UK tax law. Rebuilds cannot qualify.

Note: Large industrial compressors have a drive shaft driven by an external motor, described as 'open' type compressors. These have different characteristics and are excluded from this category.

Definition of a refrigeration compressor

For the purposes of the Energy Technology List, a refrigeration compressor is defined as: "a machine which raises the pressure, temperature and energy level of a refrigerant vapour".

Definition of an Economiser Package

This category is also open to economiser packages, defined as:

> *"A package supplied, or specified, by the compressor manufacturer consisting of compressor, heat exchanger and controller, for which the manufacturer has provided performance data."*

Economiser packages are subject to exactly the same test and data presentation requirements. The model number of an economiser package must clearly distinguish it from any non-economised similar product. Economiser packages are separately listed from non-economised compressors on the Energy Technology List.

Compressor / Economiser Package with Refrigerant combination

1. Eligibility is assessed for a compressor/economiser package combined with a specific stated refrigerant, for its performance at a particular temperature rating point (see also "Rating Points for Performance Data" below). A compressor / economiser package may appear on the List more than once, with different refrigerants.

2. The product/refrigerant and temperature range combinations for which performance thresholds have been set are as follows:

   - High temperature with R407C
   - Medium Temperature with R404A
   - Low Temperature with R404A

Performance testing and data presentation standards

The Coefficient of Performance (COP) is the measure of energy efficiency used to assess eligibility for the Energy Technology List, as defined in EN12900.

1. Test data generated in accordance with the following standards may be submitted:

   » EN13771-1 *Performance testing and test methods – Refrigerant compressors*

   » ASHRAE standard 23 *Methods of testing for rating positive displacement refrigerant compressors and condensing units*

2. Data shall be presented according to EN12900 *Refrigerant compressors – Rating conditions, tolerances and presentation of manufacturer's performance data.*

Note: EN12900: 1999 is due to be superseded by prEN12900 during 2004/05. Data prepared to either standard will be acceptable until August 2005, at which point updated criteria may be issued. One possible outcome is that products for which supporting data is prepared to EN12900: 1999 may be removed from the List unless updated data is submitted. This will be kept under review.

Refrigerant Thermodynamic Properties

Refrigerant properties used as the basis for compressor performance analysis are to be as defined in the US National Institute of Standards & Technology (NIST) Standard Reference Database 23

Thermodynamic and Transport Properties of Refrigerants and Refrigerant Mixtures Database: Version 6.0 or later. See http://fluidproperties.nist.gov/ or http://www.nist.gov/

Contact details: Standard Reference Data Program, National Institute of Standards and Technology, 100 Bureau Dr., Stop 2310, Gaithersburg, MD 20899-2310, USA (301) 975-2008 (VOICE)(301) 926-0416 (FAX), srdata@nist.gov

Alternatively, the ASERCOM properties database may be used as defined in the ASERCOM Certification scheme, which is based closely on the NIST database (see http://www.asercom.org/)

Rating points for performance data

1. As the qualifying compressors are for use in the UK, they are required to meet the stated COP values as measured at conditions representing typical UK conditions. Hence capacity and COP data shall be submitted for the rating points given in the table below.

2. Capacity and COP data is also required for the EN12900 rating points for the purposes of data verification.

3. Data for Medium and Low temperature ranges must be derived from physical testing at Suction Gas Temperature of 20°C.

4. Data for Suction Gas Temperature 20°C may be obtained by "thermodynamic translation" of data physically tested at 10K for the High temperature category only.

	Evaporating	Condensing	SGT	Sub-cooling
Low temp	-35°C	25°C	20°C	0 K
Medium temp	-10°C	30°C	20°C	0 K
High temp	+5°C	35°C	20°C	0 K

Note: SGT = Suction Gas Temperature

Required Evidence of Compliance

a. The onus is on the manufacturer or supplier to prove that their product meets the Criteria.

b. Applications must include submission of all data as required on the on-line application form and generated in accordance with these criteria.

c. Applications must enclose a test report. If the test report is **not** from an independent body, the applicant must submit evidence that a representative sample of the data for all their products is independently verified or cross-checked.

d. The manufacturer or supplier must provide evidence that the products are subject to adequate quality assurance procedures to ensure consistency of performance between one production item and any other. (For example, a copy of the relevant parts of the applicant's Quality Manual and a copy of the ISO 9000 series certificate).

e. The data supporting any product's application shall be reasonably up to date. Once a product is on the Energy Technology List, the Carbon Trust reserve the right to require refresh of old or obsolete data.

f. The data submitted for the Energy Technology List must be the same as that published in the manufacturer's technical data.

Performance thresholds for eligibility

The COP of the compressor or economiser package at the stated conditions must exceed the values in the table below:

High temperature with R407C	>4.74
Medium Temperature with R404A	>3.22
Low Temperature with R404A	>1.83

">" means "greater than "

For the avoidance of doubt test data should be presented to 2 decimal places. As an example a COP of less than 4.75 for a high temperature unit with R407C would be deemed to be a fail.

3.Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Refrigeration System Controls

1. Technology Description

Refrigeration controls currently covered under the ECA Scheme are:

- System manager controls with optimisation and energy log

  Computer based systems that act as the central intelligent control and monitoring unit, integrating all the peripheral control devices in a refrigeration installation, in order to optimise system performance and monitor energy consumption.

- Anti condensation heater controls

  Controls that save energy by minimising the operation of anti condensation heaters.

Investments in refrigeration controls can only qualify for ECAs if the refrigeration control is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the qualifying criteria as set out below.

2. Eligibility Criteria

System manager controls with optimisation and energy log

Eligible products are computer based systems that act as the central intelligent control and monitoring unit, integrating all the peripheral control devices in a refrigeration installation, such as the compressor pack/compressor, evaporator(s) and condenser(s). In addition, to be listed on the Energy Technology Product List, products must have the following functions:

- System suction and condensing temperature optimisation so as to minimise the temperature lift, taking advantage of ambient temperature and system load fluctuations.

- Refrigeration system energy input (kWh) monitoring and data logging, including (i) software for comparison of predicted against actual power consumption with adjustment for ambient temperature conditions and (ii) alarm indication when power consumption exceeds a predetermined value so as to initiate remedial action.

Anti condensation heater controls

Eligible products are anti condensation heater controls that monitor the store humidity and control the door heater function accordingly, minimising energy consumption by switching the heaters off when not required. These controls consist of a central unit, RH sensor and a number of cabinet switching devices.

3. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Refrigerated Display Cabinets

Date added to ETL August 2004.

1. Definition of Technology

Refrigerated display cabinets are products that are specifically designed to store and display chilled and/or frozen foodstuffs.

2. Technology Description

Refrigerated display cabinets are used to maintain foodstuffs and drinks at chilled and frozen temperatures. There are many different designs of refrigerated display cabinets, but all enable the customer to view the foodstuff stored in the cabinet; either through an opening in the cabinet, or through a transparent door or lid.

The Enhanced Capital Allowance scheme aims to encourage the purchase of energy efficient refrigerated display cabinets. These can typically offer substantial energy savings (of up to 60%) when compared to refrigerated display cabinets of average efficiency.
The categories of refrigerated display cabinets covered are:

- 'Plug in' cabinets with integral refrigeration systems (i.e. incorporating a compressor and condensing unit);
- 'Remote' cabinets that are designed to work with a non-integral refrigeration system (i.e. where the compressor and condenser, or all or parts of the refrigeration system are located at a different location from the cabinet).

Investments in refrigerated display cabinets can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be designed to display chilled and/or frozen foodstuffs, whilst maintaining them within prescribed temperature limits;
- Conform to one of the temperature classifications in Table 1 when tested to BS EN ISO 23953-2:2005 in climate class III (25°C, 60% RH);
- Be classified in accordance with the precise 5 digit classification system set out in Annex A of EN ISO 23953-1:2005;
- Be subject to quality assurance procedures that ensure consistency of performance between one production item and any other;
- Be CE marked.

Table 1. Classification according to temperature.

Class	The highest temperature $_{ah}$ of the warmest M-package equal to or lower than °C	The lowest temperature $_{b}$ of the coldest M-package equal to or higher than °C	The lowest temperature $_{al}$ of the warmest M-package equal to or lower than °C
L1	-15	-	-18
L3	-12	-	-15
M0*	+4	-1	-
M1	+5	-1	-
M2	+7	-1	-
H1	+10	+1	-
H2	+10	-1	-

*****Note: All classes are as described in BS EN ISO 23953-2:2005, except M0, which is based upon recommendations from the British Refrigeration Association

Performance criteria
Products must have an Energy Efficiency Index (EEI) that is less than, or equal to, the threshold shown in Table 2 for the relevant temperature class and type of cabinet.

Table 2. EEI performance thresholds for integral and remote cabinets.

Classification according to temperature	**EEI performance threshold (kWh/day/m^2)**	
	Integral Type	Remote Type
M0	<=12.50	<=11.75
M1	<=11.95	<=11.45
M2	<=10.55	<=10.85
H1	n/a	<=8.00
H2	<=9.20	<=9.20
L1	<=19.10	<=23.50

L3	n/a	<=21.00

"<=" means "less than or equal to"

Where the Energy Efficiency Index (EEI) is defined as the ratio of the product's Total Energy Consumption (TEC) to Total Display Area (TDA) i.e. EEI = TEC/TDA, and:

- TEC is calculated according to BS EN ISO 23953-2:2005 section 5.3.6.3.4
- TDA is calculated according to BS EN ISO 23953-2:2005 Annex A.

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a remote type M0 cabinet with an EEI performance threshold of 11.76 would be deemed to be a fail.

Required test procedures

All cabinets must be tested in a test room conforming to BS EN ISO 23953-2:2005.
During testing the cabinet shall comply with the conditions defined in BS EN ISO 23953-2:2005 with the following specifications:

- Section 5.3.2.7 – Lighting and night covers – section (b). Test data must not include tests with night blinds.
- Section 5.3.6 - Heat extraction rate measurement when condensing unit is remote from cabinet shall be calculated according to section 5.3.6.3.1, section (b) and 5.3.6.3.2 method $Ø_{run75}$.

The test report must be prepared in accordance with specification in BS EN ISO 23953-2:2005, and accompanied by a signed statement that explains how the quality of the performance data has been independently verified or cross checked.

Where applications are being made for two or more cabinet models that are variants of the same basic design, test data may be submitted for a single 'representative model'. The rules in Table 3 must be used to select the representative model that should be performance tested.

Table 3. Rules for selecting the representative model for performance testing.

Variation between models	Selection rule
Cosmetic differences to the exterior	Any model may be selected to be the representative model.
Heaters (door, trim etc.), fans, defrosts, lighting and other accessories	The model with the greatest energy consumption must be the representative model
Temperature level	The model with the lowest temperature setting must be the representative model
Length	The representative model must be either 2.44 or 2.5 metres in length. This length of model can only be used to represent models between 1.8 m and 3.75m in length; and separate data must be submitted for each model outside of these limits.
Shelves	The model with the lowest number of shelves must be the representative model.
Shelf angle	The model with the highest shelf angle (taken from horizontal) must be the representative model
Front-opening height (throat):	The model with the largest front-opening height

	(throat) must be the representative model
Lighting	The model with the greatest lighting energy consumption must be the representative model
Two or more of the above variations	The rules set out above must be combined when selecting the representative model

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the ETPL then other products linked with that representative model may be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested; then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.

Solar Thermal Systems

Date added to ETL September 2002, updated 2007.

1. Definition of Technology

Solar thermal systems are products that are specifically designed to capture solar energy and convert it to useful heat for water heating applications.

2. Technology Description

Solar thermal systems are an energy saving product that reduces the amount of fossil fuel consumed by conventional water heating plant. They are built around a solar collector that has a dark coloured absorbing surface, which traps solar radiation and converts in into heat. This heat is then transferred to a storage vessel by means of a circulating fluid, or in some instances, the solar collector could be directly connected into the heating circuit.

A solar thermal system either may be assembled by an installer using standard components from different suppliers, or a complete system may be purchased in kit form direct from a single manufacturer. To cover these options, the Energy Technology Product List (ETPL) includes individual solar collectors, as well as packaged products.

Investments in solar thermal systems can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must either:

- Use collectors that comply with the requirements of BS EN 12975-1:2006 “Thermal solar systems and components. Solar collectors. General requirements”; or

- Be sold as a complete, ready to install, solar thermal system with a fixed configuration that complies with the requirements of BS EN 12976-1:2006 “Thermal solar systems and components. Factory made systems. General requirements”.

Eligible products may include the following components:

- One or more solar collectors;
- One or more appropriately sized storage vessels (where required);
- The pipework and valves forming the connection loop between the solar collector(s) and storage vessel(s), including any non-return valves, control valves, pressure relief valves, air bleed valves etc, as required for the effective operation of the product;
- Circulation pumps (where required);
- Any controls or sensors (and their associated power supplies) needed to:
    1. Stop circulation when the yield is low;
    2. Ensure compliance with Health & Safety Executive (HSE) requirements;
    3. Operate a drain down or a frost protection strategy (where required).

Exclusions

The following items shall not be considered to be part of the product unless they are required to deliver the functionality outlined above:

- The pipework from the storage vessel(s) to the point of use.
- Any auxiliary tanks used to provide back-up heating to the solar thermal system.
- Any cold water tanks and associated pipework used to replace the water being consumed at the point of use.
- Any re-enforcement to roof or structure required to mount the solar thermal system.

Performance criteria

The solar collector within the product must:

- Pass the reliability tests detailed in BS EN 12975-2:2006 “Thermal Solar Systems and Components – Solar Collectors – Part 2 test methods”;
- Achieve a minimum instantaneous efficiency of 50% for operating conditions of T*m = 0.05 (i.e. ambient temperature of 20°C, collector temperature 60°C and solar radiation 800W/m2), where T*m is as defined in BS EN 12975-2:2006.

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in the standards specified in the performance criteria above.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from HMRC.