A-Z Guide

Energy Saving and Renewable in the Built Environment

Your Guide to Carbon Jargon!

HFL Energy Solutions

Introduction

Building a ‘low to no carbon’ world is no easy job. It’s a challenging and dynamic process that requires innovation, energy and resources. But whether you’re a client, contractor or homeowner, there can be considerable financial opportunities, in addition to reducing carbon dioxide emissions to the global environment.

A

Air-source heat pumps

Small to medium-sized units that extract low grade heat (i.e. not that warm) from the outside air and convert it into useful heating inside a building or, in reverse, useful cooling in summer. These pumps can run on electricity, so there is no need for a gas connection or fuel storage.

Air sourced heat pumps tend to look like air conditioning units, and they have a lot in common. Planning permission is sometimes needed because of low level noise. (See heat pumps).

Alternative energy

An alternative to fossil fuel combustion - such as energy from wind, photovoltaics or hydroelectricity. ‘Alternative energy’ is often used interchangeably with ’renewable energy’ but they are not exactly the same. Some technologies that are not based on renewable energy - notably nuclear power - are sometimes referred to as alternative energy.

Asset rating

An energy efficiency rating given to new buildings, based on theoretical (which may not be the actual) energy use.

Audit

An audit is an objective (sometimes independent) check on whether something is happening as planned. An audit can check virtually anything, but done properly, it answers the question “how are we (or you) doing?”. What matters most with an audit is what is done about the findings.

B

Benchmarking

Comparing performance with (comparable) others, either within or outside the organisation. Helps to assess where an organisation (or part of it) stands, in terms of good or best practice.

BREEAM

The Building Research Establishment Environmental Assessment Method (BREEAM) is an important way of assessing and describing the environmental performance of buildings. It sets standards for sustainable design and build. BREEAM assesses buildings against various criteria, including but not exclusively, energy and ‘innovation’. Based on these criteria, BREEAM provides an overall rating that falls within a band of ‘pass, good, very good, excellent or outstanding’.

BS EN 16001

BS EN 16001 is an international energy management systems Standard. It is potentially useful to a range of organisations, notably those covered by the CRC Energy Efficiency Scheme. Although it emphasises energy management issues, it is similar in approach to ISO 14001, which deals with broader environmental management issues, which can also include energy.

Building Emission Rate (BER)

The Building Emission Rate from a building in operation is compared to the Target Emission Rate (TER), to assess the level of compliance with the Building Regulations.

Building services contractors

Building services contractors, notably those familiar with electrical and related design and installation, can help to assess the feasibility and scope of energy saving and carbon reduction options. They can provide ‘whole building’ or ‘integrated’ approaches to the design, installation and successful commissioning of electrical, mechanical and other building services.

C

Carbon cap

A limit on carbon emissions set on a Government, organisation or individual under a carbon emissions trading scheme.

Carbon credit

A credit (or permit) arising from a greenhouse gas reduction scheme, such as carbon emissions trading.

Carbon dioxide CO2

The most common man-made greenhouse gas by a country mile, most notably produced when burning fossil fuel for energy. Burning fossil fuel releases ‘extra’ carbon to the air that had been previously locked in geological deposits. CO2 is also produced by burning non-fossil fuels such as wood, but the growth of plant-based materials removes the equivalent carbon from the air, rather than from geological storage.

Carbon dioxide equivalent

Carbon dioxide equivalent (CO2 e) converts the masses of various greenhouse gases to a mass of CO2 that gives the same global warming potential (GWP) – generally over a 100 year timeframe. For example, the CO2-e of methane is 25 times more than carbon dioxide.

Carbon footprint

The total amount of greenhouse gases (misleadingly, not just carbon dioxide) emitted directly or indirectly due to various activities (i.e. ‘doing business’). It is typically expressed in equivalent tonnes of either carbon or carbon dioxide – though it is essential to say which, and to compare like with like.

Carbon neutral

When applied to a building, this means running the building without net carbon emissions. The usual route to this is a combination of energy efficiency and renewable energy, but can also include offsetting the carbon emissions, for example, through tree planting schemes. (See also zero carbon).

CARBON

In the context of climate change, ‘carbon’ has become shorthand for carbon dioxide (CO2) - the now infamous ‘greenhouse gas’. The carbon-related terms below illustrate how vitally important carbon has become to the wider sustainability agenda...

Carbon offset

A reduction in emissions of carbon or other greenhouse gases that compensates for ('offsets') a greenhouse gas emission somewhere else. A tonne of carbon emitted elsewhere has the same climate change impact as a tonne of carbon emitted nearer home. However, some carbon reduction measures are cheaper than others, which can make offsetting seem sensible. A common offset is paying towards the generation of renewable energy, but it can include other measures such as managed forestry or burning methane from landfills.

Carbon reduction

Reducing the demand for energy obtained from burning fossil fuels (such as coal and gas at power stations).

Carbon Reduction Commitment (CRC) Energy Efficiency Scheme

Views on the CRC Energy Efficiency Scheme include "expensive and complicated" and "important and innovative". Either way, the CRC aims to reduce commercial and public sector carbon emissions by modifying the behaviour of organisations that use at least 6,000-megawatt hours of electricity per annum. These organisations must buy carbon emission allowances at £12/tonne from 2012. Back in October 2010, the coalition Government announced that the money raised from selling carbon allowances will go to the Treasury, adding around 8% to commercial energy bills from 2012 – as long as the Government doesn't change the rules again.

Carbon trading

Carbon trading allows the buying and selling of carbon emission allowances. Organisations that reduce carbon below their allowance can sell the difference to others who want to buy them. To reduce overall carbon emissions, the total amount of allowances is reduced over time, to raise the price of carbon and encourage carbon reduction. The EU Emission Trading Scheme covers various greenhouse gases and puts limits on total emissions.

Carbon Trust

The Carbon Trust is a not-for profit UK company that encourages and promotes low carbon technologies and other carbon reduction measures by business and the public sector. It also provides funding to support technological innovation and other carbon reduction measures.

Certification

Process of third party assessment to see if an organisation or product meets a specified (energy) standard, e.g. certification of an organisation's energy management system to ISO 16001.

Certification body

An organisation that offers third party certification of a management system. UK accreditation of these organisations is normally carried out by UKAS. So, for example, companies are not "accredited" to ISO 16001 - they are "certificated".

Climate change

This is usually taken to mean 'anthropogenic' climate change (i.e. climate change caused by human activity), such as burning fossil fuels and land use that 'unlocks' ground-stored carbon.

Climate Change Act

Amongst other things, the Climate Change Act 2008 sets a UK target for 2050 for the reduction of targeted greenhouse gas emissions by 80% from a 1990 baseline, with an interim 34% reduction by 2020. It's a tough challenge and getting tougher all the time. The Act also paved the way for the CCC (see later) and the CRC Energy Efficiency Scheme.

Climate Change Levy

The Climate Change Levy is a tax on the commercial supply of energy for lighting, heating and power. Those paying the levy include industry, commerce, and public Administration, though some get big discounts. In 2011 it was:

- electricity = 0.485 pence per kilowatt hour
- gas supplied by a gas utility = 0.169 pence per kilowatt hour
- petroleum gases = 1.083 pence per kilogram

For electricity, the CCL adds around 5% to commercial energy bills

Code for Sustainable Homes

This is a voluntary Code that assesses a new home against categories of sustainable design, rating the 'whole home' as a complete package. It uses a 1 to 6 star rating system to communicate overall sustainability performance. Code 6 is effectively a 'zero carbon' home. The Code also gives buyers information about the environmental impact of a new home and its potential energy costs. (See Zero Carbon Building).

Committee on Climate Change (CCC)

The CCC is an independent body, established under the Climate Change Act 2008 to advise the UK Government on progress or otherwise with its ongoing carbon budgets, and to report to Parliament on how well the UK is meeting the greenhouse gas reduction targets.

Coefficient of Performance (CoP)

The CoP is a ratio of the heating or cooling provided by a system to the energy consumed by the system. The most energy efficient systems have a relatively high CoP (basic electrical heating has a CoP of one).

Combined heat and power (CHP)

Technology that produces electricity from the combustion of fuel and allows the heat to be utilised e.g. to heat buildings or for hot water. CHP can use fossil fuels such as gas but also fuels from renewable sources e.g. woodchip and organic waste. The heat is supplied to premises or used in industrial processes. CHP plants are not suitable for all buildings but when they are, they can be over 90 per cent efficient (compared to power stations that may be less than 40 per cent efficient).

Corporate social responsibility (CSR)

Corporate social responsibility refers to an organisation's responsibility to its stakeholders, which include employees, customers and the general public. Energy policy and performance can be an important part of CSR, which requires communication with key stakeholders, rather than just disseminating messages.

CSR is becoming increasingly important in the supply chain, as organisations realise that stakeholders can significantly affect company objectives.

D

Demand-side management

Demand-side management is designed to help balance energy demand with supply. It is particularly important for electricity, which is difficult or expensive to store. It influences the quantity or patterns of energy use, such as action to reduce peak demand during periods when energy-supply is constrained. Peak demand management may not decrease total energy consumption but it can allow the overall energy supply to be delivered more efficiently.

Display Energy Certificate (DEC)

A certificate of energy performance that must be displayed in many public (i.e. government or publicly owned) buildings. It shows the energy consumption per unit area of the building, and compares it against a suitable benchmark to give an ‘A-G’ rating. An ‘A’ rating shows excellent energy performance.

E

Eco-tax

A financial measure that aims to modify organisations’ behaviour so that they reduce their environmental impacts. For example, an energy tax encourages energy efficiency, while a carbon tax encourages moves to lower carbon technologies, including renewable energy. Ecotaxes provide choice, to the extent that they don’t specify what the modified behaviour should be, or to what extent it should be undertaken.

Energy Performance of Buildings Directive (EPBD)

The European EPBD sets national requirements for improving the energy performance of buildings.

The Directive:

- establishes a framework for a common method for calculating the energy performance of buildings
- sets minimum energy performance standards for new buildings, and buildings subject to refurbishment
- introduced energy performance certificates. The requirements of the EPBD are implemented in the approved documents of Building Regulations Part F (Ventilation) and Part L (Fuel and power) for England and Wales, with similar rules in the rest of the UK

Energy Performance Certificate (EPC)

A certificate required when a building is purchased, sold or has a change of lease or tenancy. It compares the design of the building with a model to give an ‘A – G’ energy rating. ‘A’ shows excellent energy performance, and the current national average is about ‘D’.

Energy review

An energy review shows where, how and what sort of energy is currently used in an organisation. A good energy review will:

- Establish the total amount of energy being used
- Identify wasteful energy use
- Identify opportunities for making carbon reductions and cost savings
- Highlight maintenance requirements, and
- Assess the scope for new technology and other energy saving measures

Enhanced Capital Allowance (ECA)

The ECA allows end users to offset 100% of the cost of eligible low energy and low carbon equipment against tax in the year it is purchased. Qualifying products are shown in the Carbon Trust's Energy Technology List.

Energy management system (EMS)

Part of an organisation's overall management system that covers energy and associated issues, notably costs and carbon emissions. It includes organisational structure, planning, responsibilities, practices, procedures, processes and resources. These are then deployed to achieve review and support a suitable environmental policy and objectives. It is possible to run an EMS without third party certification.

Environmental performance indicator (EPI)

Provides headline information about selected parts of an organisation's environmental performance. EPIs may cover 'aspects' (e.g. amount of carbon dioxide emitted per unit output) or 'management' (e.g. amount of training).

F

Feed-in Tariffs (FiTs)

FITs pay homeowners (and some businesses) to generate electricity from selected renewable sources. Introduced in April 2010, FITs kick-started the installation of domestic and small scale commercial photovoltaics, for those who have access to the capital outlay. FITs are misnamed in that the bulk of the tariff is not made for 'feeding in' energy to the national grid, but by simply generating renewable energy. There is a relatively small extra payment for feeding energy into the grid. FITs are subject to ongoing Government review...

Fossil fuel

Organic sediments or pockets formed underground over geological time. Common fossil fuels are coal, natural gas and oil. These fuels are regarded as non-renewable (i.e. they cannot be replaced, which also has implications for energy supply) and burning them produces carbon dioxide. (See carbon dioxide).

Fuel cells

Fuel cells store energy and employ electrochemistry (electrodes and electrolyte) and hydrogen and oxygen to generate electricity. Fuel cells are different from conventional batteries – the former consume reactants while the latter store their own (chemical) electrical energy. Other combinations of fuels and oxidants are possible. Developments in renewable energy could conceivably lead to low carbon hydrogen production (using off-peak electricity to convert water into hydrogen and oxygen).

G

Greenhouse gas

Certain gases in the atmosphere absorb reflected solar radiation from the Earth's surface and then re-radiate it as heat, which leads to global warming. Carbon dioxide is a major greenhouse gas. (See also GWP).

Global warming

An overall average increase in the Earth's lower atmospheric (troposphere) and surface temperature. This happens when energy that would otherwise radiate back into space is absorbed by greenhouse gases to give a so called 'greenhouse effect'. Global warming does not mean that the whole world heats up to the same degree, and it can lead to increased rainfall and other extreme weather, not just hotter, drier climates.

Global warming potential (GWP)

GWP estimates how much a given greenhouse gas contributes to global warming. It is a relative scale that compares greenhouse gases to the same mass of carbon dioxide. A GWP should ideally be expressed over a specific time, such as 100 years. For example,

GWPs are:

- Carbon dioxide (which is defined as 1)
- Methane 21
- Halocarbons 140 to 11,700
- Sulphur hexafluoride 23,000

Ground source heat pumps

Systems that convert large amounts of low grade heat from the ground into smaller amounts of higher grade heat for use in a building. Ground source heat pumps typically provide the heating equivalent of 2.5 to 4 times the energy needed to make them work (the CoP). A major investment, and best considered when other major building work is planned.

H

Heat pump

A heat pump uses compression (powered by electricity) to extract heat from a large volume (low grade) heat reservoir and deliver that heat to a smaller volume (higher grade) heat reservoir. In reverse it can be used to cool or refrigerate. A heat pump has three main parts:

- the evaporator coil – this absorbs heat from the outside air;
- the compressor – which pumps the refrigerant through the heat pump and compresses the gaseous refrigerant to the temperature needed for the heat distribution circuit (the part that tends to make noise); and
- the condenser/heat exchanger (e.g. the warm part at the back of a fridge) gives up heat to a hot water tank which feeds the distribution system

I

Innovation

Typically, applying an existing technology or technique in new ways, or applying a new technology / technique for the first time.

Integrated photovoltaics

Systems where photovoltaic panels replace conventional building materials such as roof tiles or facades. A major investment which is usually best considered if the roof is being replaced.

K

Key performance indicator (KPI)

KPIs are commonly used by Government and organisations to evaluate and publicise how much progress has been made towards selected improvement targets. Carbon reduction is a widely used KPI. (See also EPIs).

Kyoto Protocol

The United Nations legally binding agreement by over 150 countries to reduce greenhouse gas emissions. Industrialised countries committed to cut overall emissions to 5% below 1990 levels by 2008 - 2012. The protocol is rapidly being overtaken by time and events, including far bigger international carbon reduction targets.

L

Life cycle assessment (LCA)

An LCA compiles material, energy and waste flows to help evaluate the environmental impact of a product or service over its life cycle (often including reuse or recovery). An LCA needs good raw data, and it is more credible when it deals with simple products and supply chains. LCA is often used to compare the impacts of different products that are used for the same function. Depending on who is doing the LCA, they may show some bias and some include assumptions and caveats. 'Embodied carbon' or 'embodied energy' refers to an LCA that only covers the energy-related impacts of a product or service.

Low and Zero Carbon (LZC) technologies

Building services systems that are either carbon neutral or highly energy efficient, reducing carbon emissions from power generation or fossil fuel use. Also called 'low to no carbon' measures.

M

Marginal abatement cost curve (MACC)

MACCs show the cost per tonne of eliminating CO2 emissions and the amount of CO2 saved. A MACC curve ranks projects or measures based on their Whole-life Net Present Value (expressed as £/t CO2 reduced). MACCs typically assess the relative cost and carbon reduction implications of potential energy saving or renewables projects.

Micro-CHP

Typically, CHP with an output of less than 5kW electrical output, designed for use in suitable homes and small commercial buildings.

Microgeneration

Small energy generating systems, typically up to 50kW output. They are installed close to the point of use, either in smaller businesses or homes. Such systems include CHP, air source heat pumps and renewables such as photovoltaics and less commonly, wind power.

Microgeneration Certification Scheme (MCS)

The MCS is supported by the Government's Department of Energy and Climate Change (DECC). It is designed to evaluate microgeneration products - and those who install them - against robust criteria. The scheme is open to firms that supply, design, install and commission microgeneration technologies. It is not possible to benefit from FITs or the RHI without using an installer who is registered with the MCS. Elecsa, an ECA group company, runs a leading MCS.

Micro-wind turbines

Small wind turbines (usually up to 1kW output) designed to provide electric power to a home or other local sites. Seldom at the top of the list for anyone looking to install renewables in built-up or sheltered areas.

N

Notional Calculation Methodology

The Notional Calculation Methodology is a procedure for demonstrating compliance with the Building Regulations for non-domestic buildings. It requires the calculation of the annual energy use for a proposed building, which is then compared with the energy use of a standard 'notional' building.

O

Operational rating

A measure of a building's energy use (and resulting carbon emissions) compared to a benchmark for that type of building – usually based on at least 18 months of energy use information. (For new buildings see 'asset rating').

P

Passive building

A well insulated and very airtight building that has mechanical inlet and extract ventilation. A dwelling that achieves the German ‘PassivHaus’ standard typically includes:

- very good levels of insulation with minimal thermal bridges
- effective utilisation of solar and internal gains
- excellent airtightness; and
- good indoor air quality, provided by a whole house mechanical ventilation system with highly efficient heat recovery

Passive solar energy

Key techniques include south-facing windows, natural shading and ventilation, and materials that absorb heat from the sun and then slowly release it.

Photovoltaics

Photovoltaics convert solar energy into electricity. They are usually made of two or more thin semi-conducting silicon layers (often referred to as ‘solar cells’). When sunlight strikes the cell, electrons move toward the treated front surface, causing electricity to flow. Up to a point, the greater the intensity of light, the greater the flow of electricity.

R

Renewable Energy

Energy from resources that can be readily replaced. Examples include passive solar (building design), active solar heating (through collectors such as plates or tubes), photovoltaics, wind power, hydro-electricity and biofuels (using organic waste, timber or ‘energy crops’). Renewables tend to greatly reduce carbon emissions for a given unit of energy, which is the main environmental benefit. The renewable aspect is also attractive because it contributes to energy sufficiency.

Renewable Heat Incentive (RHI)

The Government-backed RHI is expected to start in two phases, firstly in winter 2011, and secondly in late 2012. It aims to provide long term support for renewable heat technologies, from household solar thermal panels to heat pumps and commercial wood pellet boilers. The Government says it is committed generating 12% of all heat from a renewable source by 2020.

Renewables Obligation

The renewables obligation is placed on licensed electricity suppliers, who must deliver a specified amount of electricity from eligible renewable sources. Energy companies are required to generate a minimum of 10% of their output from renewable sources, or buy renewables obligation certificates on the open market.

S

Simplified Building Energy Model

Calculation software to help building services designers comply with 'Part L' of the Building Regulations (which deals with fuel and energy).

SMART target

SMART energy or carbon targets are 'specific, measureable, agreed, realistic and time bound'. They are often linked to objectives, and KPIs or EPIs.

Solar thermal heating

Using energy from the sun to provide hot water for a building. Solar thermal roof panels usually come in two types: flat panels or vacuum tubes.

Stakeholder

Individuals, communities or other bodies that have a significant interest in an organisation or are affected significantly by its policy or behaviour. Stakeholders can include employees, customers, suppliers, local communities, neighbours, regulators, pressure groups and the media. They can influence the organisation's 'operating space' – what it can and cannot do in terms of its activities, products and services.

Standard Assessment Procedure (SAP)

The SAP has been adopted by Government as the UK method for calculating energy performance within 'Part L' Approved Document L1A - Conservation of fuel and power in new dwellings and Approved Document L1B – for existing dwellings. It is based on a range of factors contributing to energy efficiency, notably:

- the materials used in construction of the dwelling
- thermal insulation of the building fabric
- ventilation characteristics of the dwelling and ventilation equipment
- efficiency and control of the heating system(s)
- solar gain
- the fuel used to provide space and water heating, ventilation and lighting
- renewable energy technologies

SUSTAINABILITY

Sustainability is a massive, long-haul goal, with challenges and opportunities to match. Regarded by some as the 'S Word', but our ability to control carbon emissions is a fundamental part of the sustainability challenge. The way to get there is called sustainable development, and as we have seen, 'low to no carbon' measures have a huge role to play...

Sustainable development

The Brundtland Commission's classic definition is: "development which meets the needs of the present without compromising the ability of future generations to meet their own needs". Sustainable development is the process that heads towards the ultimate goal of 'sustainability'. The 1987 Brundtland Commission report ('Our Common Future') highlighted three components of sustainable development: environment, society and economy - but it is now acknowledged that the environment has load bearing and resource limits that must not be exceeded. It is widely regarded that we must limit the amount of carbon dioxide in the atmosphere to prevent significant global impacts. However, a fundamental problem is that we are not sure what the safe limits are, or what happens if and when we exceed them. (See also Sustainability).

T

Target Emissions Rate (TER)

The preferred rate of greenhouse gas emissions from a proposed building or refurbishment project. It is set by the project team and client at the start of the design process.

Z

Zero carbon building

Finally, we come to ‘zero carbon’ buildings. There aren’t very many of these yet, so by themselves, they aren’t going to deliver sustainability. However, they show the way for new buildings and provide excellent cues for what to do when laying into the UK’s existing building stock. Those that have been built have zero net carbon emissions as a result of innovative ‘passive’ design, renewables or other so-called ‘allowable solutions’ (e.g. a separate wind turbine or CHP plant). The latest update to the EPBD says that the ‘total annual primary energy consumption’ of a ’net zero energy building’ ‘does not exceed the energy produced from renewable energy sources on-site’.

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