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introduction to the low carbon domestic retrofit guides



LOW CARBON DOMESTIC RETROFIT

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Institute for Sustainability

Technology Strategy Board
Driving Innovation



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1.1 A £500 billion opportunity

The UK is about to embark on a programme of low carbon housing retrofit of most of the national housing stock. The purpose of this programme is to help meet the challenge of climate change, to improve energy security, and to alleviate fuel poverty in an era of rising fuel prices. The national target is to reduce carbon dioxide emissions by 80%, compared with 1990 levels, by 2050.

In 2009, our homes accounted for more than 28% of total UK energy use (and the associated carbon dioxide emissions) and the average replacement rate of our national stock of approximately 26 million dwellings is less than 0.5% per year, so more than 80% of existing dwellings will still be in use in 2050. A housing retrofit programme is therefore essential to meet our national target.

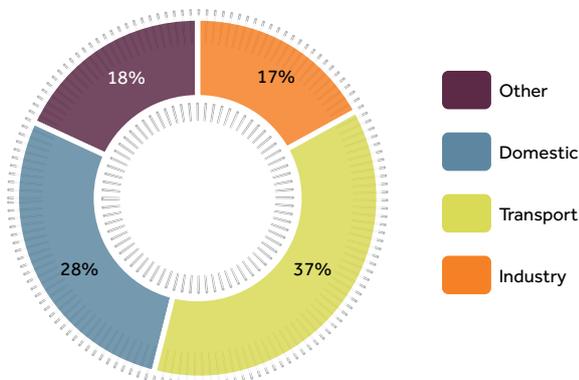


Figure 1.1 UK energy use by end user, 2009.
(Source: *Digest of UK Energy Statistics 2010*)

Domestic greenhouse gas (GHG) emissions (mostly carbon dioxide) currently amount to more than 160 million tonnes of carbon dioxide equivalent per year (MtCO₂e/yr), and they are rising (See Figure 1.2 – green line) with the growth of the housing stock. Current improvement programmes will reduce emissions slightly (yellow line), and the requirement for new dwellings to meet the “zero carbon” standard from 2016 may also help (purple line). But the trajectory we have to follow to meet our target, shown by the orange line, is very challenging.

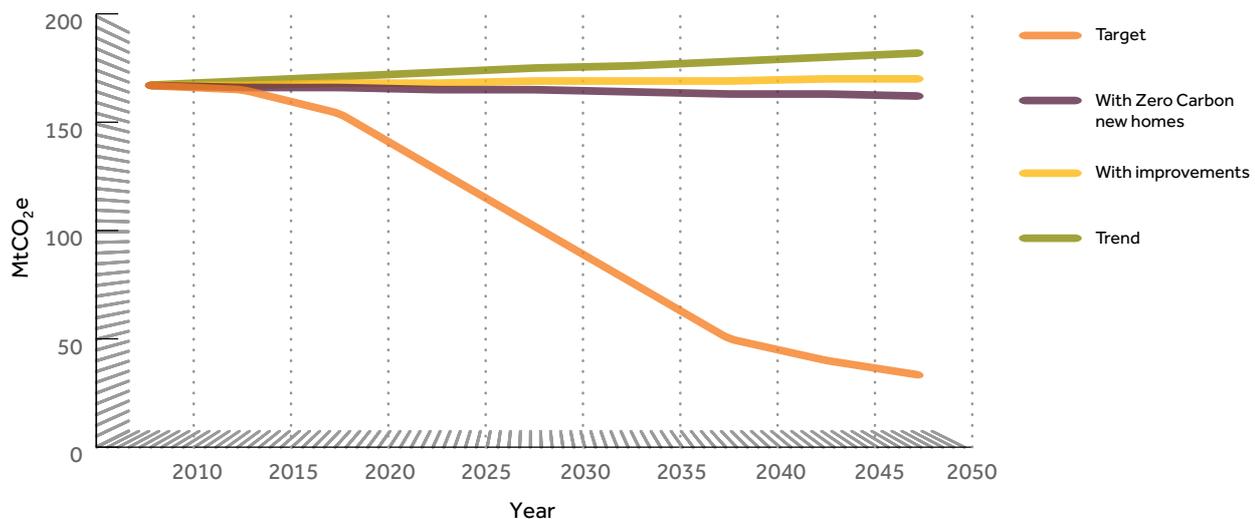
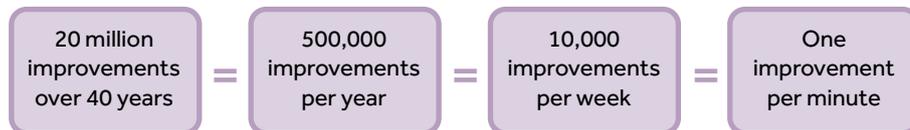


Figure 1.2 UK domestic GHG emissions and the route to 80% reduction by 2050. (Source: DECC 2011)

Some reductions in carbon dioxide emissions will be delivered by “decarbonisation” of the national electricity supply, by the use of local renewable energy systems (eg community heating and local wind power), and by the replacement of some of the poorest performing homes with much more efficient new homes (“zero carbon” homes from 2016). Nevertheless, the energy efficiency of at least 20 million homes must be improved in order to reduce the current carbon dioxide emissions associated with energy use by approximately 60% over 40 years (the balance of the 80% target will be delivered by decarbonisation etc). This means that on average we have to improve half a million dwellings every year, for the next 40 years. This is equivalent to completing one improvement project every minute!



The average improvement cost (at 2010 prices) to achieve 60% reduction of current emissions is likely to be of the order of £25,000 per dwelling, so the entire improvement programme is worth £500 billion, or £12.5 billion per year.



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This national low carbon retrofit programme represents a huge business opportunity. Delivering the programme will involve great commitment from owners and occupants, and require the services of:

- surveyors
- energy assessors
- energy advisors
- architects
- engineers
- project managers
- builders
- suppliers of materials and products
- installers of insulation, building services and renewable energy technologies.

Upgrading the capacity of the industry, and ensuring quality, will involve managers, inspectors, trainers, accreditation bodies and regulators.

1.2 Why retrofit?

The Government will provide financial and regulatory incentives for householders and landlords to retrofit their properties. Even without these incentives, the benefits of low carbon domestic retrofit are five-fold:

- protection against rising fuel prices, which are expected to rise by up to 60% by 2020
- improved comfort in homes which are better insulated, better ventilated and draught-free
- mitigation of climate change through improved energy efficiency and reduced carbon dioxide emissions
- adaptation to climate change through reduced risk of summer overheating and improved resistance to more frequent extreme weather
- improved market value.

Low carbon retrofitting of homes is not just a technical option, it is a lifestyle choice, and there are business opportunities associated with promoting the benefits of low carbon retrofit and marketing the services of the many organisations that will help to deliver it.

1.3 These business opportunity guides

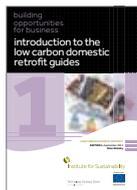
Purpose

The purpose of these guides is to:

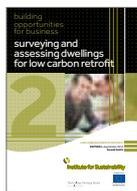
- identify business opportunities associated with low carbon domestic retrofit
- explain the characteristics of opportunities eg funding structures, routes to market, customer acceptability
- identify prerequisites for exploiting opportunities eg training and accreditation of assessors, advisers and installers.

Scope

There are 12 guides altogether:



1 Introduction to the low carbon domestic retrofit guides (this guide)



2 Surveying and assessing dwellings for low carbon retrofit: opportunities for professionals, including surveyors, architects, Domestic Energy Assessors and Home Energy Advisors.



3 Planning low carbon retrofit projects: opportunities for professionals and tradespeople to establish low carbon improvement plans for dwellings and stocks of dwellings.



4 Funding and procurement for low carbon retrofit projects: opportunities for professionals to help householders and landlords secure funding for low carbon retrofit projects from multiple sources; and to procure materials, products, contractors and installers.



5 Managing low carbon retrofit projects: opportunities for managing projects and protecting householders' and landlords' interests, from inception to completion, including statutory approvals, selection and appointment of contractors, contract management, inspecting and certifying the quality of work, and post-occupancy monitoring and evaluation.



6 Improving the building fabric: opportunities for designers, builders and installers to specify, supply and install measures to improve insulation and air tightness, reduce thermal bridging, control condensation and reduce the risk of summer overheating.



7 Improving the building services: opportunities for designers, builders and installers to specify, supply and install efficient ventilation, heating, water heating and lighting systems, and domestic appliances; and to specify, supply and install renewable energy systems.



8 Green retrofit: materials, waste, water and maintenance: opportunities for designing sustainable retrofit, specifying sustainable materials and products, promoting water efficiency and sustainable drainage, managing waste and pollution during the retrofit process and maintaining homes that have been retrofitted.



9 Living in a low carbon home: opportunities for assisting householders to make the best use of their retrofitted homes by specifying and installing appropriate controls and by providing guidance on appropriate behaviour patterns and lifestyle changes; opportunities for training and accreditation of energy advisors and for the provision of guidance services.



10 Identifying opportunities and promoting low carbon retrofit services: understanding business opportunities associated with low carbon retrofit work; expanding existing businesses to embrace low carbon retrofit; promoting and marketing low carbon retrofit services to householders, landlords and other suppliers, and exploiting "trigger points".

Because their content is continually changing, the following two guides will be available on the web only (not in printed form), until at least mid 2012:



A Promotion programmes for low carbon retrofit: an explanation of the Green Deal including the pay as you save (PAYS) mechanism, the "Golden Rule", the proposals for quality assurance and how the Green Deal will be supplemented by Energy Company Obligation (ECO), the Feed in Tariff (FiT) and the emerging Renewable Heat Incentive (RHI).



B Skills, training and accreditation for low carbon retrofit: emerging arrangements for the training and accreditation of surveyors, assessors, advisors, providers and installers of low carbon retrofit, and for the accreditation of products and systems; the Green Deal Code of Practice and the Green Deal Publicly Available Specification; opportunities for providing training and accreditation services.

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1.4 Delivering low carbon retrofit

The emerging low carbon retrofit industry

An industry is emerging to deliver the national low carbon retrofit programme. The structure of the industry is being shaped by the Government's proposed incentive schemes, principally the Green Deal, the Energy Company Obligation (ECO), the Feed in Tariff (FiT) and the Renewable Heat Incentive (RHI).

- The Green Deal is a scheme to provide households and landlords with third-party funding for approved low carbon retrofit projects and for the capital cost to be repaid by the PAYS mechanism (see below); the focus of the Green Deal is on improving insulation, air tightness, ventilation and heating and hot water systems but other systems such as renewable energy may be included.
- The ECO is essentially a rebranding of previous "supplier obligation" schemes such as the Carbon Emission Reduction Target (CERT), under which fuel suppliers are obliged to divert some of their own funds to improve the energy efficiency of buildings; ECO will supplement the Green Deal and be focused on "hard to treat" dwellings and households in fuel poverty.
- The FiT provides incentive payments for electricity that is generated from small-scale zero carbon sources such as solar photovoltaic (PV) systems and wind turbines.
- The RHI provides payments for heat that is generated from small-scale low or zero carbon sources such as solar panels, biofuel boilers, geothermal energy and some types of heat pumps.

For detailed information about these schemes see Guide A.

Three main funding mechanisms have emerged:

- statutory supplier obligation schemes such as ECO, which require fuel suppliers to fund improvements to the energy efficiency of their customers' dwellings
- Pay As You Save (PAYS), under which a loan to finance low carbon retrofit work is repaid (with interest) by means of a charge attached to the fuel bills of the dwelling that is improved; improvements are delivered by a "provider" organisation at no cost to the householder or landlord. The charge remains with the dwelling, even if the occupants change, and is repaid over a period of up to 25 years. The "Golden Rule" is that PAYS charges must not exceed the fuel cost savings expected to arise from the installed improvements
- incentive tariffs such as the FiT and the RHI, which support the installation of low and zero carbon (LZC) "renewable energy" technologies by subsidising the local production of LZC heat or power. These tariffs are supported by a levy imposed on all fuel bills.

For more detailed information about funding mechanisms for low carbon domestic retrofit see Guide 4.

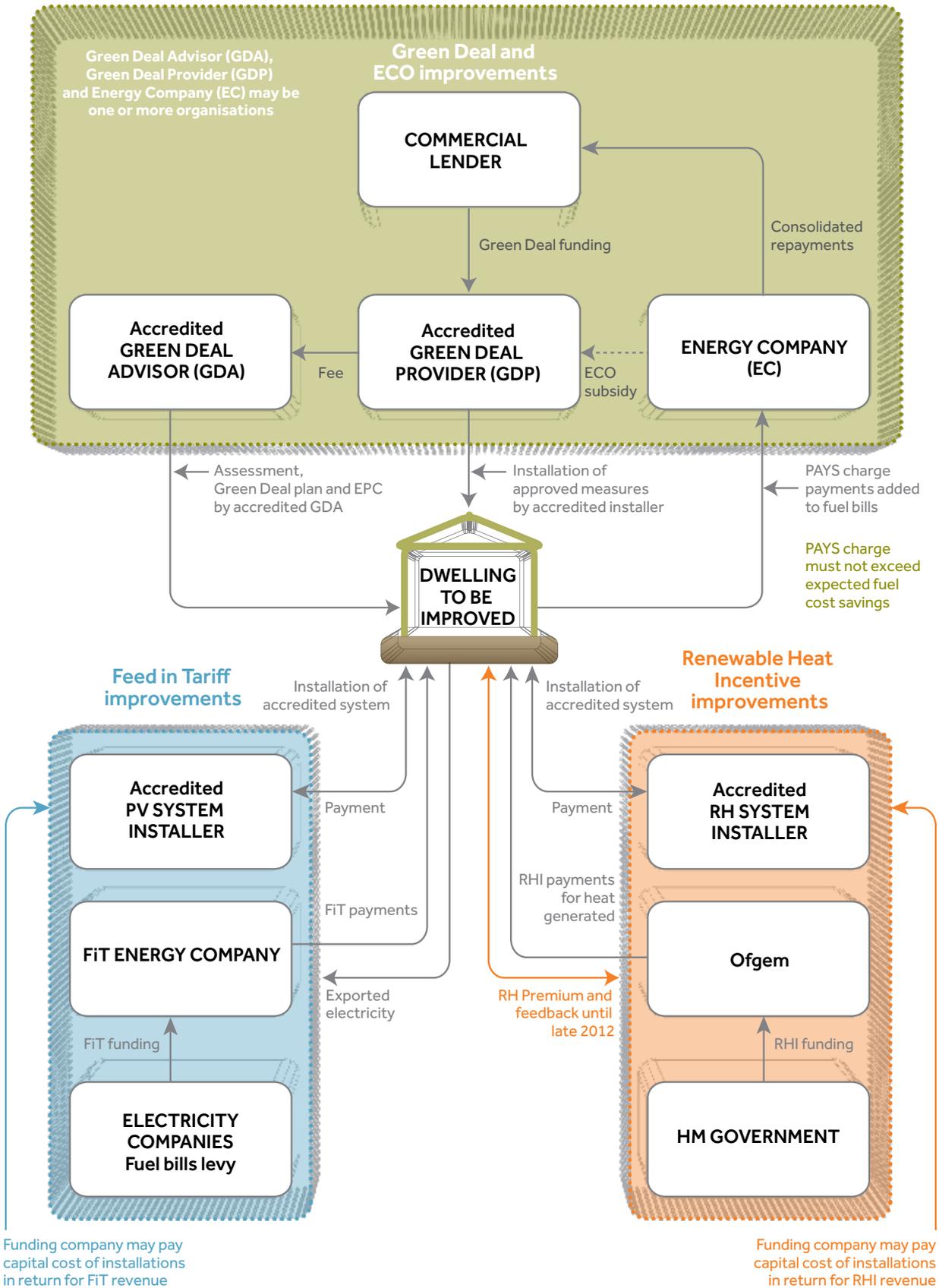


Figure 1.3 The relationships between the various schemes, funding mechanisms and organisations involved in low carbon domestic retrofit.

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Essentially, four main types of organisation are emerging to support the low carbon retrofit programme:

- **Lenders**, ie financial institutions that make capital funding available for low carbon retrofit, for repayment via the Pay As You Save (PAYS) procedure.
- **Advisors**, who survey and assess dwellings, evaluate improvement options, advise householders and landlords on appropriate improvement measures and costs, and may also deal with statutory approvals such as planning permission and Building Regulations.
- **Providers**, who receive funding from lenders, manage the installation of approved improvement measures and arrange PAYS payments via fuel suppliers.
- **Installers**, who are trained and accredited to install approved materials and accredited products for low carbon retrofit and to advise householders about how to use and maintain them.

The relationships between the various low carbon retrofit schemes, funding mechanisms and organisations are summarised in Figure 1.3.

Quality assurance

The Government has emphasised that in order to protect householders and landlords, all individuals and organisations helping to deliver the low carbon retrofit programme, and in particular those delivering improvements funded by the Green Deal, must be appropriately trained, qualified and accredited. Guarantee schemes are being developed. Three accreditation mechanisms have emerged:

- **The Green Deal Code of Practice (GDCoP)** regulates the behaviour of individuals and organisations involved in low carbon retrofit and their relationships with householders and landlords.
- **The Green Deal Publicly Accessible Specification (PAS 2030)** establishes minimum acceptable standards for low carbon retrofit materials, products and systems, and for their installation.
- **Industry accreditation schemes** accredit products and installers, and must be consistent with the GDCoP and PAS 2030. Many existing accreditation schemes are being used, with suitable amendments, and new schemes are being set up.

For more detailed information about skills, training and accreditation see Guide B.

1.5 Exploiting business opportunities

Exploiting the opportunities associated with low carbon domestic retrofit work involves preparing a business plan that embraces:

- identifying products or services that are needed by the low carbon retrofit industry or by householders or landlords
- establishing the sizes of the markets for such products or services, how they are structured and how they can be accessed, including the identification of “trigger points” when customers are most likely to purchase. For more detailed information see Guide 10
- evaluating the need for investment in staff, premises, plant and equipment, raw materials, stock, distribution networks, marketing or promotion, and securing the necessary funding

- obtaining any necessary training and accreditation for staff; obtaining approval, certification or accreditation of materials and products, and complying with the GDCoP and PAS 2030. For more detailed information about training and accreditation see Guide B
- establishing procedures for delivering products and services in sustainable ways, consistent with customers' expectations and standards
- protecting the business and its customers with appropriate quality-assurance procedures and insurance.

1.6 Next steps

The guides in this suite provide a starting point for identifying and investigating business opportunities associated with low carbon domestic retrofit. Each guide provides references and links to sources of further information. Key references and links related to the material in this guide are listed below.

Key references

CONSTRUCTION PRODUCTS ASSOCIATION (CPA) (2010) *An Introduction to Low Carbon Domestic Refurbishment*, Construction Products Association, London, www.constructionproducts.org.uk/publications/Page.aspx?Id=507 [Accessed 28/06/11].

GRIFFITHS, N (2007) *The Eco House Manual*, Haynes, Yeovil.

DECC (2011) *The Green Deal: A Summary of the Government's Proposals*, Department of Energy and Climate Change, www.decc.gov.uk/en/content/cms/what_we_do/consumers/green_deal/green_deal.aspx.

Key links

Department of Energy and Climate Change (DECC): www.decc.gov.uk

FLASH programme: www.instituteforsustainability.org.uk/flash.html

Institute for Sustainability: www.instituteforsustainability.org.uk

National Housing Federation: www.housing.org.uk

Retrofit for the Future: www.innovateuk.org/retrofit

Royal Institute of British Architects (RIBA) Sustainability Hub:
www.architecture.com/SustainabilityHub/SustainabilityHub.aspx

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1.7 Glossary

The abbreviations and technical terms used in these guides are listed below.

Abbreviations

ABBE	Awarding Body for the Built Environment	GHG	Greenhouse Gas
ASHP	Air Source Heat Pump	GSHP	Ground Source Heat Pump
BREDEM	Building Research Establishment Domestic Energy Model	HEA	Home Energy Advisor
BREEAM	Building Research Establishment Environmental Assessment Method	HRRV	Heat Recovery Room Ventilator
BSI	British Standards Institution	IRCA	International Register of Certified Auditors
CEA	Commercial Energy Assessor	IRR	Internal Rate of Return
CERT	Carbon Emissions Reduction Target	IWI	Internal Wall Insulation (for solid external walls)
CESP	Community Energy Saving Programme	LCC	Low Carbon Consultant
CFL	Compact Fluorescent Lamp	LCEA	Low Carbon Energy Assessor
CHP	Combined Heat and Power	LED	Light Emitting Diode
CIBSE	Chartered Institution of Building Services Engineers	MEV	Mechanical Extract Ventilation
CIGA	Cavity Insulation Guarantee Agency	MVHR	Mechanical Ventilation with Heat Recovery
CLG	Department for Communities and Local Government	NHER	National Home Energy Rating
CO₂	Carbon Dioxide	NISP	National Industrial Symbiosis Programme
CPS	Competent Persons Scheme	NPV	Net Present Value
DDA	Disability Discrimination Act	OCDEA	On Construction Domestic Energy Assessor
DEA	Domestic Energy Assessor	PAYS	Pay As You Save
DECC	Department of Energy and Climate Change	PHPP	Passive House Planning Package
ECO	Energy Company Obligation	PSV	Passive Stack Ventilation
EEPH	Energy Efficiency Partnership for Homes	PV	Photovoltaic
EIB	European Investment Bank	RDSAP	Reduced Data Standard Assessment Procedure
EPBD	European Energy Performance of Buildings Directive	RHI	Renewable Heat Incentive
EPC	Energy Performance Certificate	RIBA	Royal Institute of British Architects
ERDF	European Regional Development Fund	RICS	Royal Institution of Chartered Surveyors
EST	Energy Saving Trust	SAP	Standard Assessment Procedure
EWI	External Wall Insulation (for solid external walls)	SUDS	Sustainable Urban Drainage System
FEES	Fabric Energy Efficiency Standard	SWH	Solar Water Heating
FiT	Feed in Tariff	SWI	Solid Wall Insulation
GDA	Green Deal Advisor	SWIGA	Solid Wall Insulation Guarantee Agency
GDCoP	Green Deal Code of Practice	TRV	Thermostatic Radiator Valve
GDP	Green Deal Provider	TSB	Technology Strategy Board
GDPAS	Green Deal Publicly Accessible Specification	UKAS	United Kingdom Accreditation Service
		WRAP	Waste & Resources Action Programme
		ZCH	Zero Carbon Hub

Technical terms

Affordable warmth: Access to an acceptable standard of heating and hot water at a cost not exceeding 10% of household income (the opposite of fuel poverty – see below).

Air permeability: A measure of the air tightness of building fabric in m³ of air leakage per m² of building envelope per hour, at 50 Pa excess pressure.

Air tightness: The resistance of building fabric to adventitious or uncontrolled air leakage.

Building fabric: The external envelope of a building – floors, walls, roof, windows, doors, rooflights etc.

Building Research Establishment Environmental Assessment Method (BREEAM): A methodology for assessing the environmental quality of buildings, developed and administered by BRE.

Building Research Establishment Domestic Energy Model (BREDEM): A calculation method for estimating the annual energy requirements for space heating, water heating, cooking, lighting and electrical appliances within a self-contained dwelling and for estimating the savings resulting from improvement measures.

Carbon Emission Reduction Target (CERT): A programme of energy efficiency improvements carried out by energy supply companies in their customers' buildings as part of the "Supplier Obligation" imposed by the Government and regulated by Ofgem.

Carbon neutrality: Net zero carbon dioxide emission achieved by balancing emissions associated with mains energy use with an equivalent amount of zero emission energy (eg electricity generated locally by PV) supplied to the national grid.

Cavity Insulation Guarantee Agency (CIGA): An organisation that provides independent 25-year guarantees for cavity wall insulation fitted by registered installers in the UK and Channel Islands.

Climate change adaptation: Adapting buildings to anticipated climate change by means of measures such as solar shading (to mitigate overheating) and sustainable drainage (to improve flood resilience).

Code of Practice for Energy Advice: A Code of Practice (CoP) for all organisations/individuals that provide domestic energy efficiency advice that is specific to individuals and their circumstances. The CoP was created by the Energy Efficiency Partnership for Homes (EEPH) and is managed by the Energy Saving Trust (EST). The CoP consists of a set of core standards related to the quality of advice and information provided, the training and development of advisers, customer access, quality assurance and service improvements.

Commercial Energy Assessor (CEA): An energy assessor who is accredited via the NHER scheme for assessing non-domestic buildings and issuing EPCs.

Community Energy Saving Programme (CESP): A programme of local, community-wide energy efficiency improvements carried out by energy supply companies in partnership with local authorities, as part of the "Supplier Obligation" imposed by the Government.

Competent Persons Scheme (CPS): A scheme that allows trained and accredited individuals to self-certify that their work complies with certain specified parts of the Building Regulations, as an alternative to submitting a Building Notice, making an application to a Building Control Body or employing an Approved Inspector.

Cross-ventilation: Ventilation of a room, or across a floor within a building, that is enabled by arranging ventilation openings on opposite sides of the space, so that fresh air is admitted on one side and stale air is emitted on the other side, driven by wind pressure.

Decentralised energy: Small, local, renewable energy sources eg wind farms, community scale CHP, domestic scale solar thermal and photovoltaic arrays.

Department of Energy and Climate Change (DECC): A Government department established to take the lead in tackling the challenge of climate change and moving the UK towards a low carbon economy.

Domestic Energy Assessor (DEA): An accredited energy assessor who can issue Energy Performance Certificates (EPCs) for existing self-contained dwellings following an on-site survey.

Energy Company Obligation (ECO): An obligation to be placed by the Government on fuel companies to invest in the energy efficiency of buildings; from autumn 2012 ECO will replace CERT and CESP, and complement the Green Deal.

Energy Performance Certificate (EPC): A certificate issued following an energy assessment of a building by an accredited assessor (OCDEA for new dwellings, DEA for existing dwellings, CEA or LCEA for non-domestic buildings). The EPC evaluates the energy performance of the dwelling in terms of an Energy Rating on an A to G scale and identifies potential improvement measures.

European Investment Bank (EIB): The European Union's financing institution, its shareholders being the 27 Member States of the Union, which have jointly subscribed its capital. The EIB's role is to provide long-term finance in support of investment projects.

European Regional Development Fund (ERDF): A fund allocated by the European Union for the period 2007–2013 to promote regional development through measures such as creating sustainable jobs, stimulating economic growth, enhancing access to transport and telecommunications etc.

External shading: Integrated or building mounted solar shading devices on the outside of a building, including extended eaves, brise soleil etc.

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Fabric Energy Efficiency Standard (FEES): An energy standard for the fabric of new dwellings, which will form part of the Zero Carbon Standard (ZCH) from 2016. The FEES sets the energy demand for space heating and cooling demand in dwellings: 39 kWh/m²/year for flats and mid terraced dwellings, and 46 kWh/m²/year for end of terrace, semi-detached and detached dwellings.

Feed in Tariff (FiT): A funding scheme that provides payments for electricity that is generated from small-scale zero carbon sources such as solar photovoltaic (PV) systems and wind turbines. The FiT is funded by a levy on all fuel bills.

Fuel poverty: The condition of a household that must spend more than 10% of its income on fuel in order to obtain an acceptable standard of space heating and hot water. Fuel poverty is the opposite of affordable warmth.

Green Deal: The Government's principal incentive scheme for promoting improvement of the energy efficiency of existing buildings, funded by commercial investment which is subsequently recovered by charges levied on the fuel bills associated with the buildings that are improved.

Green Deal Advisor (GDA): An accredited advisor who can visit a dwelling, assess its energy performance, evaluate improvement options and provide the occupants with advice about improving the energy efficiency of the dwelling.

Green Deal Code of Practice (GDCoP): A public document containing standards and requirements to regulate the behaviour of GDAs, GDPs, suppliers and installers working under the auspices of the Green Deal, in order to provide consumer protection.

Green Deal Provider (GDP): An organisation that arranges the funding and installation of energy improvement measures for dwellings, as recommended by Green Deal Advisors.

Green Deal Publicly Accessible Specification (PAS 2030): A published generic specification to which services provided and energy improvement measures installed under the auspices of the Green Deal must conform.

Green Guide to Building Specification: A guide to the relative environmental impacts of the construction materials commonly used in six different generic types of buildings; in excess of 1,500 specifications are outlined in the guide, which is published by BRE Ltd.

Greenhouse gas: the gases whose increased concentration in the atmosphere promotes warming and consequent climate change; the principal greenhouse gas is carbon dioxide, others include methane and oxides of nitrogen.

Golden Rule: A principle associated with the Green Deal, under which PAYS charges applied to fuel bills and paid by householders must not exceed the expected fuel cost savings associated with installed energy improvement measures.

Home Energy Advisor (HEA): An accredited HEA is a DEA who also provides energy efficiency advice to households about measures to reduce energy use, covering changes that could be made to the dwelling and behavioural changes.

Home Energy Master Plan: A comprehensive evaluation of a dwelling to help the occupier understand the best options for making it warmer, reducing its energy bills and reducing carbon dioxide emissions.

Interstitial condensation: Condensation that forms when warm, moist air from within the building penetrates into the building fabric (walls, roof or floor) and meets a cold surface, potentially leading to damage or rotting of the building fabric or structure.

Life cycle assessment (LCA): An assessment of the environmental impacts associated with all the stages of a product's life from raw material extraction, materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling (ie "from cradle to grave"). Sometimes also known as whole life assessment.

Local renewable energy systems: Renewable energy systems that are installed close to the buildings they serve, but not within their curtilages, ie off site.

Low Carbon Energy Assessor (LCEA): An energy assessor who is accredited via the CIBSE for assessing non-domestic buildings and issuing EPCs.

Low carbon retrofit: Refurbishment of an existing building with a view to significant reduction in the carbon dioxide emissions associated with energy use.

Microgeneration Certification Scheme (MCS): A product and installer certification scheme that certifies microgeneration technologies that are used to produce electricity and heat from renewable sources (photovoltaics, solar thermal, micro wind turbines, heat pumps – ground and air source, biomass, CHP and micro hydro).

National Home Energy Rating (NHER): A BREDEM-based domestic energy rating based on a scale of 0 to 20 (20 being the best), which is similar to the SAP energy rating but takes account of all energy uses (ie heating, water heating, cooking, lighting and the use of appliances) and the location and local exposure of the dwelling, all under SAP standard occupancy. The NHER also estimates annual fuel use, fuel costs and carbon dioxide emissions under specified occupancy.

National Industrial Symbiosis Programme (NISP): An innovative business opportunity programme that aims to improve cross industry resource efficiency and sustainability in terms of physical exchange of materials, by-products, energy, water and/or together with the shared use of assets, logistics and expertise.

On-site renewable energy systems: Renewable energy systems that are installed within the curtilage of a building (eg on the roof, in the plant room or elsewhere on site).

Passive House Planning Package (PHPP): A workbook-based performance assessment tool produced by the PassivHaus Institut to assist the design and certification of dwellings to meet the Passive House Standard.

Passive House Standard: A performance standard for very energy efficient new dwellings, developed and certified by the PassivHaus Institut and widely taken up across western Europe.

Pay As You Save (PAYS): A funding scheme under which a loan to finance low carbon retrofit is repaid by means of a charge attached to the fuel bills of the dwelling that is improved; the charge remains with the dwelling, even if the occupants change, and is repaid over a period of up to 25 years. The "Golden Rule" is that PAYS charges must not exceed the fuel cost savings expected to arise from the installed improvements.

Pay-back time: The time taken for the capital cost of low carbon retrofit work to pay for itself through fuel cost savings.

Post-occupancy monitoring and evaluation (POE): Monitoring of the performance of a dwelling, after retrofitting and occupation, to evaluate the effectiveness of the improvements.

Prudential borrowing: The set of rules governing local authority borrowing whereby the amount of debt and other liabilities is not capped by an upper limit but must conform to the Prudential Code, which includes a requirement that borrowing be affordable and prudential.

Radiant surface temperature: The temperature of a surface (eg of a wall) measured by the radiation it emits (and which may be different from the temperature of the surrounding air).

Rainwater harvesting system: System that collects rainwater falling within the curtilage of a dwelling, for use in the home or garden.

Reduced Data Standard Assessment Procedure (RDSAP): A "stripped down" version of the Standard Assessment Procedure (SAP) energy rating in which data items that are difficult or time-consuming to determine during a survey (eg ground floor insulation, window areas) are replaced by 'least unlikely' default data, in order to reduce the cost of energy surveys.

Renewable Heat Incentive (RHI): A funding scheme that provides payments for heat that is generated from small-scale low or zero carbon sources such as solar panels, biofuel boilers, geothermal energy and some types of heat pumps. The RHI is funded by a levy on all fuel bills.

Renewable Heat Incentive Premium Payment: A direct payment from the Government to subsidise heat that is generated from small-scale low or zero carbon sources such as solar panels, biofuel boilers, geothermal energy and some types of heat pumps, in return for feedback on system performance; this is an interim subsidy that will apply only until the RHI is implemented for domestic buildings in autumn 2012.

Simple pay-back: A method of assessing the cost-effectiveness of a low carbon retrofit measure by evaluating the time taken for the capital cost of low carbon retrofit work to pay for itself through fuel cost savings.

Small and medium-sized enterprises (SMEs): Commercial organisations that employ 250 people or fewer.

Solid wall insulation (SWI): Insulation that is installed internally (IWI) or externally (EWI) to solid external walls in order to improve their thermal performance.

Solid Wall Insulation Guarantee Agency (SWIGA): An organisation established to develop an independent guarantee and associated industry quality and standards infrastructure for solid wall insulation (EWI and IWI).

Standard Assessment Procedure (SAP): A BREDEM-based domestic energy rating based on the annual fuel cost for heating, hot water and fixed lighting only, under standard occupancy and in a standard location, expressed on a scale of 1 to 100+.

Stratification: The tendency of air in a closed space, or water in a tank, to form layers of different temperatures, with the warmest at the top.

Sustainable urban drainage system (SUDS): A combination of water management practices and control measures designed to drain away surface water in a more sustainable way than conventional mains drainage methods. SUDS techniques include: permeable paving, soakaways, green roofs, swales, site ponds, infiltration ditches, balancing ponds, wetlands etc.

Technology Strategy Board (TSB): A non-departmental public body established by the Government to promote, support and invest in technology research, development and commercialisation by providing grants and undertaking research.

Thermal bridge: An area of building fabric that is less well insulated than surrounding areas and therefore allows a greater rate of heat loss, as a result of the construction of the building; thermal bridges typically occur where structural members penetrate through insulation layers, at corners and junctions between elements (ie between floors, walls and roofs) and around openings such as windows and external doors.

Thermal comfort: Perceived comfort in relation to environmental variables including air temperature and the radiant temperatures of surrounding surfaces, as well as personal factors including insulation by clothing and metabolic heat generation.

Thermography: The use of infrared thermal imaging equipment to investigate the thermal performance of building envelopes, usually to detect and evaluate thermal bridges and air leakage.

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Vapour balanced construction: A form of construction that allows water vapour to pass through the building fabric from inside to outside but inhibits its passage in the opposite direction, while maintaining air tightness; sometimes erroneously called “breathing” or “breathable” construction.

Warm Front: A Government-funded scheme that provides insulation and heating grants for low-income households that are in receipt of certain income-related benefits, in order to improve the energy efficiency of their dwellings and thus alleviate fuel poverty.

Waste & Resources Action Programme (WRAP): A Government-funded organisation with the objectives of developing markets for materials that would otherwise become waste and of providing information and advice to businesses and individuals to promote resource efficiency and recycling.

Waste water heat recovery: A system that uses a heat exchanger to recover heat from waste water from showers, baths, washing machines and dishwashers and return it to the domestic hot water cylinder in order to reduce the energy requirement for water heating.

Whole life assessment (WLA): An assessment of the environmental impacts associated with all the stages of a product’s life from raw material extraction, materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling (ie “from cradle to grave”). Sometimes also known as life cycle assessment.

Whole life costing (WLC): An assessment of the total cost of a product through all the stages of its life, including costs associated with raw material extraction, materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling (ie “from cradle to grave”).

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