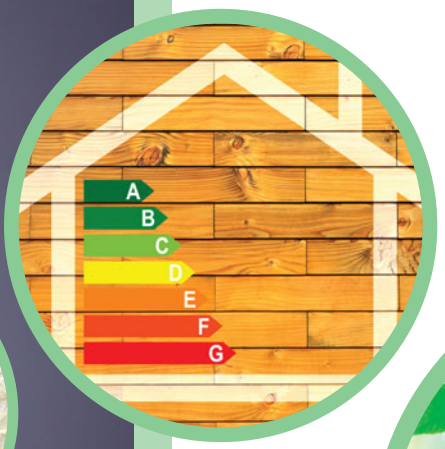
practice briefs

Greening your Housing Stock

With support from

Swan New Homes



Contents

Greening your housing stock ..... Page 3
New build ..... Page 4
Tackling existing housing stock ..... Page 13
Financing retrofit ..... Page 21
Microgeneration ..... Page 32
Fuel poverty ..... Page 37
Engaging with tenants ..... Page 41
Developing a strategy for your stock ..... Page 47
Glossary ..... Page 58
Finding out more ..... Page 59

Customer feedback

We welcome feedback on how we can improve our publications both in terms of format and content. If you would like to contribute to our commitment to improving our services please email: policyandpractice@cih.org

Authors: David Pipe, Policy and Practice Officer and John Perry, Policy Adviser (CIH)

Editor: Debbie Larner, Head of Practice (CIH)

Acknowledgements: We are grateful to Swan Housing Group **www.swan.org.uk** for partnering CIH in the production and dissemination of this practice brief.
Permission to reproduce diagrams was received from: BRE (p.6), Zero Carbon Hub (p.8), Construction Products Association (pp.14 and 51), uSwitch (p.38).
Richard Baines, Black Country HA, made helpful comments on the text.

Production/print: Jeremy Spencer/Hobbs the printers, Totton.

Images sourced by Marion Conlon, CIH (from istockphoto.com and shutterstock.com)

Registered charity No. 244067/R ISBN 978-1-905018-92-5

This publication is printed on Nine Lives 55 130gsm silk which is made with 55% recycled fibre from both pre-consumer and post-consumer sources, together with 45% virgin ECF fibre from sustainable forests.

Greening your housing stock

Most housing organisations want to improve their environmental performance. Many have looked at going 'green'. The **practice brief** *Greening your Organisation* sets out why this is important, what the benefits are and how to do it. Read it for the wider background to this new **practice brief** on greening your stock. Here we focus more directly on reducing carbon emissions from your homes.

As a housing organisation, you can achieve your biggest impact by raising environmental standards in the stock itself. This is because carbon emissions from homes contribute more than a quarter of the UK's total. Reducing them will be vital in achieving the UK target of reducing total emissions by 80% by 2050. Housing is particularly important because improvements can be made more quickly and economically in this sector than in others, such as transport. And energy efficiency is good news for occupiers because it should lead to lower fuel bills and helps tackle fuel poverty.

This **practice brief** is not a technical guide. It's a broad introduction for those wanting to know how to go about greening the houses they own or plan to provide.

The aims are to:

- set out what is required of you as a landlord and developer
- say why it is important
- outline the available techniques
- consider the key issues you will face when getting started
- discuss ways in which to engage with tenants
- tell you how the work can be resourced
- show how to develop a strategy that fits with your business plan
- provide you with links to detailed information sources and guidance.

The methods for greening housing stock apply across the UK and much of northern Europe. The policies and financial arrangements differ in the four UK administrations, and the **practice brief** covers these differences.

It has separate sections covering:

- **new build** – what are the relevant policies, requirements and standards?
- **existing stock** – what different requirements apply?
- **finance** – how do you pay for the investment?
- **microgeneration techniques** – should you generate renewable energy onsite?
- **fuel poverty** – how does the energy efficiency of your stock affect your tenants' finances?
- **engaging with tenants** – how do you build commitment to saving energy?
- **developing a strategy** – how do you bring all this together?

This **practice brief** is mainly about **mitigation** – the term used for work which helps to reduce climate change. But it also covers some key aspects of **adaptation** – making sure your stock is in a better state to cope with climate change as it occurs.

New build

What's the issue?

According to the Zero Carbon Hub, a non-profit organisation that supports the delivery of zero carbon homes, a typical household living in an average-size house, built to 2006 Building Regulations, generates just over three tonnes of CO_2 per year. In order to meet the government's overall ambition to reduce total carbon emissions by 80% by 2050, new homes will need to be built to much higher standards of energy efficiency.

In addition to directly contributing to lower CO_2 emissions, new homes also have a wider environmental impact. The types of materials used, the way waste and pollution are minimised and the way natural resources like rainwater are utilised all contribute to the overall sustainability of a development.

There are a number of ways of assessing the sustainability of new homes and different methods and targets exist in different parts of the UK.

Building Regulations

Building Regulations (or Building Standards in Scotland) set out the absolute minimum requirements for most new buildings. They specify a level of energy efficiency that must be achieved in new dwellings. The level is determined by calculating the total carbon emission rate for the property using a Standard Assessment Procedure (see page 52 for more on SAP).

These regulations are expected to become much more demanding from 2016 (see page 8).

The Code for Sustainable Homes

The Code for Sustainable Homes is an assessment method for rating and certifying the environmental performance of new homes. Performance targets are more demanding than the minimum standard needed to satisfy current Building Regulations.

Unlike Building Regulations, the Code assesses the wider environmental impact of the new development, not just its carbon emissions. It assesses the sustainability of the homes across nine categories:

- energy and CO_2 emissions
- water
- materials
- surface water run-off
- waste
- pollution
- health and wellbeing
- management
- ecology.

Each category includes a number of environmental issues and each issue is a source of environmental impact which can be assessed against a performance target and awarded one or more credits.

A home is assessed at design and post-construction stages, before it can be certified with a rating of Level 1 to 6 based on the credits accrued, Level 6 being the highest standard. Relatively few developments have achieved the highest possible sustainability rating. Some of those that have are featured in this **practice brief**.

All new publicly funded housing in England, Wales and Northern Ireland is required to meet at least Code Level 3. It is also mandatory for all new homes in England to be assessed against the Code for Sustainable Homes, even where there are no requirements to meet a minimum Code Level. Although higher levels are achieved on a voluntary basis, the Code helps promote higher standards of sustainable design. It is not used in Scotland.

This **practice brief** is not intended as a technical guide on how to design homes that will achieve a high sustainability rating. The Department for Communities and Local Government (DCLG) have published technical guidance to accompany the Code, available from their website at: **www.communities.gov.uk/publications/planningandbuilding/codeguide**

Practice example

Metropolitan Housing Partnership

Part of the Upton development in Northampton, One Earth Homes were the first social housing units in the UK to achieve Code Level 6. The three-bedroom houses were designed by ZEDfactory, the architects behind the iconic BEDzed development. Originally designed to comply with EcoHomes Excellent (equivalent to Code Level 3 or 4), the decision was taken to upgrade to Code Level 6.

Key features of the development include:

- floor featuring 300mm mineral wool insulation which is covered with waxed slab, laid on an acoustic mat and plywood
- timber frame roof with 300mm mineral wool insulation, including a layer of breather membrane
- 3.78m^2 of solar tubes providing most of the hot water requirements (topped up by district heating system when needed)
- 20 modules of solar PV cells, covering a total of 20m^2 of roof space and generating a maximum of 3.6kW of electricity
- a wind cowl on the roof, which supplies fresh air and extracts stale air; a heat exchanger uses heat from extracted air to pre-warm the fresh incoming air
- high-performing vapour-permeable breather membrane ensuring high levels of air tightness
- rainwater from the roof is harvested (stored in a tank in the car park) and used for toilet flushing
- a green (sedum) roof on the north elevation.

The additional cost of lifting these homes from Code Level 3 or 4 to Level 6 was £26,500 per unit.

More information:
www.ruralzed.com/ruralzed_completed.html

Cost of works

The actual cost of works can vary considerably depending on the nature of the development. However, in August 2011 DCLG estimated the typical cost of achieving compliance with each level of the Code for Sustainable Homes.

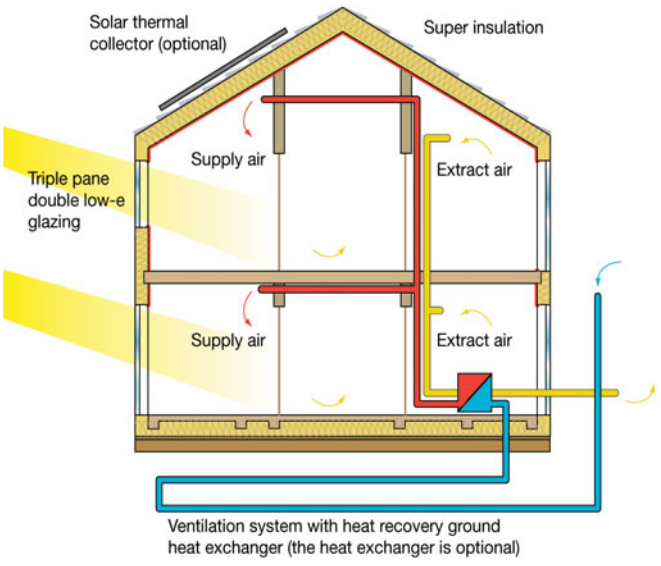
The figures here are only intended to be illustrative. They are costs for an average dwelling on a small brownfield development, based on DCLG figures. They are expressed as the additional cost of complying with the Code, using a property that conforms to 2006 Building Regulations as a baseline.

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
£3,472	£3,714	£4,154	£7,418	£22,894	£37,424

Source: DCLG *Cost of Building to the Code for Sustainable Homes*

More details, and statistics for other types of development, are available from DCLG: www.communities.gov.uk/publications/planningandbuilding/codeupdatedcostreview

Indicative section through a Passivhaus



Source: www.passivhaus.org.uk

The Passivhaus Standard

The Passivhaus Standard was developed in Germany in the early 1990s and is now used in many countries around the world. Assessment of homes against the Standard is not mandatory anywhere in the UK but some developers are applying Passivhaus principles to help reduce their properties' carbon emissions. The standard's focus is on reducing the need for energy to be used to heat and cool spaces. Through the application of Passivhaus principles it is possible that a traditional heating system may no longer be required at all. This is typically achieved through:

- good levels of insulation
- internal heat sources and natural heating
- excellent levels of airtightness
- good ventilation with an efficient heat recovery system.

The Passivhaus Standard is sometimes considered an alternative to the Code for Sustainable Homes. However as it is focused solely on heating and cooling and does not assess wider environmental impact, it is actually more comparable with SAP. In practice these standards do not have to be mutually exclusive and using Passivhaus design principles can contribute to developers achieving both a higher SAP rating and a higher level of the Code.

For more information visit:
www.passivhaus.org.uk or **www.sphc.co.uk** (The Scottish Passivhaus Centre)

Practice example

Fyne Homes have developed 14 new terraced homes for low cost home ownership alongside the Firth of Clyde. It was the first development in Scotland to be accredited by the German Passivhaus Institute and the first affordable development to be accredited in the UK.

The overall heating requirement for the houses is 1,600kWh per year, approximately a tenth of what an average traditional house uses. Solar thermal panels were also installed to further reduce energy bills for hot water by over 50%. Finally, a heat recovery system provides up to 80% of the homes' heating requirements through warmed fresh air.

The properties are all now occupied and anecdotal feedback from the occupiers suggests they have noticed significantly reduced fuel bills in comparison with their previous homes.

The development has received three Scottish Design Awards and a RIBA award.

More information:
www.fynehomes.org.uk/tigh_na_cladach.html

Practice example

Orbit Heart of England have completed the UK's largest Passivhaus development at Sampson Close in Coventry, containing 23 new homes.

The scheme features a mechanical ventilation and heat recovery system and high performing insulation, made up of a high recycled content. This gives u-values of less than 0.15W/m^{2}K to walls, floors and roofs (see page 10 for an explanation of u-values).

Current building regulations state that houses must be shown to leak no more air than 10m^3/hr/m^2@50Pa. The first three homes at Sampson Close all achieved an air test of 0.6 or below.

Large solar panels are also used to heat the domestic hot water system and a district gas fired heating system provides space heating when required.

Orbit estimate that a two-bedroom flat in the development will cost less than £2 per week to heat.

More information:
www.orbitinnovation.org.uk/p/h/Home/Project_showcase/2/?lang=

Zero Carbon Homes

It is the government's aim that all new homes in England and Wales will be zero carbon by 2016. This means that all new homes will have to be energy self-sufficient.

The target relates only to 'regulated energy' – which is energy used in the home for things like heating and lighting – and not 'unregulated energy' – energy consumed by the occupants of homes through activities such as cooking and by appliances such as televisions and computers. Even so, it is an ambitious target, one of the most stringent in the world.

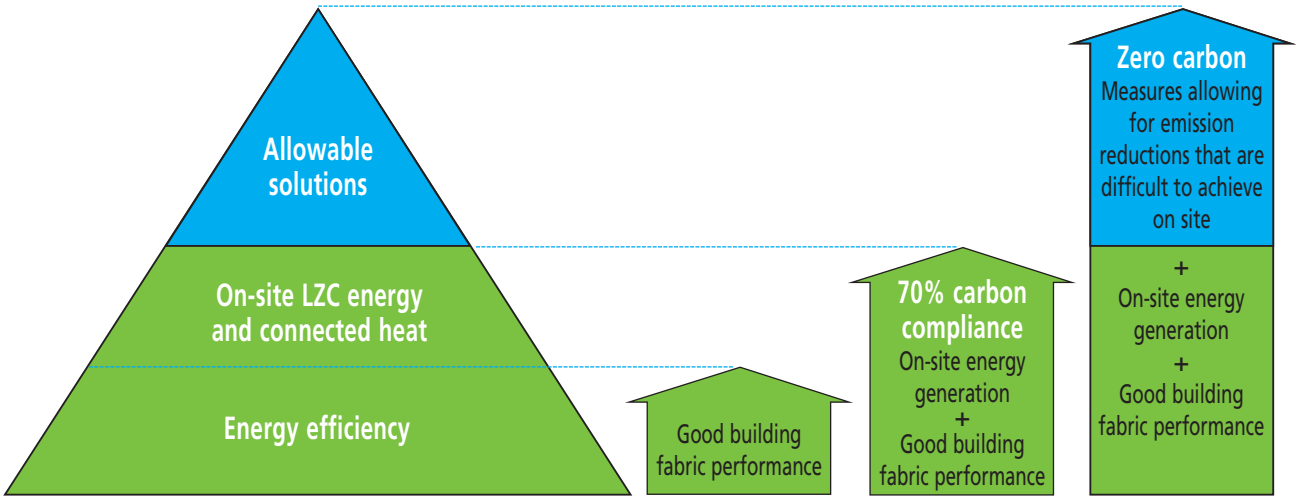
At present, the definition of what constitutes a zero carbon home is being reviewed. Previously, it was considered to mean homes that met Level 6 of the Code for Sustainable Homes. However, in practice this is not always achievable in every instance, principally because not all households are able to generate sufficient energy on-site to offset their energy use.

The government has therefore tasked the Zero Carbon Hub with developing a new definition which would be technically achievable and cost-effective for developers.

Their suggested definition is that developers should be able to achieve a 70% reduction in regulated energy use (from what is allowed by 2006 Building Regulations) through a combination of energy-efficient building and the use of energy generated from a low or zero carbon (LZC) source, such as from an on-site solar panel. The remaining reduction in energy use could be made up through 'allowable solutions', a form of carbon offsetting where the developer invests in other carbon-saving projects.

The government has not defined exactly what could constitute an allowable solution but, for example, it may include the retro-fitting of other nearby homes or buildings or investing in low-carbon street lighting for the area.

The zero carbon hierarchy



Source: www.zerocarbonhub.org

This definition, and in particular what will constitute allowable solutions, will be refined and will become part of Building Regulations in England and Wales from 2016. This will considerably increase the requirements around controlling carbon emissions from new homes.

In Scotland there are separate targets for establishing zero carbon homes. These are based on the Sullivan Report, which was published in 2007 and recommended staged improvements leading to net zero carbon buildings by 2016/17, if practicable.

This target will also be implemented through changes to Building Standards, though there may be some differences between the definitions of zero carbon used in different parts of the UK.

The Sullivan Report is available online at **www.scotland.gov.uk/Resource/Doc/217736/0092637.pdf** and the Scottish Government's Energy Efficiency Action Plan, which sets out how it will implement recommendations from the Sullivan Report can be found at **www.scotland.gov.uk/Topics/Business-Industry/Energy/Action/energy-efficiency-policy/ActionPlan**

Improving the sustainability of new homes

Whichever assessment methods are used, it is likely that the same design features will be crucial in reducing the environmental impact of new homes. These could include:

- Good insulation and use of materials which do not lose large quantities of heat – the common measure of this is a material or product's u-value (see page 10).
- Air tight build to further reduce heat loss – the measure of this is the rate of air leakage per square metre. This is normally measured at an artificial pressure of 50Pa and is expressed as $Xm^3/hr/m^2$@50Pa. Wall, roof and floor areas that are exposed to the external environment are included in the calculation. In England and Wales, the maximum air leakage rate allowed by Building Regulations is $8m^3/hr/m^2$@50Pa. However, a rate of 5-6 can usually be achieved on a conventional construction and 3-4 in timber or steel-framed structures.
- Use of heat recovery ventilation systems – systems which 'capture' heat lost from the building and recycle it to keep the home warm. For example, air can be extracted from rooms that typically produce heat, such as a kitchen, and before this air is expelled it can be passed through a heat exchanger where the heat is transferred to incoming fresh air.
- Use of natural heating – orientating homes to make the most of sunlight and reduce the need for artificial heating. However, developers do also need to be aware of the danger of summertime overheating, increasing the need for artificial cooling.
- Rainwater harvesting.
- On-site energy generation (considered in more detail on pages 32-36).

- Installation of energy-efficient appliances – such as low energy lighting.
- Use of 'green roofs', such as a sedum roof – sedum is a plant that can be grown on your roof. It provides natural insulation and can alleviate some of the flooding from heavy rainfall as most of the initial water is soaked up into the vegetation on the roof.

U-values

The u-value is a measure of the heat loss per square metre of a building element such as a wall, door or window. The lower the u-value, the better. To give an example, a solid brick wall may have a u-value of 2.3W/m^{2}K, an uninsulated cavity wall 1.6, but a modern filled cavity wall 0.3.

Practice example

Swan New Homes are developing one of the largest zero carbon projects in the Thames Gateway. Cranes Court, Basildon is the first housing development to have 100% of its electric, space and water heating provided by a combined heat and power (CHP) Glycerol unit (for an explanation of this technology, see page 36). It is the largest Code Level 6 scheme in the Thames Gateway.

The key to this achievement is Glycerol, the fuel used in the CHP plant, which is a waste product in the manufacture of bio-diesel and has a defined emissions factor of 0.057 kg/CO_2/kWh. The CHP plant provides sufficient electricity for the scheme over the course of a year, importing electricity from the National Grid at peak times and exporting excess electricity to it at times of low demand. For every unit of Glycerol burnt, the plant will generate electricity and the 'waste' heat is used for heating. As a result of the selected fuel and CHP plant efficiencies, no additional renewable energy was required. This innovative approach avoids the installation of solar panels, creating a more traditional façade, which was an important issue with planners.

The majority of the homes have been orientated to make best use of natural sunlight. Heating requirements in the 28 new houses and flats will be kept to an absolute minimum with average wall and floor u-values of 0.15 W/m^{2}K, roof u-values of 0.13 W/m^{2}K, with triple-glazed windows at 0.8W/m^{2}K and

an exceedingly high air tightness standard (permeability of 3). All units are equipped with a whole-house ventilation system with heat recovery, which further reduces CO_2 emissions.

The scheme incorporates a rainwater harvesting system, in order that the development as a whole will not discharge more rainwater than the previous development on the site. All plots are to achieve an internal water usage of 80 litres per person per day (considerably less than the requirements set out in Building Regulations of no more than 125 litres per person day) thereby causing no increased pressure on the local drainage network and reducing the likelihood of localised flooding.

Further features of Cranes Court include individual smart metering of all properties; use of recycled materials for the road base; triple-glazed wood-framed windows; the installation of insulation blocks beneath the floor slabs; and the use of the Stewart Milne Sigma II panellised wall system.

With the site being evaluated as having ecological value, owing to the number of mature trees, achieving Level 6 of the Code for Sustainable Homes was particularly difficult. The design had to gain maximum points from non-ecology sections within the Code and consequently encompasses the whole range of ambitions of the Code. 100% of the available credits have been secured within the water, surface water run-off, waste and management categories.

More information:
www.swan.org.uk/development_and_regeneration/design_and_sustainability/

Green methods of construction

A further way of improving the sustainability of a development which is rarely considered is the use of more natural materials in the construction process. Natural materials use less energy to produce than synthetic ones and so have additional benefits to the environment, as well as reducing carbon emissions from the property itself.

Green construction methods could include the use of natural insulation made from materials such as hemp or sheep's wool. A mixture of hemp and lime can also be used in the construction of walls, floors and roofs.

Practice example

Oaklee Housing Association has built 11 new properties at Drumalla House, Carnlough County Antrim in Northern Ireland. The properties were built with timber frame using insulated solid walling made from hemp and lime.

Hemp is a renewable material grown and processed in the UK. Once hemp fibre has been separated, the remaining straw or 'shiv' is chopped and mixed with a wet mix of a special lime binder and cast into a lightweight solid wall, 300mm thick, which resembles concrete. The walls are then rendered externally with lime and plastered internally. In this case a permanent shuttering board of magnesium silicate was used. Hemp provides a robust, highly insulating, but healthy, non-toxic, breathable material which locks up CO_2 in the fabric of the building.

The project was part of the Renewable House programme, which consisted of 12 projects throughout the UK which demonstrate the use of a range of natural and renewable materials including wood fibre, hemp, sheep's wool, straw and hempcrete.

More information:
http://neesonline.org/?p=266

How to find out more

Code for Sustainable Homes: **www.communities.gov.uk/publications/planningandbuilding/codeguide**

Passivhaus: **www.passivhaus.org.uk**

Zero Carbon: **www.zerocarbonhub.org**

Measuring water use in the home: **www.thewatercalculator.org.uk**

The use of natural materials in construction is considered in more detail in the CIH and Housing Studies Association publication *Housing, the environment and our changing climate* (Chapter 9): **www.cih.org/thebookshop**

A website devoted to natural building methods is: **www.greenhomebuilding.com**

A full account of the Renewable House programme, written by Professor Tom Woolley, will be published later in 2012.

Practice checklist: New build

- ✔ are you aware of the current standards for new build and do you comply?
- ✔ are you up-to-date with how they are changing?
- ✔ why not consider aiming for zero carbon now, rather than waiting until its compulsory?
- ✔ have you considered following Passivhaus principles in new design?
- ✔ and have you considered alternative building materials such as hempcrete?

Tackling existing housing stock

What's the issue?

Every landlord has large parts (perhaps the whole) of their housing stock which are sub-standard in environmental terms. Most face an enormous task to bring their stock up to high standards to provide comfort and affordability for residents and to meet low carbon goals. This chapter looks at the physical works required from a non-technical perspective. The aim is to give the housing professional a broad understanding of what is involved. It provides the background for setting targets and programming the work, covered on pages 47-57.

House types and their problems

Across a landlord's typical stock there will be considerable differences in energy efficiency and hence carbon emissions, even before resident behaviour is factored into the assessment. This is because some house types are inherently more energy-efficient, or have characteristics which will have lent themselves to upgrading in earlier schemes. The most modern stock, built in the last ten years, will also have been built to higher energy efficiency standards and (for example) have insulated cavity walls. Most traditionally-built stock dating after the 1920s has cavity walls, which may already have been insulated. Traditionally-built houses usually have lofts suitable for insulation (although may also have part-sloping ceilings).

Most social landlords' homes are physically joined to their neighbours, in a terrace, as a pair of 'semis' or within a block. These are inherently more efficient as heat loss between occupied dwellings is lower. By the same token, more exposed detached or end-terrace properties are likely to be less efficient.

Particular problems are likely to occur in retrofitting both modern properties that are in blocks (especially tower blocks), and older properties (pre-1919) that have solid walls, which lose heat quickly (see page 17) but can only be insulated by losing room space or installing outside cladding. Clearly, houses of architectural or historic interest also pose special challenges (see example on page 14).

Practice example

Dumfries and Galloway Housing Partnership (DGHP) has carried out a challenging refurbishment project on six blocks of flats, each comprising eight one-bedroom homes. Of the 48 properties, 33 are owned by DGHP and 15 are owner-occupied. The properties are of historic interest, having been built a century ago to a somewhat unusual construction, and were generally heated by electric storage heaters.

All but four of the flats were refurbished to current Building Standards. Four flats were used to incorporate the building and energy technologies needed to meet the 2050 carbon emissions target, including:

- microgeneration
- significantly higher levels of insulation (walls – external and internal – and floors; use of sheep's wool loft insulation)
- living sedum flat roofs
- Passivhaus standard doors and windows
- air tightness of under $2m^3/m^2hr@50Pa$.

The project also incorporated:

- $53m^2$ of solar PV producing 7.2kWp saving 3,409kg of CO_2 per year
- light emitting diodes (LED) lighting
- underfloor heating using 'A' rated condensing gas boilers
- use of recycled materials
- encouraging use of outdoor space e.g. for food growing.

The project was funded by DGHP with support from the low carbon building programme, CERT and FiT.

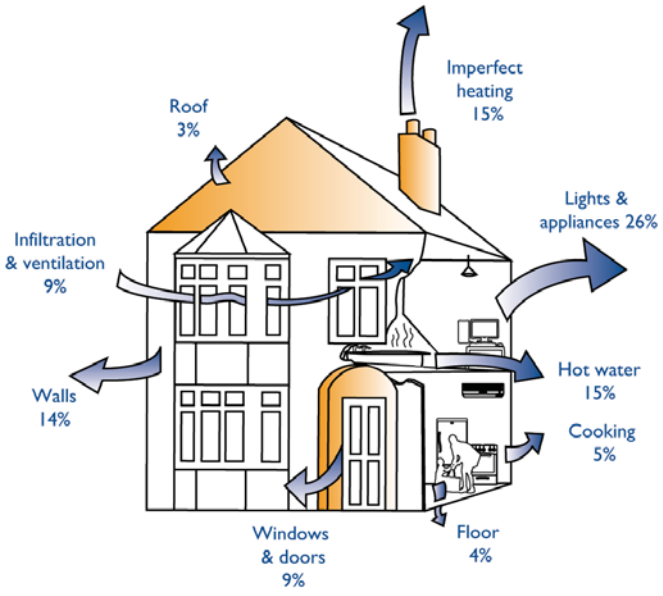
The project has won two awards; The National Home Improvement Council Retro Fitting Energy Efficient 2010 and the Scottish Homes judges award 2010.

Contact: Mike Trant, Asset Management and Policy Manager – **mike.trant@dghp.org.uk**

Typical heat losses and priorities for tackling them

The diagram below shows typical heat losses and hence emissions from an older, uninsulated house. The biggest source of emissions is space heating (54% of emissions). Of this percentage, 39% is due to heat losses through the fabric and 15% due to inefficient equipment and poor controls. The next biggest source of emissions is lighting and appliances (26%). Hot water (15%) and cooking (5%) are the remaining sources.

Typical sources of emissions in an older, uninsulated house



Source: *An Introduction to Low Carbon Domestic Refurbishment*. Construction Products Association (2010).

Explaining heat losses and carbon emissions in this way makes it immediately apparent that action depends on both the landlord and the resident: the landlord can make the physical fabric and the sources of energy as efficient as possible; the resident needs to make proper use of the systems and also to be aware of energy use by cookers, refrigerators and the range of household appliances and gadgets. In addition, emissions only partly depend upon what happens in the house itself: the fuel used to provide electricity is a further factor. The landlord or tenant may be able to source low carbon electricity or (for example) replace heating systems so they use gas or are connected to efficient district heating schemes, but the landlord is not usually the main energy supplier.

An important starting point is therefore the fabric of the dwelling, since this is usually entirely within the landlord's control. The landlord's principal aim should be to make the physical fabric of the house as energy-efficient as possible, for several linked reasons:

- poorly-insulated fabric is responsible for heat losses and hence for a significant proportion of emissions
- minimising heat loss by having a well-insulated fabric means that the need for space heating is reduced or even – in a hyper-efficient property – virtually eliminated
- the more efficient the fabric, the less important it is to invest in highly efficient heating (since space heating will become a much smaller factor in the home's energy use)
- the landlord has a great deal of control over the fabric, which is largely fixed, as opposed to heating and – even more – appliances, which are largely controlled by the resident
- good insulation is likely to be appreciated by tenants for its 'comfort value', because the house retains heat for much longer while they are out or during the night.

Measuring thermal efficiency and assessing cost effectiveness

Two technical issues have to be considered briefly before discussing retrofit works.

First, the landlord has to understand what affects the thermal efficiency of a house or of building materials. The common measure of thermal efficiency is a material or product's u-value (for an explanation of u-values, see page 10). The u-values of all the building elements can be calculated together to give the heat loss from the whole house.

Second, the landlord has to be able to judge the cost-effectiveness of one product or treatment compared with another. This is a complex area, as there are so many different products or treatments (from new light bulbs to external wall cladding) with vastly different costs and expected lifetimes. The issue can be simplified by obtaining guidance on the 'carbon cost effectiveness' of different measures. This is the capital cost of the product or treatment, minus the fuel cost savings that it will deliver, per tonne of carbon dioxide emission saved, during the lifetime of the measure. There is a guide to the carbon

cost effectiveness of different measures in *An Introduction to Low Carbon Domestic Refurbishment*.

Some measures, like loft insulation, are so cost-effective that they pay for themselves in a very short time. At the other extreme are measures which save relatively small amounts of carbon per £ invested, but which may be necessary to achieve the targets discussed in this **practice brief**.

There are tools available to help the non-technical person understand the choices to be made and relative costs involved:

- Sustainable Homes provides Carbon Reduction Options for Housing Managers (CROHM) – an assessment service: **www.sustainablehomes.co.uk/stock_carbon_assessment.aspx**
- the Energy Saving Trust (EST) has an Energy Credits Calculator designed to help housing professionals to assess the potential approaches and features necessary to achieve a range of energy credits within the Code for Sustainable Homes: **www.energysavingtrust.org.uk/business/Business/Housing-professionals/Interactive-tools/Energy-Credits-Calculator**

Typical retrofit works

In this **practice brief** our aim is to give a very brief overview of the types of work (and choices about types of work) likely to be considered in a retrofit scheme. We deal in turn with each of the main building elements shown in the diagram of the house and typical emissions on page 14.

This **practice brief** does not deal with procurement, as this was covered in *Greening your organisation*.

Roofs

In a conventional house with a loft, the easiest option is to lay insulation between the joists in the roof space, and then put further insulation across the joists. The minimum thickness should be 270mm; benefits can be obtained from even thicker insulation given that the labour costs are low. If there are still houses in the stock with uninsulated lofts, these should be a priority for action by a contractor aware of the technical requirements (e.g. ventilation, insulation of cold water tanks, etc.) and may be readily funded during the final stages of CERT (see page 22).

Houses with other types of roof present technical problems (e.g. weatherproofing, condensation) and insulation is best carried out as part of planned renewal of the roof:

- in houses with a roof space that is a room, or in rooms with part-sloping ceilings, insulation must be put between the roof rafters and below the roofing material
- with flat roofs, it may be possible to insulate above the existing roof.

Walls

Where walls have suitable cavities, they can be readily insulated by a specialist contractor, e.g. through CERT. There may be opportunities for a social landlord to offer insulation services to private properties in the same area, e.g. right to buy properties. Even with cavity wall insulation, however, the u-values achieved may not be low enough and further insulation might be required (see below).

Other types of wall require insulation to be added to the inside or outside:

- In the case of older terrace houses, especially if built onto the street, interior insulation may be the only option, inevitably reducing the floorspace of the affected rooms. Where this is the planned approach, care must be taken when scheduling kitchen or bathroom replacements to ensure that internal insulation is installed at the same time as (or prior to) the replacement, so that the new fittings fit the reduced space and do not have to be removed/replaced later.
- Insulating with external cladding may be the appropriate solution for blocks of flats. However, it needs careful technical work and programming because:
  - the eaves of the roof may need to be extended to cover the new wall thickness
  - there is a danger of 'cold bridges' being created, especially around windows and other openings, therefore ideally window replacement will be planned as part of a comprehensive insulation scheme
  - cladding may interfere with other building elements such as storm water drains or gulleys.

Floors

Houses with suspended wooden floors lose considerable amounts of heat both because of the low efficiency of the floor itself and through draughts, because the sub-floor space has to be ventilated to avoid woodwork becoming rotten. Suspended floors can be draught-proofed and have insulation suspended between the floor joists, but its thickness will probably be restricted to the depth of the joists so as not to interfere with ventilation.

Solid floors (and solid replacements of suspended floors) can be insulated, either above the floor if it is to be retained or below if it is to be replaced.

Doors and windows

Doors and windows are a major source of heat loss. Energy-efficient windows, when correctly selected and installed, will help to improve thermal comfort for the occupants as well as to cut fuel bills. Savings from high-performance glazing are significant. Because windows are replaced only infrequently, windows of the highest thermal performance should be installed when the opportunity arises in improvement programmes. There is now a range of types of high-performance windows with insulated frames, special coatings to reflect heat back into the house, etc.

Doors can be readily replaced with new ones that have insulated cores.

Cold bridges, air leakage and ventilation

Careful attention needs to be paid to heat loss through the surrounds to doors and windows as well as the doors/windows themselves, as these are often the parts of the building structure where 'cold bridges' occur. Cold or thermal bridges are localised areas of low thermal resistance caused by the presence of elements which conduct heat readily, such as steel window frames – and other less obvious examples such as a steel support for a balcony which crosses the width of the exterior wall.

Because these parts of the structure are colder (or, in summer, warmer) they reduce the effectiveness of the building's insulation. The better the insulation, the more important it is to deal with cold bridges. They can be severe enough to cause condensation and staining. Cold bridges can be readily identified with thermal imaging equipment, but dealing with them is a specialist area.

There is guidance on this with construction details at: **www.energysavingtrust.org.uk/business/Business/Housing-professionals/Interactive-tools/Enhanced-Construction-Details**

Drafts are also a major cause of heat loss because warm air from inside the house is replaced by cold air from outside. In a typical untreated house, air leakage may be so bad that the air is changed every hour. However, buildings (and people) do of course need ventilation, so the two issues are normally considered together to avoid solving one set of problems and causing another (e.g. damage through condensation resulting from poor ventilation).

Basic measures such as draught-proofing doors and windows can be taken without seriously affecting ventilation, but more ambitious projects (e.g. as part of refurbishment) will need specific forms of ventilation, from the simple provision of extractor fans in kitchens/bathrooms to more ambitious 'whole house' methods, which may extract the heat from air before it is expelled. Obviously, modern systems are designed to be either passive or low-energy in operation.

Heating

Given that boilers need periodic replacement, installing a high-efficiency ('A' graded) boiler is usually cost-effective, the current best option being a gas boiler if the house is on the gas grid. If significant insulation measures are being undertaken or are planned, the main use of the boiler may shift from house-heating to water-heating and this needs to be taken into account in deciding on the type (for example, choosing a combi-boiler providing instant hot water and having no hot water tank).

It is also relatively inexpensive to replace heating controls to ensure that the system is used efficiently – providing of course that residents have been given guidance on their use. One option is to install smart meters, that show real-time energy use and encourage residents to make savings.

Renewable energy systems (e.g. thermal solar) may be considered especially because of the financial incentives available (see page 26). However, careful consideration is needed as to their cost-effectiveness compared with other investments. Connecting houses to a high-efficiency district heating system may be an economical option in some areas (also see example on page 29).

Lighting and appliances

Low-energy bulbs are now becoming standard, but these and other appliances are likely to be chosen by residents. Nevertheless, selection and use of appliances, and the energy they consume, can be an important aspect of energy-saving advice. Again, micro-generation of electricity might be considered (see pages 32-36).

Other measures

A range of other measures can be considered, some of which reflect broader environmental aims rather than reducing carbon emissions. These might include improving the efficiency of water use through (for example) low-flow fittings or re-use of rain water, to recycling schemes, tree planting, minimising car use through car pools, and so on. These wider measures are an excellent focus for engaging with residents (see the **practice brief** *Greening your organisation*). They will not be dealt with in detail here.

Adapting housing to climate change

So far this chapter has focused on improving the energy efficiency of housing in order to 'mitigate' climate change, but it is also important in improvement schemes to consider how to adapt housing to the effects of climate change as they begin to occur. These are likely to be a warmer, wetter, stormier and more unpredictable climate. There are two main associated risks: overheating and flooding.

Avoiding overheating

A well-insulated house is ideal for the colder months when the need is to avoid heat loss, but in the summer the natural heat from the people and appliances in the house will be retained, too, possibly making the house too hot. If residents then install forms of air-conditioning, this obviously counteracts the savings in energy use and in emissions from the other measures taken to improve the house.

The aim should therefore to be to incorporate 'passive' measures to reduce overheating (i.e. ones needing little or no energy input). Such measures should include:

- reducing areas of south-facing windows
- installing external shading of south-facing windows
- providing adequate ventilation
- ensuring that any heat recovery systems (e.g. part of whole-house ventilation systems) can be set to expel (not retain) heat in summer
- advising residents how to keep their houses cool in summer – by minimising heat gain in the daytime and ventilating with cooler air at night time.

In specifying retrofit schemes for houses with solid walls, it is worth bearing in mind that external insulation, though having disadvantages, helps to keep buildings cool in summer (whereas internal insulation allows heat to build up in the wall structure).

An online toolkit has been developed at De Montfort University to help diagnose and prevent potential overheating in four standard dwelling types (detached, semi-detached and terrace houses, and flats): **www.iesd.dmu.ac.uk/crew/**

Avoiding flooding

It is good practice to make flood risk assessments for your housing and, where necessary, introduce measures to protect against flooding in improvement schemes. These might include:

- improvements to storm water drainage to reduce the risk of backing-up
- where surface water run-off is significant (e.g. car park areas) consider creating permeable surfaces to reduce run-off
- relocating vulnerable equipment above ground-floor level
- making buildings and their interiors more resilient, and having contingency rescue and clean-up plans.

A good, non-technical guide to the issues is the RIBA toolkit *Designing for Flood Risk*: **www.architecture.com/Files/RIBAHoldings/PolicyAndInternationalRelations/Policy/Environment/2Designing_for_floodrisk.pdf**

How to find out more

Excellent guides to low carbon refurbishment, in non-technical language, are the Construction Products Association's *An Introduction to Low Carbon Domestic Refurbishment*: **www.constructionproducts.org.uk/publications/Page.aspx?Id=511**

and the EST's guide to *Sustainable Refurbishment*: **www.energysavingtrust.org.uk/business/Business/Housing-professionals/Existing-housing** (this also has guidance on adapting to climate change).

Practice checklist: Retrofit

In setting out to convince people about your green agenda:

- ✔ have you begun to look at retrofit for your stock?
- ✔ have you researched what the main issues are?
- ✔ have you trained in-house technical staff and do they understand the retrofit agenda? If not, how will you address it?
- ✔ have you also considered how to adapt the stock to climate change?

Financing retrofit

What's the issue?

Having decided that you are going to green your stock, how do you finance it? Retrofitting houses to high energy efficiency standards is expensive – depending on the level aimed for, it can range from say £7,000 to achieve a 20% carbon reduction to £70,000 or more for an 80% reduction.

Unfortunately, apart from trials or small-scale schemes, most of the funding methods fall below or near the bottom of this range. For example, although there is no maximum payment under the Green Deal (see page 26), payments can be no higher than the predicted energy savings; this will limit them to small sums in some cases. The difficulty that social landlords face is that, without careful planning, they might take advantage of available funding for a modest retrofit scheme, then have to return to the properties to do more major works further down the line. A balance needs to be struck – which in the current funding climate is not an easy task.

Financing retrofit work is not straightforward in another sense – there is a bewildering range of schemes and not all are aimed at social housing. Most schemes apply across Great Britain but some do not apply in Northern Ireland. Some can help to finance retrofit directly while others (such as decent homes funding or its equivalent) are aimed more widely. Others (like the Feed in Tariff) produce an income which pays a return on the landlord's investment, rather than being a grant.

In practice therefore, planning how to finance the work has to be part of your strategy (see pages 47-57): inevitably there will be difficult funding choices and decisions about how to achieve the biggest carbon reductions in the stock or tackle the worst fuel poverty among tenants, from the available sources of finance.

Main financing options

The main financing methods are outlined here. They are:

- current supplier obligation programmes – UK-wide
  - Carbon Emissions Reduction Target (CERT)
  - Community Energy Saving Programme (CESP)
- Feed in Tariff (FiT) – England, Scotland and Wales
- Renewable Heat Incentive (RHI) – potentially UK-wide (but not yet available in Northern Ireland)
- Green Deal and Energy Company Obligation (ECO) – UK-wide
- guarantee funds – potentially UK-wide
- low carbon district heating – potentially UK-wide
- mainstrean funding, e.g. for stock investment – UK-wide (if available).

This does not exhaust the possibilities: there are other ideas for funding and this is an area where new opportunities frequently emerge (page 30).

The Energy Saving Trust (EST) has summarised the overall approaches to finance in the diagram below, depending whether an organisation is 'carbon proactive' and whether it looks for in-house or out-sourced solutions. In principle, many of the finance sources listed can be adapted to fit with one of the approaches below. For example, the Green Deal can potentially combine with ECO and in-house funds to finance an in-house, carbon proactive approach; equally, Green Deal might be left to the private sector and individual householder initiative – a minimalist, out-sourced approach. See the diagram below.

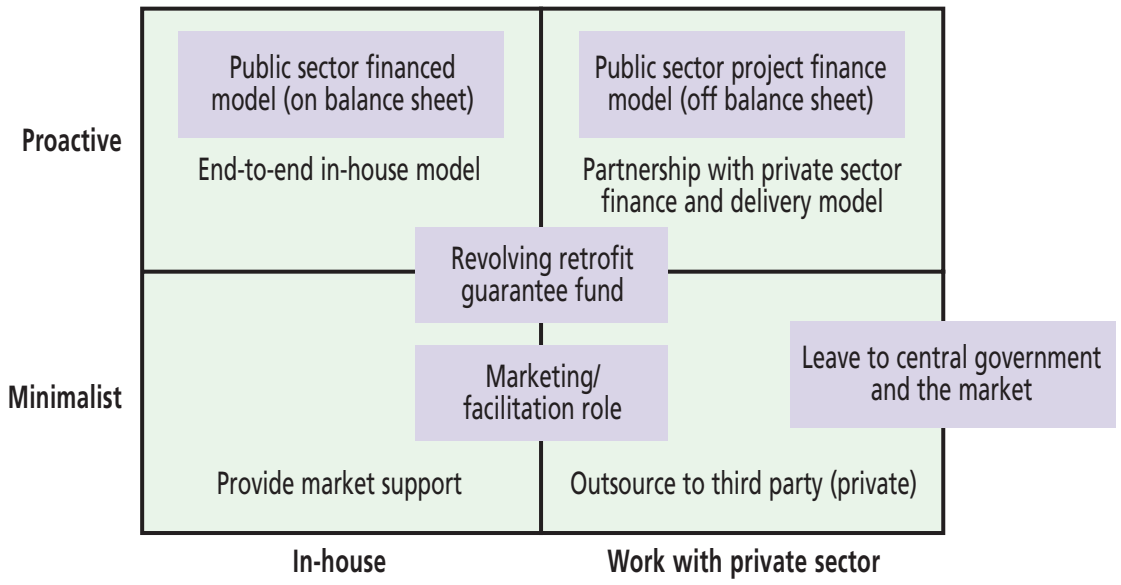
Current supplier obligation programmes – CERT and CESP

The government's current supplier obligation programmes (CERT and CESP in England, Scotland and Wales; NISEP in Northern Ireland) are delivered by the fuel supply industries and continue into 2012. The replacement programme will be called 'ECO' (Energy Company Obligation) and will complement the government's forthcoming Green Deal by being targeted at hard-to-treat homes and fuel poor households from later in 2013 (see page 26).

Carbon Emissions Reduction Target (CERT) funding

Planned to continue into 2012, CERT is available for social landlords to install a wide range of retrofit measures, providing they target households on benefits or with older residents (over 70 years old). About 43% of households are thought to be in the target groups, and schemes must achieve 40% of their savings from such households. There are special incentives to include hard-to-treat homes such as those needing external cladding or not on the gas grid.

Summary of green finance options



Source: Based on Energy Saving Trust *Review of local authority finance models for large-scale domestic retrofit* – www.energysavingtrust.org.uk/england/content/view/full/1404

In the first two years of CERT, it spent £2.2m on loft and cavity wall insulation, of which £1.9m was in England and the remainder in Scotland and Wales. Such insulation measures are attractive to energy suppliers because they provide the biggest reductions in emissions per £ spent (towards meeting their targets). However, the remaining potential for loft/cavity wall insulation in the social sector is limited, so suppliers may want to concentrate on private sector homes.

A comprehensive briefing paper on CERT is available from the EST: **www.energysavingtrust.org.uk/business/Global-Data/Publications/Carbon-Emissions-Reduction-Target-CERT-funding**

Community Energy Saving Programme (CESP)

CESP targets households in low-income areas across Great Britain to improve energy efficiency standards and reduce fuel bills. CESP is also funded by an obligation on energy suppliers. It is expected to deliver up to £350m of efficiency measures. 4,500 low-income areas are eligible (see **www.decc.gov.uk/en/content/cms/funding/funding_ops/cesp/cesp.aspx**).

CESP promotes a whole house approach – a package of energy efficiency measures for the individual property. The programme is delivered through community-based partnerships between local authorities, community groups and energy companies, on a house-by-house, street-by-street basis. Up to 400 schemes are expected to be carried out, benefiting around 90,000 homes and saving nearly 2.9m tonnes of CO_2 emissions. CESP is expected to deliver annual average fuel savings of up to £300 for participating households.

CESP started in September 2009 and the first 'live' CESP scheme was launched in Walsall in January 2010. By June 2011 there were over 150 live schemes. Landlords have until the end of 2012 to apply for funds.

Practice example

WM Housing Group in the West Midlands has set up a framework with eleven delivery partners, linked to energy company funding, in which the partners have already been selected using EU procurement procedures. The framework is open for use by other social landlords. The first to use it will be Whitefriars Housing, delivering a £6m CESP scheme in two areas of Coventry; Willenhall and Willenhall Wood.

Contact: Trevor Passingham, Assistant Director of Asset Management, on 024 7676 7144

Practice example

Leicester City Council has a major CESP scheme focused on its Saffron Lane and Braunstone estates, with 792 units of its own stock and (subject to take-up) adjoining right to buy properties. All have solid walls; the CESP scheme will provide external insulation, boiler replacement, heating controls and loft insulation 'top up' works. Of a total scheme

cost of almost £5m, three-quarters will be met by the CESP partner (E.ON UK Property Services) and the remainder from the council's capital programme. The winning partner offered CESP of £24.51/per tonne of CO_2, considerably higher than competing offers.

Since it began, the scheme has expanded to install solar PV panels on the roofs of 1,045 council dwellings (almost 1% of the city's stock). This is worth a further £0.74m in CESP funding. Additional carbon savings have enabled E.ON to offer free solid wall insulation to approximately 180 private home owners living in the CESP areas.

The work started in June 2011 and is due to end in September 2012.

Contact: Nick Morris, Head of Energy Services, **Nick.Morris@leicester.gov.uk**

Northern Ireland Sustainable Energy Programme (NISEP)

This is Northern Ireland's supplier obligation programme. From mid-2011, it includes a 'Cosy Homes' programme for housing associations, which provides:

- a grant of up to £1,000 towards heating and £150 towards insulation
- energy saving light bulbs
- energy saving advice for tenants.

Clearly, it is limited in scope and associations will need to combine this with other funding to undertake fuller retrofit schemes. For the latest information, see: **www.uregni.gov.uk/social_environmental/**

Feed in Tariff

The Feed in Tariff (FiT) provides a guaranteed income from micro-generation of electricity (e.g. from photovoltaic panels, domestic CHP or small-scale wind turbines) at a rate intended to provide an attractive investment. Every roof is potentially eligible for a solar PV installation that would attract FiT, although of course only a proportion of a typical stock has roofs that are readily suitable (south-facing, etc.).

FiT includes a basic payment for every unit of power generated locally (even if used on site), an additional payment for every unit exported to the electricity grid, and a proportion of free electricity for the occupier:

- the *generation tariff* pays for each kWh of electricity produced whether used by the tenant or fed back to the grid
- an *additional premium* is paid for each unit exported back to the grid
- *substantial savings* are also made for tenants by avoiding constantly rising costs on the proportion of the electricity they consume which is micro-generated.

Current tariff levels can be found at **www.government-grants.co.uk/feed-in-tariff.shtml#feedintariffs** but are under review at the time of going to press. Under the tariff levels in 2011, for a retrofit installation generating up to 4Kw the tariff was 43.3p per Kw, giving a possible annual income from the generation tariff of £1,434 and from the additional premium – £52, while providing savings to the tenant of about £243.

As capital costs of equipment fall, FiT is set to be reduced in stages (for new installations)

from 2012, but the revenue stream is supposed to be sufficient to recover the capital cost and financing of a PV installation in approximately ten years. FiT payments continue for 25 years, so the revenue stream can be deployed elsewhere for the remaining fifteen years, such as in other retrofit work.

However, the consultation on new FiT levels at the end of 2011 was controversial in imposing rapids cuts in the tariff and in setting a much lower tariff for multiple installation, 'aggregated' PV schemes of the kind often used by social landlords. It was also proposed to set a high standard for the primary energy efficiency of a home before it becomes eligible for FiT: the current position should be checked at the DECC website (see page 59).

Many landlords have used FiT to secure a proportion of zero carbon electricity for residents, reducing residents' fuel costs and also reducing the carbon emissions associated with their stock. For a solar PV installation, the electricity normally has to be consumed or exported as it is used, so savings to the tenant will depend on the extent to which they are at home in daylight hours. It is therefore vital in designing a FiT scheme to be clear what combination of benefits is being sought. A higher priority given to delivering free electricity to residents will result in a lower rate of return to the provider. Most providers will want to balance the benefits in order to secure resident support for schemes.

Some landlords have entered into partnerships with installers (making their roofs available in exchange either for 'roof rent' or for some of the FiT revenue); others have developed their own FiT-funded PV programmes. The balance of advantage appears to favour self-installation, but landlords will need to look at the options including partnerships with other social landlords to achieve economies of scale.

Practice example

Glasgow's FiT scheme

Glasgow Housing Association (GHA) is fitting solar panels to 500 of its homes to help tenants to save on their fuel bills. They are designed to cut the carbon footprint of the homes at the same time as providing free electricity during the day for residents. Tenants benefiting from free electricity use during daylight hours will save about £100 a year on their bills.

Through this scheme, GHA are contributing to Sustainable Glasgow – a partnership that aims to make Glasgow one of the most sustainable cities in Europe and reduce the cities $C0_2$ emissions by 30% by 2020. Tenants will be asked if they want to take part in the scheme before the panels are installed.

Any surplus income generated by the Feed in Tariff in GHA properties will be reinvested in GHA homes: **www.sustainableglasgow.org.uk/News/Pages/GHAcutscarbonfootprintandhelpstenantssavemoneyontheirfuelbills.aspx**

There is a review of Scottish social landlords' experience with FiT at: **www.energysavingtrust.org.uk/Publications2/Local-authorities/Funding-and-finance/Homing-in-on-Feed-in-Tariffs**

Renewable Heat Incentive

The Renewable Heat Incentive (RHI) is complementary to FiT in providing payments for heat-generating renewable energy installations. Qualifying technologies include biofuel boilers, combined heat and power (CHP), some heat pumps and solar water heating. There is, of course, no export tariff as there is with FiT as there is no grid to which to export.

RHI started in 2011 and £3m of the available funding is earmarked for social landlords. The website **www.rhincentive.co.uk/RHI/** has current details including tariff rates. The rate for solar water heating (SWH) is 8.5p/kWh for 20 years. SWH generates approximately 400 kWh/m^2/yr of heat, and a typical 4m^2 installation would therefore deliver 1,600 kWh/yr and produce £136/yr of RHI revenue.

Factors that housing organisations should take into account in considering RHI are similar to those for FiT. In a well-insulated and reasonably air-tight house, water heating imposes a bigger thermal load than space heating, and about half of that load can potentially be satisfied by SWH, with no associated fuel costs or carbon dioxide emissions.

Therefore, RHI-funded SWH can potentially provide a significant benefit, and it should be considered alongside FiT-funded solar PV installations, possibly in a combined programme. It is important not to allocate all the available roofspace for solar PV, thus eliminating the option of SWH.

Green Deal and ECO

The Green Deal is the keystone of a national low carbon retrofit programme for existing buildings, including dwellings in all sectors. It is the main measure aimed at achieving the government's interim target of a 34% cut in carbon dioxide emissions by 2020 by eventually retrofitting 14m homes and creating 250,000 jobs. Under the scheme, Green Deal providers will offer householders energy efficiency improvements to their homes, at no cost to the householders or landlords. They will recover their costs from charges levied on the householders' fuel bills, on a 'pay-as-you-save' (PAYS) basis, over periods of up to 25 years. The capital cost will be funded by the provider, not by government.

The Green Deal is complemented by ECO (the new 'energy company obligation'), intended to provide £1.3bn of extra help annually where needed. ECO will replace CERT and CESP (see page 22). Under it, energy companies will make two types of investment, and meet the costs from their own resources (i.e. they will be reflected in their overall charges to consumers). The two types of investment are:

- *Carbon saving*. If a house is 'hard-to-treat' and the householder cannot fully fund energy efficiency improvements through Green Deal alone, ECO will be able to provide supplementary funding. The energy company will be looking to achieve the biggest energy saving possible for every £ it spends, as its obligation is expressed in terms of reducing emissions (not spending a certain amount of money). The main focus is on properties with solid walls.

- *Affordable warmth*. This smaller component of ECO will be aimed at low-income and vulnerable households, to reduce their lifetime energy costs and tackle fuel poverty. This element is not currently planned to be available to social landlords.

Approved ECO measures are the same as those under Green Deal but the government expects the carbon saving element to focus on external wall insulation. ECO providers will have an incentive to link with the Green Deal because they can count the full carbon savings under a scheme, including the measures financed under Green Deal, towards their 'obligation' (the target they have to meet, imposed by government).

The Green Deal charges stay with the dwellings, not with the occupants, so if a resident moves and ceases to pay the fuel bills the financial obligation transfers to the next occupant. The Green Deal is not a conventional loan: the occupant is not liable for the full cost of the work, and the charge is only paid as the benefits are enjoyed. However, the dwelling is improved and its asset value is increased.

Key features of the Green Deal

There are eight key features of the Green Deal. The first and most important is that the expected fuel cost savings must be equal to or greater than the charges attached to the fuel bill. This is known as the 'Golden Rule'.

In addition:

- improvement 'measures' must be from a list of 30 'approved' ones, and the fuel costs savings must be those associated with the approved measures
- improvement measures applied to a property must have been recommended by an accredited adviser following a 'Green Deal assessment' (based on an Energy Performance Certificate – see page 51)
- measures must be installed by an accredited installer
- Green Deal providers must give householders appropriate advice under the Consumer Credit Act, based on individual circumstances
- providers must obtain the consent of all relevant parties, including the householder and the landlord
- any Green Deal charge on the property must be disclosed to prospective occupants along with the EPC
- fuel suppliers must collect Green Deal charges and pass them on to the relevant providers within the regulatory safeguards for collecting fuel bill payments, including protection for vulnerable customers.

Landlords will be allowed to become providers for their own dwellings and for dwellings owned by other landlords and owner-occupiers in their areas. If housing organisations do not themselves become providers, then it will be essential to form partnerships with local providers to gain access to Green Deal funds. Alternatively, Green Deal providers may offer works to tenants directly, with a landlord's permission, but of course this is bound to raise issues of 'who-is-responsible-for-what?' in terms of subsequent maintenance.

Note that PAYS funding will be 'off balance sheet' for landlords, because it will go to Green Deal providers and be recovered from residents via their fuel bills. However, the asset value of the dwellings will increase.

The Green Deal is planned to come into operation during the autumn of 2012; details were still under review as this **practice brief** went to press.

Practice example

Gentoo was one of five companies selected for a PAYS trial. The scheme saw 117 Gentoo homes retrofitted and an environmental charge placed against the property. A small increase in rent pays off the cost of the retrofit improvements, and it is intended that savings in monthly fuel bills will offset this. For those families on housing benefit the increase will be covered. Early results show that the planned savings are being achieved.

More information:
www.gentoogroup.com/News/It_PAYS_to_trial_green_energy

Guarantee funds

One of the main difficulties in funding schemes that either will produce revenue or will be eligible for a subsidy such as FiT, is how to raise the capital. Two sets of associations, one in England and one in Wales, are exploring the setting up of guarantee funds against which loans can be raised and which will reduce their cost.

Practice example

Radian is taking the lead in developing a revolving guarantee fund involving about 20 associations in the second phase of their Retrofit South East project. It benefits from the support of the 4% of the region's European Regional Development Fund (ERDF) that is available for retrofit work. The associations are likely to contribute part of the funding using planned maintenance programmes. The intention is to create an alternative route to retrofit funding that will stand alone from or complement the Green Deal.

Contact: Paul Ciniglio, Sustainability Manager
Paul.Ciniglio@radian.co.uk

In **Wales**, seven associations have worked with Community Housing Cymru to establish a guarantee fund that will initially be for solar PV retrofit work but can later be extended to other kinds of retrofit. The fund has been started with contributions from the seven member associations, and sources of capital are now being sought for the PV projects themselves.
www.chcymru.org.uk/chc_dev_final/key-issues/retrofit-revolving-guarantee-fund/en/background-information.cfm

Low Carbon District Heating

The Low Carbon Infrastructure Fund, now closed, financed sixteen low carbon heating projects, several of which used Energy Services Companies (ESCos). The Homes and Communities Agency (HCA) says that it will continue to support low carbon heating schemes as part of its normal funding. Its report *District Heating Good Practice: Learning from the Low Carbon Infrastructure Fund* has thirteen case studies.
www.homesandcommunities.co.uk/district-heating-good-practice-learning-low-carbon-infrastructure-fund

ESCos are themselves a way of providing low carbon heating in ways that are cost-effective. A number of local authorities have established or have partnerships with ESCos. They often use combined heat and power (CHP) and aim to recover the initial investment by selling energy to consumers.

Practice example

Leicester District Energy Company

Leicester has established an ESCo which is intended to deliver up to 6% of the council's carbon reduction target by providing more efficient heating to a range of customers, including 2,800 tenants and leaseholders. The scheme makes use of and links together six existing district heating schemes. New CHP units will generate electricity as well as providing heating. The scheme also takes in Leicester University and various council offices. There are plans to extend it to other public users such as the prison.

Contact: Debbie White, Project Manager
deborah.white@leicester.gov.uk

Mainstream funding

The normal sources of funding available to social landlords – although of course under severe pressure – may be appropriately used for retrofit work. In England this might be decent homes funding from the HCA (for social landlords), or it might be capital receipts or housing association business surpluses. Combining a landlord's own investment sources with FiT or RHI might provide an attractive return on investment. For English local authorities (and already for Scottish ones), the new freedoms in managing council housing finance after April 2012 could provide funding for retrofit work.

Social landlords are now expected to fund basic work such as loft and cavity wall insulation from their planned maintenance programmes, using the other sources of funding outlined in this chapter for more ambitious retrofit work or for properties (like those with solid walls) where cheaper methods cannot be used.

Practice example

Through a partnership with the HCA, **Norwich City Council** received £1.75m for a retrofit programme for more than 800 council homes, which included loft and cavity wall insulation, external wall insulation where required, new boilers and new, energy-efficient doors and windows. The standard aimed for was the current Building Regulations requirement for refurbishment, and the council aims to continue the programme using HRA funds and intends to 'future proof' the work by aiming for a higher insulation standard.

Contact: Justin Warnes, Investment Team Leader, **JustinWarnes@norwich.gov.uk**

Other funding sources

Various other schemes apply in particular administrations or are new sources of funding that are emerging:

- the Scottish Climate Challenge Fund assists community-based projects and has been used by housing associations **www.scotland.gov.uk/Topics/Environment/climatechange/howyoucanhelp/communities/ClimateChallengeFund**
- several sources of funding in Scotland are given on the EST website (see page 31) including:
  - Energy Saving Scotland offers 0% interest loans to help small and medium-size enterprises (SMEs), private sector landlords, and not-for-profit organisations to install measures that reduce energy consumption or to install renewable energy technologies
  - the Central Energy Efficiency Fund is available to local authorities for energy efficiency and micro-generation schemes
- ARBED is the strategic energy performance investment programme in Wales, which invested £30m in its first stage projects **http://wales.gov.uk/topics/environmentcountryside/energy/efficiency/arbed/?lang=en**
- projects in London may be eligible for the £100m London Energy Efficiency Fund **www.leef.co.uk/**

- EU funding sources include the European Regional Development Fund (ERDF) and ELENA (European Local Energy Assistance). Information on EU funding sources for energy efficiency projects is provided by the National Housing Federation. **www.housing.org.uk/services/funding_and_partnerships/european_funding/energy_funding.aspx**

- Tax Increment Financing (TiF) will soon allow local authorities in England to borrow against future business rates; it could potentially be used for retrofit. **www.guardian.co.uk/housing-network/2011/jul/11/tif-funding-boost-retrofitting?&**).

How to find out more

More information on the Green Deal as it develops can be found at:

www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx

Sustainable Homes has published a free 10-page guide for social landlords which can be ordered at: **http://green.sustainablehomes.co.uk/GDCS-landing-page/**

The Department for Energy and Climate Change web page for FiTs is: **www.decc.gov.uk/en/content/cms/meeting_energy/Renewable_ener/feedin_tariff/feedin_tariff.aspx**

CIH comments on the FiTs and Green Deal consultations can be seen at: **www.cih.org/policy/display/vpathDCR/templatedata/cih/policy/data/The_green_agenda**

The Energy Saving Trust has a web page on funding opportunities for local authorities and social landlords, with separate guides for the four parts of the UK **www.energysavingtrust.org.uk/business/Business/Local-Authorities/Funding**

Practice checklist: Financing retrofit

- ✔ how will you begin to fund a retrofit programme?
- ✔ have you reviewed the sources of finance available in your region?
- ✔ are you keeping up-to-date on the rapid developments in funding?
- ✔ if not, how will you do this?
- ✔ are you prepared for tenants asking for the Green Deal?
- ✔ have you considered forming partnerships with other providers, to source the best financial deals?

Microgeneration

What's the issue?

Microgeneration is the small-scale generation of heat or power for domestic use, often from renewable sources such as solar and wind. Microgeneration technologies in new developments will be essential to meet the government's target of all new homes being 'zero carbon' by 2016, as well as to contribute towards targets for the existing stock.

Here we explain the different options for small-scale generation of heat and/or power and set out likely costs and benefits associated with them.

Actual costs may vary significantly from one scheme to another. In some cases providers may be able to achieve efficiencies if the cost of work can be spread across a number of properties – or if, in a new development, microgeneration can be designed into plans from an early stage. Costs given here are intended only as a general guide.

Solar photovoltaic (PV) systems

What are they?

Solar PV systems, comprised of panels, wiring, isolator switches, invertors (a type of transformer) and safety equipment, use energy from the sun to create electricity for domestic use. Excess energy can be exported to the national grid. Off-grid systems may use battery storage but in the UK this is not usual.

When can they be used?

The panels can be installed on a building's roof, but only if it is strong enough to support them, orientated in the right way and not overshadowed by other tall buildings or trees.

They can also be mounted on 'A frames' for use on flat roofs or in circumstances where they can be free-standing.

What are the costs and benefits?

The most significant factor in determining the cost of a solar PV system is the amount of electricity it is capable of producing. The typical cost is around £2,200 – £2,300 for each kilowatt of electricity the system is able to generate at times of peak sunlight (kWp). An average system generates around 2kWp and costs around £5,000.

Over a year, a system of this size would typically produce about 50% of the total electricity a household requires, depending how much power the household uses in daytime.

Glasgow's FiT scheme (see page 25) is an example of a recent solar PV project. On page 33 is an earlier pilot project.

Practice example

Places for People worked on five properties in Whitechapel, Preston as a template for future energy efficiency work. The project was known as the TwentyFifty Whitechapel Project.

Solar panels were installed on each of the five properties. Each panel generates 1.04kWp. The cost of the panels was £7,350 per property in 2009.

They were fitted as one part of a retrofit package which also included the installation of a ground source heat pump and the distributing of energy monitors to tenants to encourage energy saving behaviour.

More information:
www.powerhouseeurope.eu/nc/cases_resources/case_studies/single_view/?tx_phecasestudies_pi3[id]=20

Solar water heating systems

What are they?

Solar water heating uses solar tubes or plates installed on a property's roof to collect heat from the sun's radiation and use it to heat water for domestic use.

When can they be used?

Like solar PV systems, solar water heating requires a roof that is orientated in the right way and receives direct sunlight for the main part of the day. Alternatively, tubes can be mounted on south-facing walls.

What are the costs and benefits?

Solar water heating is considerably cheaper than a solar PV system, the average cost is between £3,500 and £5,500.

A typical solar water heating system can reduce water heating bills by between £50 and £85 per year.

Wind turbines

What are they?

Wind turbines harness the power of the wind and use it to generate electricity. Like solar PV systems, excess energy can be exported to the national grid. Unlike solar, there has been a shift away from use of very small-scale wind power as smaller turbines may be less efficient, so their use should be considered carefully.

When can they be used?

The ideal site is on top of a hill with a clear exposure to the wind, free from obstructions like large trees or buildings. Small wind turbines suitable for urban locations are available providing the site is situated somewhere with a good wind speed, free from obstructions. Power is best converted from DC to AC as close as possible to the turbine to minimise losses.

What are the costs and benefits?

Costs will depend heavily on the scale of the installation. A roof-mounted micro-turbine costs around £2,000 and would generate between 1kW and 2kW of electricity. Slightly larger, free-standing turbines are likely to generate between 2.5kW and 6kW and cost between £15,000 and £24,000.

Hydro power systems

What are they?

Hydro systems use the energy in 'falling' water to turn a turbine and generate electricity. This could be water that is falling gently, for example a river, or steeply, as in a conventional dam.

When can they be used?

Small-scale hydro power systems can be used in developments situated close to a source of elevated water. The amount of electricity that can be generated depends on the speed of the flow.

What are the costs and benefits?

Costs are highly variable but a 5kW scheme, which is sufficient to generate enough electricity for an average household, might cost between £20,000 and £25,000.

Heat pumps

What are they?

Cold water or air is warmed using heat extracted from the ground, from water or the air.

In the case of a ground source heat pump, water is heated in underground pipes, known as a 'ground loop'. This heat is then used to power radiators, underfloor heating or to provide hot water. Air source heat pumps absorb heat from the outside air to heat radiators, underfloor heating systems, or warm air convectors and hot water in the home.

When can they be used?

Sufficient space and suitable ground is needed to install a ground loop.

What are the costs and benefits?

The cost of installing a heat pump is around £8,000 – £10,000. A ground loop costs between £1,000 and £2,500.

Once installed, there will still be running costs as the heat pump runs on electricity but, although performance can vary depending on factors such as their location, for every unit of electricity that is 'input' to run them, they can often generate an 'output' of up to three units of equivalent energy.

Practice example

In a scheme at Mersey Street in east Belfast, **Connswater Homes** installed a mechanical heat recovery ventilation system within each property. The system recovers heat from stale air in humid rooms like kitchens and supplies fresh, tempered air into the living rooms and bedrooms. The system has a facility to boost the ventilation rates via a light switch, sensor or humidistat in addition to a control panel located within each kitchen, which can be manually adjusted. The boost facility has an adjustable run-on timer set up to meet building control requirements.

More information:
housing@connswater.org.uk

Biomass boilers

What are they?

Biomass boilers provide heating from the burning of organic materials, such as wood chip, logs or pellets. Although some carbon dioxide is emitted when this fuel is burned, it is only equal to the amount that was absorbed by the plants previously. So as long as new plants continue to grow in place of those used for fuel and are burned locally to where they grow (to minimise emissions involved in transport) the process is much more sustainable than the burning of fossil fuels.

When can they be used?

The property will need to have a flue fitted, so that smoke can be channelled out of the building, and space to store fuel.

What are the costs and benefits?

Costs vary depending on the exact type of boiler used, but as an example, the cost of an automated pellet-fed boiler is around £11,500. Manually-fed boilers, or smaller stoves, which just heat a single room, are considerably cheaper.

Although a biomass boiler can significantly reduce CO_2 emissions, there is still a need to buy fuel for it so there may not be significant cash savings for the household operating it. This depends mainly on what form of heating is currently used. Replacing electric heating with a biomass boiler could save up to £390 per year in reduced bills but replacing gas heating, which is usually cheaper than electric, may not lead to a similar saving.

Combined heat and power (CHP) units

What are they?

CHP units generate electricity from the burning of either fossil or renewable fuels, whilst also capturing the heat that is produced as a bi-product of this process. They are more efficient than many conventional ways of generating electricity, where a large amount of heat is lost as steam.

When can they be used?

CHP units are most effective where there is some need for heat all year round, otherwise if heating is only needed in the winter, the CHP will only be able to operate during those months.

What are the costs and benefits?

CHP units vary considerably in terms of scale, but micro-CHP units can be small enough to replace an existing household boiler, meeting a single household's needs for hot water and also contributing to their electricity supply. These typically cost in the region of £6,000.

(See the Leicester example on page 29. Also see the Swan example on page 10.)

How to find out more

The following websites provide more detailed information on microgeneration:

The Energy Saving Trust:
www.energysavingtrust.org.uk/Generate-your-own-energy

DirectGov:
www.direct.gov.uk/en/Environmentandgreenerliving/Energyandwatersaving/Renewableandlowcarbonenergy/index.htm

The Microgeneration Certification Scheme:
www.microgenerationcertification.org

Solar Trade Association:
www.solar-trade.org.uk

British Hydropower Association:
www.british-hydro.org

Combined Heat and Power Association:
www.chpa.co.uk

Practice checklist: Microgeneration

- ✔ have you reviewed whether microgeneration would be a viable option for your stock?
- ✔ have you reviewed the options and the possible funding packages?
- ✔ are you keeping up-to-date with the rapid developments in this field?

Fuel poverty

What's the issue?

Fuel poverty is an important issue in greening your housing stock as it is likely to be one goal of any action you take and may well be a determinant of priorities, for example for retrofit. It is also a driver in government policy and programmes such as the Green Deal.

Fuel poverty exists when a household is unable to afford enough fuel for their home to be warm and well-lit because of their income and/or the energy inefficiency of their home.

There are three main factors that affect rates of fuel poverty:

- household income
- fuel prices
- fuel consumption.

Currently the government defines a household as 'fuel poor' when they need to spend more than 10% of their net income on energy bills in order to maintain an adequate level of warmth. This includes heating the home but also hot water and electricity. However, housing costs are not included in calculations.

In England the coalition government has commissioned John Hills to carry out a review of the way fuel poverty is defined and measured. In October 2011 Hills published an interim report which proposed an alternative definition of fuel poverty. It suggested that a household should be considered to be fuel poor if:

(a) they had required costs that were above the median level; and

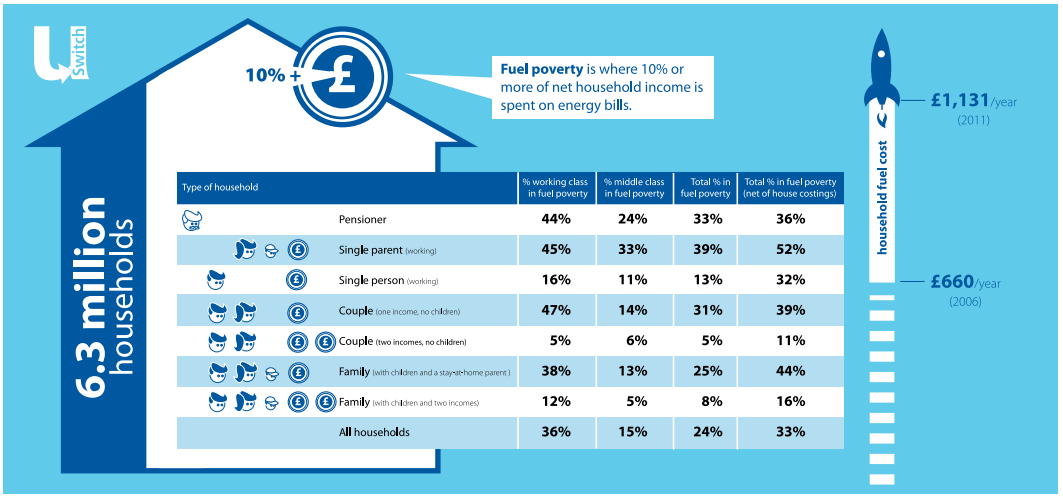
(b) were they to spend that amount, they would be left with a residual income below the poverty line.

Hills' final report will be published in 2012 and may lead to a change in the definition of fuel poverty in England, though the government is not required to accept his recommendations.

Current levels of fuel poverty

Based on the government's current definition, uSwitch estimates that in 2011 there were 6.3m households in the UK in fuel poverty. This represents almost a quarter of all households, who may struggle to meet essential costs such as that of adequately heating their home.

In the case of households that pay for their utilities through prepayment meters, there is an additional danger that a shortage of money for the meter could lead them to 'self-disconnect' leaving them temporarily without electricity or gas, even in the coldest months of the year (see the diagram on page 38).



Type of household	% working class in fuel poverty	% middle class in fuel poverty	Total % in fuel poverty	Total % in fuel poverty (net of house costings)
Pensioner	44%	24%	33%	36%
Single parent (working)	45%	33%	39%	52%
Single person (working)	16%	11%	13%	32%
Couple (one income, no children)	47%	14%	31%	39%
Couple (two incomes, no children)	5%	6%	5%	11%
Family (with children and a stay-at-home parent)	38%	13%	25%	44%
Family (with children and two incomes)	12%	5%	8%	16%
All households	36%	15%	24%	33%

Breakdown of UK households in fuel poverty

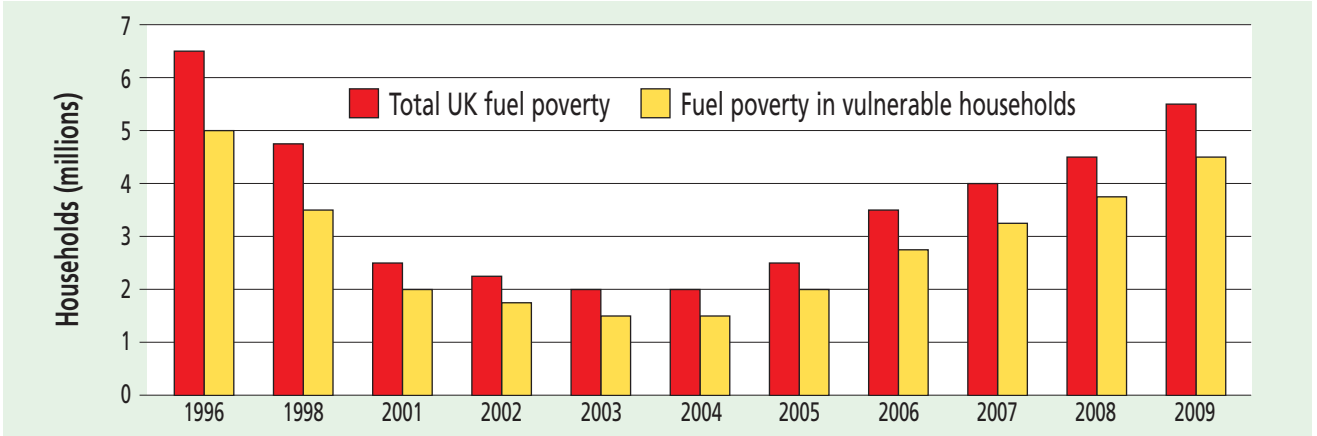
Source: www.uswitch.com

Devolved governments in different parts of the UK have set challenging targets for reducing fuel poverty:

- in England the government resolved to end fuel poverty, as far as reasonably practical, in vulnerable households by 2010 and eradicate it completely by 2016
- the Scottish Government committed to ensuring that, as far as reasonably practical, no one in Scotland is living in fuel poverty by 2016
- the Welsh Government resolved to end fuel poverty in vulnerable households by 2010 and ensure that, as far as reasonably practical, no households in Wales should live in fuel poverty beyond 2018
- in Northern Ireland the government committed to eliminate fuel poverty in vulnerable households and in social housing by 2010 and in all households by 2016.

However despite this, rates of fuel poverty in the UK are currently increasing and some of the earlier targets have already been missed. Figures published by DECC show that the number of households in fuel poverty has been steadily increasing since 2004.

Recent growth of fuel poverty in the UK



Source: DECC *Annual Report on Fuel Poverty Statistics 2011*

The main reason for the sustained increase since 2004 has been fuel prices. According to DECC, domestic electricity prices increased by 75% between 2004 and 2009, while gas prices increased by 122% over the same period. This trend looks unlikely to be reversed in the near future.

Rates of fuel poverty are monitored separately in England, Wales, Scotland and Northern Ireland, using similar methodology. The most significant difference is that in Scotland pensioners and long-term sick and disabled households are considered to require a higher temperature than other households in order to enjoy an 'adequate level of warmth'. This variation may explain Scotland's higher rate of fuel poverty compared to England and Wales.

However, the highest rates of fuel poverty are currently in Northern Ireland. The DECC suggests that this is due to a combination of lower average earnings and a higher proportion of off-gas-grid households who are forced to rely on more expensive fuels.

Country	Percentage of households in fuel poverty	Year of estimate
England	18%	2009
Scotland	33%	2009
Wales	26%	2008
Northern Ireland	44%	2008
All	21%	2009

Source: DECC *Annual Report on Fuel Poverty Statistics 2011*

Social housing and fuel poverty

Research by uSwitch shows that single parents, pensioners and working class households are most likely to be in fuel poverty.

These are all groups that are likely to be found in social housing and so social landlords are well placed to identify them and help tackle fuel poverty. This could be done by targeting households that either:

- meet the demographic profile of a household in danger of fuel poverty, such as tenants over 65
- appear to be in financial difficulty, such as those in rent arrears or those approaching the organisation for welfare or debt advice.

On pages 41-46 we explain how housing providers can engage with these tenants and help them to make changes to their behaviour, leading to lower fuel bills and reducing the risk of fuel poverty.

Reductions in fuel poverty benefit every one because they can:

- help people to keep warm
- increase disposable income
- reduce CO_2 emissions – as a result of improved energy efficiency
- reduce excess winter mortality – in part related to cold homes
- reduce cold-related illnesses
- enable more elderly people to live independently
- make it possible to release people from hospital to their homes more quickly
- reduce costs to the NHS
- reduce health inequalities.

How to find out more

DECC's annual report on fuel poverty can be found at:
www.decc.gov.uk/en/content/cms/statistics/fuelpov_stats/fuelpov_stats.aspx

The CIH publication *Housing, the environment and our changing climate* contains a more detailed chapter on *Fuel poverty – social issues and sustainability*. It is available from:
www.cih.org/thebookshop

Information on fuel poverty in each of the devolved administrations is also available online:

English Housing Survey:
www.communities.gov.uk/housing/housingresearch/housingsurveys/englishhousingsurvey/ehspublications/

Scottish House Condition Survey:
www.scotland.gov.uk/Publications/2010/11/23125350/0

Scottish Local Authority Report (containing fuel poverty statistics at local authority level):
www.scotland.gov.uk/Topics/Statistics/SHCS/LA0709

Living in Wales Survey:
http://cymru.gov.uk/topics/statistics/headlines/housing2010/1011261/;jsessionid=W3HrM2GVVS1wMnWjkmskL2BWnpTb1vXPr4xQZxzdpmsYXnkGZy7Y!-1406392113?lang=en

Northern Ireland House Condition Survey:
www.nihe.gov.uk/index/sp_home/research-2/house_condition_survey.htm

Practice checklist: Fuel poverty

- do your staff understand fuel poverty and how to identify people at risk?
- do you know the extent of fuel poverty among your residents?
- what steps are you taking to tackle it?
- how does this relate to your programmes for making your stock more energy-efficent?

Engaging with tenants

What's the issue?

Many of the initiatives covered in this **practice brief** relate to physical improvements to your housing stock to improve its energy efficiency; however the condition of the buildings themselves is not the only factor in determining their carbon footprint. Changing tenants' habits and behaviour is also crucial to successfully greening your housing stock.

Research suggests that many households are wasteful in their energy consumption. For example, every year TVs in the UK use £116m worth of electricity while left on standby. If all appliances currently left on standby were turned off we could take two power stations off the grid entirely.

Reducing this waste should be simple, but habits can be difficult to change as they are often deeply ingrained and are a result of unthinking, automatic behaviour, rather than conscious decision-making. Because most households only receive their bills every quarter, it is also easy to forget the importance of saving energy.

For this reason it is essential to engage with the tenants living in the properties you have worked on, to ensure that they get the maximum benefit from energy-saving measures.

Raising awareness and changing behaviour

One of the simplest ways to begin challenging this behaviour is to provide information to tenants about the energy-saving measures that have been installed in their home, along with advice about energy-saving behaviour.

The Energy Saving Trust (**www.energysavingtrust.org.uk**) has produced a set of top ten tips for households to stop wasting energy and money which could be reproduced or adapted for this purpose:

- turn your thermostat down – reducing your room temperature by 1°C could reduce your heating bill by 10% – and set your heating and hot water to come on only when required, rather than all of the time
- check that your water is not too hot – your cylinder thermostat should be set to 60°C
- close your curtains at dusk to stop heat escaping and check for draughts around windows and doors
- always turn lights off when you leave a room
- don't leave appliances on standby and remember not to leave laptops and mobile phones on-charge unnecessarily
- if possible, fill up the washing machine, tumble dryer and dishwasher: one full load will use less energy that two half-loads
- only boil as much water as you need
- fix leaking taps and make sure they are turned off properly: a dripping hot water tap wastes enough hot water in one week to fill a whole bath
- use energy saving light bulbs
- do a free home energy check, such as at **www.energysavingtrust.org.uk/proxy/view/full/165/homeenergycheck**

This generic energy saving advice can be communicated widely, such as by:

- including it in your existing published information, such as in your tenant handbook, on your website and in articles in your tenant newsletter or magazine
- incorporating it into other work designed to help tenants with their money, such as rent arrears visits and welfare/debt advice
- providing it to all new tenants at sign-up.

Practice example

Swan New Homes provides tenant packs to all its new tenants. These include a variety of useful energy-saving tips and other helpful sustainability-related information, such as sustainable shopping advice and information on public and other sustainable forms of transport. The tips cover all aspects of daily life, from closing curtains at dusk to stop heat escaping at night and waiting until you have a full load before using the washing machine, to advice on buying local and organic produce and nearby recycling options.

Tenants are also given The Energy Saving Trust's contact details should they require further information on home energy saving, climate change and other sustainability guidance.

More information:
www.swan.org.uk/sustainability/

Practice example

Orkney Housing Association have launched a project called Reducing Energy Growing Green which is aimed at helping residents reduce their energy use and in turn save on household bills and cut carbon emissions.

The project is encouraging residents to use alternative means of transport as well as giving them the opportunity to grow their own food. All tenants and shared owners received Reducing Energy Growing Green packs, which include leaflets on how to claim back the cost of bus journeys and a guide to home energy saving.

More information: www.ohal.org.uk/

However for tenants who are moving into homes that have been specially designed for energy efficiency, or who have received works to retrofit their existing home, this generic advice should also be supplemented with more tailored information about those energy-saving features and how to get the maximum benefit from them.

The cost of providing this information is comparatively small compared to the costs of the works in the first place, however without it you may not achieve the maximum possible reduction in your carbon footprint or get the best possible value for the money you have invested.

Remember that habitual behaviour can be very difficult to change and there is a danger that providing information on its own can lead to an

improvement in tenants' awareness but not a lasting change in behaviour. In order to be effective, key messages may need to be reinforced on more than one occasion and supported by evidence that behavioural changes really do have an effect.

Practice example

Worthing Homes and its partners have created an award-winning programme called Relish™ (Residents 4 Low Impact Sustainable Homes). In its initial phase the programme worked intensively with a small number of households to measure the impact of low-cost improvement works – such as draught stripping, gap filling and installing easy-to-use boiler controls and radiator panels – combined with education about energy-saving behaviour on their fuel bills. Whilst these works had a maximum budget of £6,500 per home, they found that over a year a household receiving both the improvement works and education enjoyed a reduction of £368 in their energy bills, nearly ten times the reduction experienced by a household that received only the improvement works.

To achieve this saving the households were not only given an advice pack but also attended monthly update meetings on their progress with data collected from smart meters to demonstrate how much energy key appliances used, and to allow the household to see at first hand the impact of their behaviour on consumption. Seven months after the end of the programme, all the pilot households have continued to make savings.

Worthing Homes is now applying these principles more widely. The organisation has acquired 159 properties from another provider which require significant improvement works. As well as including energy efficiency work, they are also delivering resident education whilst the work is being carried out. This has included training days for all of the supply chain and 'toolbox talks' – 'no Relish™ training, you're not allowed on site!'

Key aspects of the programme are:

- classification of all residents based on their historic energy use as:
  - good energy users
  - poor energy users – receptive to education
  - poor energy users – not receptive to education

  (This allows the organisation to tailor their communications to different groups and to prioritise poor energy users where maximum benefits can be realised.)
- a Relish™ demonstration flat, used to demonstrate the energy-saving features that will be installed
- distribution of energy meters and literature on saving energy to all residents
- all contractors working on the site have received Relish™ training and are expected to pass on information about energy efficiency to residents while they are carrying out their work: as a result, information about energy saving is delivered through a continuous dialogue with residents throughout the works.

More information: www.relish.org

Practice example

Cross Keys Homes is turning one of its new developments into a 'carbon challenge site'. As well as building the properties to high environmental standards, the Peterborough based housing association is encouraging residents who move into the properties to embrace an energy-efficient lifestyle by letting them on a Green Tenancy Agreement.

The agreement, currently being drafted, will include a specific expectation that tenants endeavour to adopt energy-saving behaviour, such as by:

- turning off unnecessary lighting
- using low-energy items and appliances, where possible
- not leaving electrical appliances in 'standby' mode
- ensuring that all energy-efficient bulbs are replaced with those of a similar type
- recycling all recyclable waste generated within the property.

The Green Tenancy Agreement will be supported by training and an explanatory booklet to support tenants to embrace this low carbon lifestyle.

More information:
www.crosskeyshomes.co.uk/main.cfm?type=GAGENDA

Practice example

Wakefield District Housing (WDH) is working with CIH to develop a new qualification called the CIH Award in Sustainable Living, which will develop the skills and knowledge of residents wishing to reduce their carbon footprint. CIH hope to make this qualification available to other housing providers in the future.

WDH is also carrying out energy efficiency roadshows to engage with tenants and help them maximise the benefits of green technology. Demonstrations are also given to tenants of properties where gas central heating has been installed for the first time in an effort to improve fuel-poor areas.

More information:
www.wdh.co.uk/community/climatechange/Pages/default.aspx

Practice example

Affinity Sutton has retrofitted 102 homes in a project called FutureFit. FutureFit Living is working with additional groups of residents so that some are receiving not only the works but also advice and support on how to live in the most energy-efficient way. A Resident Liaison Officer makes a visit to talk to them about energy efficiency and they are also given a welcome pack, including advice on energy-saving behaviour, and an energy monitor.

The organisation is now monitoring energy use in the households that received both works and advice and those that received only works or advice in isolation for one year, so that results can be compared.

They are also exploring opportunities to use their repairs operatives and contractors to deliver energy saving advice, such as by asking gas contractors to spend 10 or 15 minutes at the end of an appointment to carry out an annual service speaking to the tenant about how to use their boiler in the most efficient way.

More information:
www.affinitysutton.com/about_us/corporate_responsibility/environment_and_sustainability/our_homes/futurefit_project.aspx

Providing energy saving products

A further way in which housing providers can hope to influence behaviour is by providing tenants with useful products to help them save energy, such as energy-saving light bulbs, water-efficient shower heads or energy monitors.

Providing a small number of energy-saving bulbs to tenants free of charge, either once works are complete or when they move in to their new, energy-efficient home, can be an effective way of altering their buying habits so that they are more likely to purchase them again in future. Energy monitors can help to overcome one of the most significant obstacles to energy-saving behaviour, tenants' inability to 'see' the savings that are being made as a result of their changes. The website DirectGov (www.direct.gov.uk) estimates that people who fit home energy monitors typically find that their energy use drops by between 5% and 15%.

This does not necessarily have to come at a high cost to the organisation. For example, energy-saving light bulbs typically cost only £1 – £2 per bulb and many organisations may be able to acquire energy-saving products for free or for considerably less than their retail price through partnerships with suppliers or energy companies.

Overcoming tenant apathy

Tenant apathy can be a significant barrier to greening your stock.

For example in their FutureFit project, Affinity Sutton reported that even when energy improvement works were offered free of charge and from a trusted party, take-up was low and gaining access was an issue. They found that:

- a basic invitation to take part in a free eco-project sent to more than 800 residents resulted in only a 5% response rate
- out of nearly 300 phone calls made offering free energy upgrade works, 52% said no
- among those residents who initially agreed to the works, a further 23% later withdrew their permission.

Overcoming a lack of enthusiasm may be a significant challenge for providers that need to carry out improvements with residents in situ. It is likely that much work may be needed to raise the profile of programmes to green your housing stock, to promote the benefits of it and to publicise success stories, such as households that have saved money as a result of works.

This is likely to be most effective if focused on the benefits that works can have for tenants, such as a warmer, more comfortable home and possible lower energy bills.

How to find out more

This section builds on advice and guidance on engaging with residents in our previous **practice brief** *Greening your Organisation*. It is available from our website at

www.cih.org/thebookshop

Practice checklist: Engaging with tenants

- ✔ do you have a strategy to promote energy awareness among residents?
- ✔ what are the success stories you can sell?
- ✔ how will residents know if they are saving energy?
- ✔ have you looked at the imaginative ways other landlords have used to engage residents, and the obstacles they met?

Developing a strategy for your stock

What's the issue?

Many landlords begin to green their existing stock through piecemeal projects – pilot schemes, taking advantage of funding opportunities, etc. But a strategic approach is vital for several reasons:

- *achieving targets and assessing impact* – you should establish targets for improving the performance of your stock, and the strategy will be your tool for achieving the targets and monitoring progress
- *value for money* – if you have a certain amount of finance available, where and how would it best be spent?
- *worst first or easiest first?* – you need to make some hard decisions about the parts of your stock with lowest energy efficiency: do they have a long-term future and what's the right amount to invest now? If finance is limited, is it better to achieve some quick wins elsewhere?
- *new funding opportunities* – if you have a strategy, you are much better placed to take advantage of funding opportunities and defend the budgets you already have
- *asset management* – assuming you have an asset management strategy, energy efficiency and the investment required should be integral to it, otherwise it is incomplete and not fit-for-purpose.

The basis of the approach in this **practice brief** is that greening is an essential part of effective asset management, and therefore an important driver of planned maintenance and other aspects of the organisation's overall asset management strategy.

What it should cover

The essential strategic issues are these:

- *the context* – the organisation's overall environmental objectives, as discussed in the **practice brief** *Greening your organisation*
- *your overall approach to retrofit* – what will be the balance between quick action and longer-term work to achieve high energy efficiency standards?
- *objectives, standards and targets to be achieved* – consider a target, or more likely a stepped series of targets, to progressively upgrade your stock, taking account of other targets such as achieving the Decent Homes Standard
- *appropriate measuring tool or index* – based on appraisal of different measures and their appropriateness in your circumstances
- *current state of the stock* – based on available data and possibly sample survey work, using the adopted measure(s)
- *sources of finance and feasibility of securing funds* – see pages 21-31.
- *a programme to meet the adopted targets* – set in relation to available funding and within the wider asset management strategy, with clear responsibilities and programme dates
- *relationship to other asset management issues*
- *how and at what stages to engage with residents* – both as residents' groups and as individual customers (see previous section).

- *means to monitor progress against the programme and targets, including monitoring of properties in use* – to judge whether targets have been met and efficiencies have been achieved in practice, and if not what action to take.

Where indicated, some of these issues are covered in detail in other chapters.

Approaches to the work

It is worth thinking about your overall approach to the work at the outset, especially if you have trialled retrofit work with some pilot projects. There are intricate links between the standards that you aim for, the overall approach to retrofit that you adopt, the available finance and the timescales. All of these have to be set in the context of other refurbishment or energy-related work that you are doing as part of your asset management strategy.

Obviously, more ambitious standards will need more money and perhaps take longer to achieve. On the other hand, cheaper 'quick wins' may be easy to implement but not make a great deal of difference. In practice, your approach is likely to be a mixed one, based on the practicalities of what can be achieved with available resources and the imperatives of other parts of the asset management strategy. It is likely to be a combination of:

1. *Quick wins* – measures which save energy quickly and at low cost, such as draught proofing and low-energy light bulbs, that are either compatible with bigger schemes, respond to resident demands or where cost is not a big factor if changes are made later.
2. *Adapting existing planned programmes* – for example reroofing or installing new windows – to both raise energy efficiency standards to the required level and – if practicable – do the work in such a way that it facilitates major retrofit schemes later (for example, making new roofs larger to allow for future cladding of external walls).
3. *Major retrofit schemes* – raising the performance of the stock to your target standards over a period of time, with dedicated resource streams or taking advantage of government programmes.

You will need to revisit these initial decisions about your approach, of course, when you decide your actual programme.

Standards and targets – what is required?

Setting carbon emissions targets themselves is not straightforward. The high-level target for reducing UK emissions is 80% by 2050, and while this applies across all sectors it has been argued that, to achieve it, housing needs to make even higher savings – as they are more easily achieved in buildings than in, say, transport. Nevertheless the 80% target for housing is broadly supported; the implications for the sector overall (public and private) are set out in the UK Green Building Council (2008) report *Low Carbon Existing Homes*. The details of the UK target and how it breaks down, and the equivalents for the rest of the UK are set out on page 49.

Carbon reduction targets

The UK target is to reduce carbon dioxide emissions by 80%, relative to 1990 levels, by 2050. The interim target is a 34% reduction by 2020. In addition, the government is obliged by the Climate Change Act 2008 to set and meet five-year 'carbon budgets' towards meeting these targets. These have to cover three budget cycles (five-year periods) ahead.

In Wales, the Welsh Government has a target to reduce emissions by 3% annually from 2011, using a 2006-10 baseline, in areas of devolved responsibility. It also has a target to reduce all emissions by 40% by 2020.

The Climate Change (Scotland) Act 2009 sets a target to reduce greenhouse gas emissions by 42% by 2020 and 80% by 2050 (using a 1990 baseline).

The Northern Ireland Executive currently has a target to reduce emissions by 25% by 2025.

Part of the 80% reduction can be achieved by measures separate from the building fabric, e.g. greener electricity supplies and more efficient appliances. Also, the interim targets (see box above) provide a guideline for medium-term action, although of course the longer-term target needs to be kept firmly in mind in planning a retrofit programme, so as not to take action which makes it more costly or difficult to achieve later. The Committee on Climate Change, which advises the government on targets, has said that even to achieve the 2020 target 'most' homes will need loft and cavity wall insulation and two million homes with solid walls will need external insulation. In addition, there will have to be 'significant penetration' of renewable heat (see **www.theccc.org.uk/carbon-budgets/scenarios-to-meet-budgets**). To achieve the 2050 target, much more will of course be needed.

How are these targets reflected in regulatory standards?

Unfortunately, the regulatory requirements on social landlords are much more limited than these targets would suggest (see box on page 50). This effectively leaves landlords to set their own targets, against the higher-level national ones mentioned above.

The Energy Act 2011 gives powers to prevent **private** landlords from letting properties after 2018 that do not achieve an EPC level of at least 'E' (see page 51). From 2016, it also entitles private tenants to **require** landlords to do energy efficiency improvements. Although the standards do not apply to social landlords, they should aim to meet them and bring all 'F' or 'G' rated stock up to a higher level.

Current regulatory requirements for the existing stock

In England and Northern Ireland, there are no regulatory or other requirements to meet specific targets apart from the limited coverage in the Decent Homes Standard, so landlords have to set their own, taking into account the overall targets described above and relating them to their decent homes work.

In Scotland, the Scottish Housing Regulator monitors progress towards achieving the Scottish Housing Quality Standard (SHQS) through annual returns from registered social landlords and from councils. The SHQS stipulates a minimum SAP rating (see below) of 50 for gas-heated dwellings and 60 for other dewllings.

Similarly in Wales, the Welsh Housing Quality Standard (WHQS) stipulates a minimum SAP rating of 65 for all social housing stock. In Scotland, the minimum SAP rating stipulated for projects financed under the Affordable Housing Investment Programme is 65-70 for modernised housing.

The Scottish Government is working to develop a climate change standard for social housing that goes beyond the SHQS. Consultation on this is due out in 2012 and this standard will include more rigorous energy efficiency targets.

Standards and targets – what should we aim for?

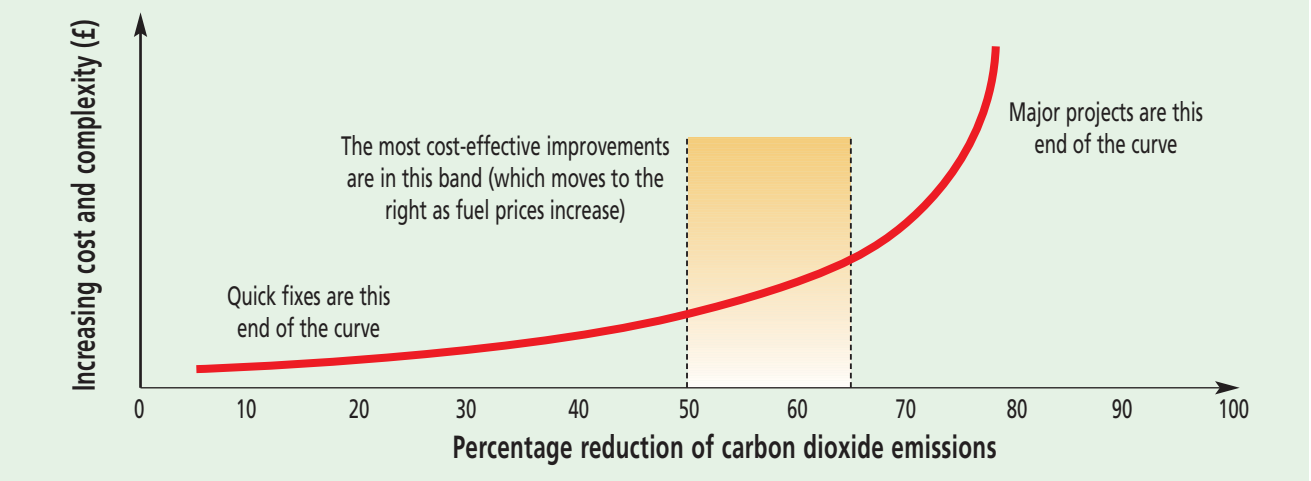
The HCA Green Homes Retrofit Manual Fit for the Future suggests four overall objectives for a strategy:

- higher resource efficiency – energy, water and waste
- reducing carbon emissions
- adapting and protecting stock against the impact of climate change
- reducing fuel poverty.

You may want to adopt some higher objectives like these to guide your strategy and ensure it achieves all your main aims, not just emissions targets.

The main problem in aiming for a very high target is inevitably cost. As the diagram on page 51 shows, costs and complexity both rise rapidly for targets above about 65%. This might suggest setting an eventual target for the fabric of most of the stock in the 60-65% range, while having a much higher target for new build and perhaps certain parts of the stock where achieving a very high target is cost-effective. Fitting a retrofit programme into an overall asset management strategy may also influence targets for different parts of the stock (see page 51).

How costs and complexity increase with higher emission targets



Source: *An Introduction to Low Carbon Domestic Refurbishment.* Construction Products Association (2010).

The strategy requires both overall target(s) and interim ones against which to assess progress. As well as setting upper level targets and steps to achieving them, it is useful to set minimum targets or thresholds that you aim to achieve, with the first being set over a short time-frame. For example, you might want to set a target minimum SAP rating across your stock, to be achieved over (say) the next two years, together with a commitment to reduce or eliminate fuel poverty among tenants by certain dates. Minimum targets will have to comply with the respective housing quality standards (see box on page 50).

Clearly, it also makes sense to spend the available funding so as to achieve the biggest emissions savings per £ spent, while at the same time not prejudicing your ability to achieve higher emissions targets later. For example, if a known amount of finance is available over (say) the next five years – other things being equal – it may be better to spend it on basic improvements to a lot of properties than to invest in achieving a very high standard in a few. You will need to balance out these factors in setting your lower-level targets.

Choosing an appropriate measuring tool or index

There are two prescribed measures of energy efficiency and some optional ones. The most basic assessment is the one associated with Energy Performance Certificates (EPCs). The industry-standard measure is, however, the Standard Assessment Procedure (SAP) rating. Here is a brief guide to the different measures.

EPCs

Energy Performance Certificates (EPCs) are required for any property which is to be let or re-let. They are also the basis for Green Deal assessments (see page 26). They are based on the Reduced Data SAP (see page 52). EPCs must be prepared by qualified Domestic Energy Assessors (DEAs), accredited through DCLG. DEAs can be independent contractors or in-house staff; in either case their work is monitored by their accreditation scheme.

The EPC banding system is a rough guide to the current state of the stock. It is similar to the rating of domestic boilers, ranging from 'G' (very poor) to 'A' (highly efficient). All your stock will need to be in the 'A' or 'B' bands to achieve the UK carbon reduction target.

SAP

The Standard Assessment Procedure (SAP) energy rating is a method of estimating the fuel use, fuel costs and carbon dioxide emissions in dwellings, based on the Building Research Establishment Domestic Energy Model. It is a reduced version of the National Home Energy Rating (see below), and assumes standard occupancy and a standard location for each dwelling being assessed. SAP ratings use sample surveys of dwelling types which are then 'cloned' across the stock. The aim should be to start with minimal SAP data and progressively strengthen it to obtain an accurate assessment for the whole stock. SAP software can also be used for comparative evaluation of improvement options (providing the base data are accurate, of course).

SAP is used for the statistical returns required in the four UK administrations, and to assess compliance with the Scottish and Welsh Housing Quality Standards.

Reduced Data SAP (RDSAP) is a reduced version of the full SAP in which 'least unlikely' default data are substituted for items that are difficult or time-consuming for surveyors to establish (e.g. floor insulation thickness, window area). Although RDSAP facilitates cost-effective energy surveys, it is less accurate than the full SAP, and less useful for evaluating retrofit options.

More information:
http://projects.bre.co.uk/sap2005/

National Home Energy Rating (NHER)

The main advantage of the NHER over SAP is that it takes account of location and also a wider range of energy uses in the home, and so is more accurate.

More information:
www.nesltd.co.uk/index.php

EcoHomes XB

EcoHomes XB is a desk-based self-assessment tool designed to:

- assess and monitor environmental performance of housing stock
- track improvements made during maintenance and minor improvements
- provide a constant monitor of performance against a benchmark
- help to prioritise maintenance and refurbishment works
- assist and guide overall performance.

It covers seven issues: management, energy, transport, pollution, water, health and wellbeing and waste. EcoHomes XB is really an overall approach to retrofit and is also the basis for the *Fit for the Future* guide.

EcoHomes XB: A guide to the methodology for existing buildings can be downloaded at:
www.sustainablehomes.co.uk/publication_detail.aspx?pid=5d4280ec-9d8a-42c3-82d7-f44598757eec

T-ZERO

T-ZERO is an interactive web-based tool which helps to identify optimal low-carbon solutions tailored to specific dwelling types. Establish a dwelling type, and T-ZERO will estimate its fuel bill and carbon footprint, then identify insulation, heating, and renewable energy options, based on a defined budget and refurbishment objectives.

More information: www.tzero.org.uk/

Assessing the current state of the stock

Crucial to the assessment of the existing stock is, of course, availability of reliable information on relevant performance aspects, such as the insulating value of existing walls. A stock condition survey is the ideal opportunity to do this, but if one is not scheduled then a combination of existing property records, possibly supplemented with sample surveys, may be sufficient at least to provide an initial picture. However, there is no substitute for comprehensive information on the stock as the strategy evolves, because past programmes may have had varying standards (e.g. in thicknesses of loft insulation) and access problems and other design snags may differ even within property types. These issues will not be evident from data which are 'cloned' from one property to another.

The aim should therefore be to get both an overall assessment of the environmental performance of the stock, and sufficient detail on individual property types to guide retrofit work. The EcoHomes XB tool, for example, requires the following data:

- age of property
- property type e.g. terrace, flat, etc.
- wall construction (this can be deduced from age and type if survey data is not available)
- roof insulation thickness
- boiler and heating controls type
- local authority recycling provision
- sanitary fitting types
- SAP rating (where a full SAP rating has not been calculated, a default SAP rating based on property age and type is supplied in the guidance document)
- location in respect of transport links.

The study should specifically identify 'hard-to-treat' houses that will need careful consideration in setting the strategy (see page 54).

After compiling an initial picture, the aim should be to create either a separate housing stock energy database, or to incorporate adequate energy data in an overall stock database used for asset management purposes.

Setting a programme to meet adopted targets

The HCA *Green Homes Retrofit Manual* includes (in section 3) a step-by-step approach to assessing the work that might be carried out and developing a programme that meets your targets. The steps can be summarised as:

- *steps that should have been taken already* – energy-efficient light fittings, 270mm loft insulation, etc – often with CERT or similar funding: identify any gaps in current/previous programmes
- *measures to be included in enhanced planned maintenance programmes* – such as low u-value windows and fitting high-efficiency boilers
- *more ambitious schemes to achieve higher (60-65%) carbon savings* – such as solid wall insulation – that may require special funding.

More guidance on the actual retrofit work is on pages 13-20. This chapter also discusses measuring the cost effectiveness of different measures, so you achieve the biggest savings with the available funds.

The key is to develop a new, more radical planned maintenance programme, in which environmental objectives weigh equally with others. The current programme will specify the standards to be achieved for all the key building components (roof, walls, kitchen, bathroom, windows, doors and heating) and how they will be met. The modified, retrofit-based programme will enhance these standards to reflect environmental objectives, and provide a modified timetable (linked to available resources) to deliver the targets set.

Relationship to other asset management issues

In addition to planned maintenance, there are other aspects of your overall asset management strategy that need to influence, and be influenced by, your retrofit programme and targets.

Decent Homes Standard (DHS)

Carrying out DHS work (or SHQS and WHQS in Scotland and Wales) provides a golden opportunity to increase specifications while keeping labour costs to similar levels. For example:

- specifying thicker insulation
- fitting the most energy-efficient ('A' standard) boilers
- raising window specifications to achieve lower u-values
- removing cold bridges where feasible
- specifying low-flow taps.

One reason for combining retrofit with this work is, of course, to avoid going into the same properties twice within a short time.

Practice example

Wakefield and District Housing is improving all of its 31,000 properties to the 'Wakefield Standard'. As part of the work, a basic retrofit of each property is carried out, which includes:

- installation of an A-rated boiler where an old boiler is deemed inefficient
- thermostatic controlled radiators
- electric shower
- low-flow taps
- dual flush toilets
- topping up of cavity and loft insulation.

The improvement work is due to be completed in April 2013 when an advanced retrofit will take place on all properties that require it. This project is expected to take four years to complete and will include:

- solar photovoltaic panels installed on properties being re-roofed
- installation of solar thermal heating that will provide warm water throughout the property
- external insulation for all non-traditional and brick wall properties.

The work is part of WDH's aim to become as carbon neutral as possible by 2016. The organisation has set aside £50m to achieve this target as part of the Climate Change Strategy, which was approved by the board in April 2008.

More information:
www.wdh.co.uk/community/climatechange/Pages/default.aspx

Maintenance standards

Can you make cost-effective, energy-saving improvements to your maintenance spec, again saving on labour costs by incorporating the changes in routine works? For example:

- when a boiler is replaced, make it the highest standard and replace the heating controls at the same time as the boiler
- if painting/repairing windows, consider replacement instead.

Building Regulations standards

Work to build or refurbish dwellings must comply with the Building Regulations (Building Standards in Scotland). They include energy efficiency requirements e.g. in the Building Regulations part L, which the government is in the process of strengthening. However, current requirements are still very basic and will not take you very far towards meeting ambitious targets.

Voids specification

Having an empty property enables you to consider:

- replacing bulbs with energy-efficient alternatives
- checking insulation to ensure it is to current standards
- considering more radical measures that are best done with no tenant being present.

Void inspections should include an energy performance checklist along with any further checks that are carried out. Void properties will require an EPC before re-letting if one is not yet available.

Demolitions and disposals

Asset management takes a long-term view of the viability of the stock against demand for different types of property in different localities. The strategy might have trigger points for considering disposal or demolition or rebuilding: these all need to take account of environmental issues and costs, alongside other criteria. The most economical answer for 'hard-to-treat' stock with poorest environmental standards might (for example) be demolition and rebuilding, not retrofit. More information is available on this from:

- Association for the Conservation of Energy's report *Hard to Treat Homes*: www.ukace.org/index.php?option=com_content&task=view&id=593&Itemid=77
- EST's tool for examining hard-to-treat options: www.energysavingtrust.org.uk/business/Business/Housing-professionals/Interactive-tools/Hard-to-treat-homes

Other opportunities

Other opportunities to check on energy performance arise in regular inspections of gas and electricity fittings. Replacing heating systems in properties may also be considered as a separate programme, e.g. because of a planned ESCo; micro-generation of power might be considered because of FiT (see page 24). The EST has produced a helpful guide to the 'trigger points' for various kinds of retrofit work (see the diagram below).

'Trigger points' for different retrofit opportunities

Measures to consider	Moving in or out	Extending	Loft conversion	Adding a conservatory	New kitchen	New bathroom	Re-roofing	Re-plastering	Replacing windows	Re-wiring	Re-flooring	New heating	Replacement boiler	Replacement hot water cylinder	Re-rendering
	Opportunity														
Wall insulation	■	■	□	□	■	■	□	■	□	■	■	■	■		■
Roof insulation	■	■	■	□	□	□	■	■	■	■	□	■	■	■	■
Floor insulation	■	■		■	■	□				■	■	■	■		
Heating controls	■	■	■	■	■	■		□		□		■	■	■	
Cylinder/pipe insulation	■	■	■	□	■	■	■			□	■	■	■	■	
Airtightness improvements	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Efficient ventilation	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Windows	■	■	■	■	■	■	□	■	■			■	■	■	■
Low energy lighting	■	■	■	■	■	■	■	■	■	■	□	□	□	□	■
Energy efficient applicances	■	■		■	■	□		□		■	□				

Key: ■ Good opportunity; □ Possible opportunity

Source: EST (2010) *Sustainable refurbishment*.

Following-through and monitoring progress

As with any other action plan, the strategy needs a clearly set programme with targets, arrangements for monitoring progress and set responsibilities for taking action if targets are not met.

Ensuring that energy-efficiency targets are not just theoretical but are actually achieved is vital, in part because a crucial factor is how the retrofitted home and any new devices are actually used, and how the property is subsequently managed and maintained. Some of the steps needed are these:

- residents are briefed about the proper use of installed systems from the outset, and at every change of tenancy; there is follow up to ensure that this is effective and any issues resolved
- repair and maintenance work does not affect key components such as insulation or air-tightness barriers
- building systems (e.g. heat pumps, ventilation systems) are serviced as required to maintain their intended performance
- the landlord's housing stock database is updated to include the specific environmental characteristics of the dwellings, e.g. materials, products and systems installed in them, and other information such as responsibility for roof-mounted solar PV systems
- the varying service lives of building elements (i.e. fabric, products and services, including renewable energy systems) and components (e.g. inverters in solar PV systems) are provided for in the asset management plan
- replacement materials, products and systems deliver energy and environmental performance at least equal to that of the original systems.

How to find out more

The EST has a range of tools and guidance for social landlords across the UK. This includes:

- the Housing Energy Management Matrix, which asks social landlords key questions about their strategies and aims to help them cover all the important issues
- guidance on surveys, types of databases and prioritising retrofit work
- detailed guidance on energy plans and targets
- ways of monitoring progress.

See **www.energysavingtrust.org.uk/business/Business/Local-Authorities/Social-housing**

Practice checklist: Developing a strategy

- ✔ have you decided your overall approach to the work?
- ✔ what objectives do you want to meet?
- ✔ how do these relate to national targets?
- ✔ what standards and measures will you adopt?
- ✔ have you properly integrated energy-efficiency work with your asset management strategy?

Glossary

CERT	Carbon Emissions Reduction Target
CESP	Community Energy Saving Programme
CHP	combined heat and power
CO_2	carbon dioxide
DEA	Domestic Energy Assessor
DECC	Department of Energy and Climate Change
DHS	Decent Homes Standard
ECO	Energy Company Obligation
ELENA	European Local Energy Assistance
EPC	Energy Performance Certificate
ERDF	European Regional Development Fund
ESCos	Energy Services Companies
EST	Energy Saving Trust
FiT	Feed in Tariff
kWp	kilowatt peak (a measure of the power of a solar electricity installation)
LED	light emitting diodes (lighting)
LZC	low or zero carbon
NHER	National Home Energy Rating
NISEP	Northern Ireland Sustainable Energy Programme
Pa	Pascals (a measure of air pressure)
PAYS	pay-as-you-save
PV	photovoltaic (as in Solar PV)
RDSAP	Reduced Data SAP
RHI	Renewable Heat Incentive
SAP	Standard Assessment Procedure
SHQS	Scottish Housing Quality Standard
SMEs	small and medium-size enterprises
SWH	solar water heating
TIF	Tax Increment Financing
WHQS	Welsh Housing Quality Standard

Finding out more

Chartered Institute of Housing
www.cih.org

Committee on Climate Change
www.theccc.org.uk

Construction Products Association
www.constructionproducts.org.uk/

Department of Energy and Climate Change
www.decc.gov.uk/

Energy Efficiency Partnership for Homes
www.eeph.org.uk/

Energy Saving Trust
www.energysavingtrust.org.uk/

Existing Homes Alliance
www.existinghomesalliance.org.uk/
www.existinghomesalliancescotland.co.uk/

Passivhaus
www.passivhaus.org.uk

Sustainable Homes
www.sustainablehomes.co.uk/

The Carbon Trust
www.carbontrust.co.uk/

Zero Carbon Hub
www.zerocarbonhub.org/

Chartered Institute of Housing

The Chartered Institute of Housing (CIH) is the professional body for people involved in housing and communities.

We are a registered charity and not-for-profit organisation. We have a diverse and growing membership of over 22,000 people – both in the public and private sectors – living and working in over 20 countries on five continents across the world.

We exist to maximise the contribution that housing professionals make to the wellbeing of communities. Our vision is to be the first point of contact for – and the credible voice of – anyone involved or interested in housing.

Swan New Homes

Superb Developments by Swan New Homes

Streamlight
London

Streamlight Tower · 9 Province Square · London · E14 9PE

High specification 1, 2, 3 bedroom apartments in a 24 storey tower in Docklands with fantastic views of the city and the River Thames.

Call Now: 0800 542 7558
www.streamlighte14.co.uk

Indigo Apartments
Romford

1 Autumn Court, Spring Gardens, Romford, Essex. RM7 9BN

A modern development of 1, 2 & 3 bedroom apartments to meet the busy lifestyles of today's young professional homeowners.

Call Now: 0800 083 8632
www.indigoapartments.co.uk

Beechwood Village
Basildon

10 Churchill Avenue, Basildon, Essex. SS14 3SG

1 & 2 bed Apartments & 2, 3 & 4 bed Houses. With our new product EZIBUY* - buy 100% of your home for 85% of the price.

Call Now: 0800 019 5005
www.beechwoodvillage.co.uk

Oldchurch Park
Romford

Oldchurch Road, Romford, Essex, RM7 0BE

Oldchurch Park by Swan New Homes is a brand new development of stylish contemporary 1-5 bedrooms properties.

Call now to register 0800 819 9390
www.oldchurchpark.co.uk

Swan New Homes

swannewhomes.co.uk

All prices correct at time of going to press. Photography and CGI are indicative only. *subject to scheme rules on selected homes only.