WWF

REPORT

SCOTLAND

2010

Conservation | Climate Change | Sustainability

Maximising the Minimum: The need for minimum energy performance standards in private housing

Minimum standards for energy performance in private housing
May 2011

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WWF works to create solutions to the most serious environmental challenges facing our planet, for a future where people and nature thrive. One of the biggest challenges we're tackling is climate change. As Scotland's housing accounts for 25% of Scotland's carbon emissions, we're committed to finding ways to reduce its impact.

CONTENTS

REDUCING GREENHOUSE GAS EMISSIONS

The experience of the new-build sector demonstrates the dramatic difference which regulation makes in driving emissions reductions. Similarly bold regulation should now be utilised for existing homes and this ambition ought to frame the Scottish Government's formulation of their approach to Section 64 of the Climate Change Act.

EXECUTIVE SUMMARY

Context – the need for minimum standards

Under the Climate Change (Scotland) Act 2009, greenhouse gas emissions in Scotland must be reduced by 42% by 2020 and by 80% by 2050. Homes account for a significant proportion of emissions (even without electricity, the residential sector contributed 14% of total emissions in 2008), so the sector will need to make a significant contribution to the achievement of these targets.

Although no sector-specific target has been set, *Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010–2022* (Scottish Government, 2011a) envisages a 36% reduction in residential emissions (excluding electricity) on 1990 levels by 2020.

Along with the other devolved administrations, the Scottish Government also has the responsibility to address fuel poverty, and has a target to eliminate fuel poverty as far as is reasonably practicable, by November 2016 (Scottish Executive, 2002). The most recent data, however, suggests that the number of households in fuel poverty is rising rather than falling.

80%
EMISSIONS REDUCTION REQUIRED IN SCOTLAND BY 2050

In order for these targets to be delivered, it is now clear that a step-change is required in the implementation of domestic energy measures. Alongside the existing support available, the introduction of the Green Deal and new Energy Company Obligation could play a significant role in delivering this step-change. However, experience from the new-build sector in the UK and experience gained in other countries, suggests that further regulation is now necessary if the climate change and fuel poverty targets are to be met.

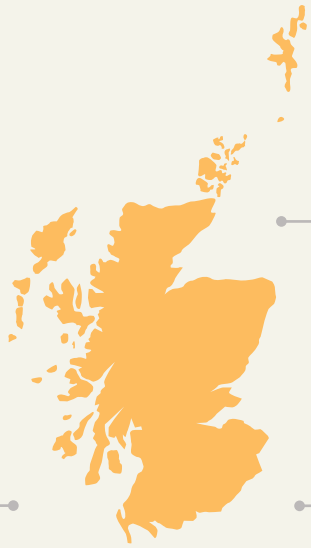
This position was recognised in the Climate Change (Scotland) Act 2009, which includes enabling powers for the introduction of regulation for existing homes. The Scottish Government published its report *Regulation of Energy Efficiency in Housing*, in March 2011, setting out the Government's approach to these powers (Scottish Government 2011b). The report makes clear

36%
IS THE REDUCTION IN RESIDENTIAL EMISSIONS ON 1990 LEVELS BY 2020 ENVISAGED BY THE SCOTTISH GOVERNMENT

the government's intention to use regulation where necessary to supplement support and advice. It also states that regulation should cover both rented and owner-occupied housing, and sets out a process to prepare for regulation.

Since the publication of *Carbon Countdown for Homes* in 2008, WWF Scotland has called for the introduction of minimum standards for energy performance for all private sector housing, with the standards escalating over time so that the housing sector can make the contribution which will be necessary if Scotland is to deliver its climate change targets. In *Carbon Countdown for Homes*, minimum standards were presented as a central measure in a balanced package of support, finance, regulatory and fiscal measures.

DELIVERING CHANGE



REGULATION
measures to regulate standards for existing homes will help realise reductions in carbon emissions already achieved by the new build sector

GREEN DEAL
meaningful financial package to fund energy efficiency improvements

ENERGY COMPANY OBLIGATION
additional financial support for the fuel poor and hard-to-treat homes

SECTION 64
Section 64 of the Climate Change (Scotland) Act provides powers for introducing minimum standards

EPC ASSESSEMENTS
Energy Performance Certificates rate a house's energy performance on an A-G scale. They are already required at point of sale and rental.

LOCAL AUTHORITIES
will have an enforcement role though most compliance can be achieved through existing processes i.e. conveyancing, landlord registration.

Purpose of this study

WWF Scotland commissioned CAG Consultants to carry out this study which is intended to supplement and inform the Scottish Government's own analysis and make a clear and reasoned argument for robust minimum standards. Some research in this area has already been carried out and some experience has been gained elsewhere. The purpose of this study is to draw together the existing evidence and experience and analyse the options in conjunction with key stakeholders in order to provide clear and persuasive recommendations for the Scottish Government.

Role of minimum standards

The provisions in Section 64 of the Climate Change (Scotland) Act provide an opportunity for the Scottish Government to introduce regulation which demonstrates a clear grasp of the challenges which need to be faced and the opportunities available, and which can act as an exemplar for the other UK administrations and internationally. There is a need to gear up for a large scale programme of whole-house energy packages, facilitated and incentivised by the Green Deal and other support, but backed by regulation which will play a key role in driving emissions reductions.

If regulation is simply utilised to 'fill the gaps', i.e. ensure the insulation of the remaining unfilled lofts and cavities, then we would argue that there is serious risk of the residential sector failing to make the necessary contribution to the emissions reductions needed by 2020 and beyond. Regulation will need to play a role in driving improvements even in hard-to-treat properties where expensive measures are involved. The experience of the new-build sector demonstrates the dramatic difference which regulation could make. Similarly bold regulation for existing homes should now be utilised and this ambition ought to frame the Scottish Government's formulation of its approach to Section 64 of the Climate Change Act.

Recommendations

Based on the research presented in this report, we make the following specific recommendations for the introduction of minimum energy standards in Scotland:

The Standard

1. From 2015, all homes being sold or rented which fall into bands F and G on the Energy Performance Certificate (EPC) should be required to be uprated to band E or above. A trajectory should also be set for the standard to increase towards 2020, with the 2020 standard acting as an 'aspirational standard', i.e. allowing property owners to achieve the standard earlier than required and adopt whole-house approaches should they choose to. Figures from the Scottish Government's housing energy model suggest that to achieve a 40% reduction in emissions from housing by 2020, the vast majority of houses would need to be at band C or above by 2020.

2. Scottish Government should work with the UK Government to ensure close integration between the Green Deal and EPC assessment processes to avoid duplication, minimise costs to householders and ensure direct links between the measures identified by the EPC process and the funding available through the Green Deal and Energy Company Obligation (ECO).

3. Scottish Government should work with DECC and Ofgem to ensure that the current additionality rules relating to CERT do not apply under the ECO. This will allow regulation to act as a lever for increased Green Deal and ECO spend in Scotland, rather than a barrier to such spend.

4. The upcoming recast of the European Directive covering EPCs provides the opportunity to make the system a suitably robust mechanism for the implementation of regulations. This should include changing the methodology so that it is sensitive (a) to the very wide range of housing and construction types in Scotland, and (b) to the very significant climatic variations across the UK.

Finance and Support

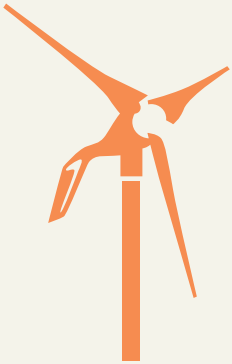
5. The Green Deal and future ECO, alongside other measures, will be critical to the acceptance and success of regulation. Once the arrangements for the Green Deal and ECO have been finalised, Scottish Government will need to examine what further finance and support will be needed, to incentivise a large scale programme of whole-house packages. This might include, for example, shifting the balance from basic measures (as in HIS and UHIS, for example) towards grants and loans for

more expensive measures, particularly solid wall insulation. In addition, the UK Government should give consideration to extending the Landlords Energy Saving Allowance (LESA) for private rented homes to help incentivise whole-house approaches in the private rented sector.

6. Scottish Government should closely monitor the level of energy savings being achieved by the regulation in conjunction with other measures over time and adjust its financial support for energy efficiency as necessary to keep emissions reductions on track towards the 2020 target. In particular, it will be imperative to ensure that the package of subsidies and financial incentives alongside regulation is helping to drive genuine whole-house approaches to improving energy performance.

7. Scottish Government should ensure that the awareness raising and support associated with the introduction of the standards, to emphasise the financial benefits of compliance, so as to encourage compliance even outside of these triggers.

8. The provision of sufficient finance and support mechanisms will be critical in minimising negative consumer reaction and this would be one of the principal benefits of aligning regulation with the Green Deal.



Scope

9. Although there is a higher percentage of homes with poor energy performance in the private rented sector, the regulations should apply to all private housing, i.e. private rented and owner-occupied homes, in order to:

    i. ensure equity across the housing sector;

    ii. achieve emissions reductions on a scale which is commensurate with the climate change and fuel poverty targets; and

    iii. accommodate the high percentage of mixed tenure domestic buildings in Scotland, where cooperation between householders is necessary for the implementation of many measures.

10. Multiple trigger points will be needed in order to ensure widespread application of the standards. They should include:

    i. point of sale, transfer and change of title;

ii. during extension/refurbishment, linked to existing requirements under Building Regulations; and

iii. point of rental, landlord registration and change to council tax.

11. 'Hard-to-treat' properties will need to make a very significant contribution to the emissions reductions needed by 2020 so exemptions from the regulations need to be avoided, whilst allowing some flexibility for the hardest-to-treat or most sensitive properties. Instead, ongoing work is needed to ensure that planning policy is consistent with the challenges of climate change and to mainstream the measures for hard-to-treat homes, particularly solid wall insulation.

12. The standards for private sector housing and the energy aspects of the Scottish Housing Quality Standard (SHQS) need to be aligned in order to avoid difficulties in mixed tenure buildings.

Enforcement, Capacity and Skills

13. Local authorities will need to play an enforcement role with regard to the private rented sector. Concerns regarding their capacity to play such a role, and carry out their existing related regulatory activities in relation to the private rented sector, need to be addressed.

14. Tenants could also play a significant role in the enforcement process. To encourage this, passing on information regarding the standards and the benefits of compliance, should be a requirement for landlords.

15. At point of sale, buyers and sellers will be informed of the regulation through the conveyancing process. Solicitors will assist with compliance with the regulation and enforcement for any non-compliance will rest with the local authority. This is similar to the process for implementing the EPC requirement. Flexibility should be allowed, such that the buyers can take responsibility for carrying out the upgrade requirements within 12 months. A further enforcement mechanism will be needed to account for these instances. Local authorities will need to be responsible for ensuring that the EPC is updated following completion of the measures, and it will be important to ensure that the costs of carrying this out are incorporated within the upgrade requirements so that the enforcement function can be properly resourced.

16. The Government's work, in association with partners, on the low carbon economy, needs to give urgent consideration to the capacity of industry to deliver the large scale programme of upgrades which are needed in Scotland. In particular, consideration needs to be given to skills, quality assurance and the supply of materials and technologies.

Minimum standards of energy performance clearly have a role to play as part of a package of measures to tackle climate change emissions and eradicate fuel poverty. This report sets out how effective regulation can be introduced which helps householders save money, does not place undue burden on owners, landlords or tenants, or on regulatory authorities while at the same time moving Scotland's homes up the scale towards low and zero carbon. This bold approach is necessary to make meeting Scotland's ambitious climate change targets a reality.

1. INTRODUCTION

1.1 Background

Section 64 of the Climate Change (Scotland) Act 2009 stipulates that the Scottish Government must, by regulations, (a) provide for the assessment of the energy performance of homes and the associated carbon emissions, and (b) require home owners to take the steps identified by such assessments to improve their performance and reduce emissions[1].

As required by the Act, the Scottish Government published its report, *Regulation of Energy Efficiency in Housing*, in March 2011, setting out the Government's approach to these powers (Scottish Government 2011b). The report makes clear the government's intention to use regulation where necessary to supplement support and advice. It also states that regulation should cover both rented and owner-occupied housing, and sets out a process to prepare for regulation. The report is accompanied by an analysis of the impacts of regulating energy efficiency standards in the domestic sector.

42%
SCOTLAND'S TARGET FOR GREENHOUSE GAS EMISSIONS REDUCTION BY 2020

Since the publication of *Carbon Countdown for Homes* in 2008, WWF Scotland has called for the introduction of minimum standards for energy performance for all private sector housing, with the standards escalating over time so that the housing sector can make the contribution which will be necessary if Scotland is to deliver its target of reducing greenhouse gas emissions by 42% by 2020. In *Carbon Countdown for Homes*, minimum standards were presented as a central measure in a balanced package of support, finance, regulatory and fiscal measures.

WWF Scotland has commissioned CAG Consultants to carry out this study which is intended to supplement and inform the Scottish Government's own analysis and make a clear and reasoned argument for robust minimum standards. Some research in this area has already been carried out and some experience has been gained elsewhere. The purpose of this study is to draw together the existing evidence and experience and analyse the options in conjunction with key stakeholders in order to provide clear and persuasive recommendations for Scottish Government.

1.2 Approach

As well as analysing the existing evidence on minimum standards for energy performance in private housing (a bibliography is provided at the end of this report), the study has sought the views of key stakeholders. This was achieved principally through a stakeholder workshop which was held in Edinburgh in December 2010. The following organisations were represented at the workshop:

EDINBURGH STAKEHOLDER WORKSHOP 2010

CHANGEWORKS ROYAL INSTITUTION OF CHARTERED SURVEYORS (RICS) SCOTLAND CONSUMER FOCUS SCOTLAND SCOTTISH RURAL PROPERTY & BUSINESS ASSOCIATION FRIENDS OF THE EARTH SCOTLAND SCOTTISH BUILDING STANDARDS EDINBURGH WORLD HERITAGE CITY OF EDINBURGH COUNCIL SCOTTISH GOVERNMENT EDINBURGH UNIVERSITY ORKNEY ISLANDS COUNCIL WWF SCOTLAND HISTORIC SCOTLAND NATIONAL FEDERATION OF PROPERTY PROFESSIONALS SUSTAINABLE DEVELOPMENT COMMISSION SCOTLAND NATIONAL LANDLORDS ASSOCIATION ENERGY SAVING TRUST

A report on the findings from the workshop is available separately. The workshop report was circulated for comment to those who attended the workshop as well as to a wider range of organisations who were unable to attend.

The purpose of the workshop was to:

1 Brief stakeholders on the policy context for the introduction of minimum standards for energy performance for private housing in Scotland and summarise the previous research on the subject.

2 Rigorously examine the practicalities of the various options for introducing minimum standards for energy performance in private housing.

3 Identify areas of agreement between different stakeholders and identify key areas for further research.

The data gathered from existing documentation and from key stakeholders was further supplemented by some modelling work using the Scottish Government's domestic energy model, DEMScot[2]. This was utilised, in particular, to explore the emissions reductions and costs associated with different approaches to the potential scope of regulations. The findings from this modelling work are incorporated in the report.

1.3 Policy and regulatory framework

1.3.1 Climate change and fuel poverty targets

The Climate Change (Scotland) Act 2009 creates the statutory framework for greenhouse gas emissions reductions in Scotland by setting an interim 42% reduction target for 2020 and an 80% reduction target for 2050. The provision for minimum standards in housing is one of many provisions made in the Act to enable delivery of these very demanding targets.

ZERO

UK GOVERNMENT STATES THAT EMISSIONS FROM HOMES NEED TO BE AT OR NEAR ZERO BY 2050

The Scottish targets sit alongside UK Government targets for reducing emissions in the home. The UK Government says that by 2050, emissions from homes need to be almost zero. *The UK Low Carbon Transition Plan*, published by the Labour government in 2009, aims to cut emissions from homes by 29% on 2008 levels by 2020, a target that was re-stated by the new coalition government in the proposals for the Green Deal. A more systematic and comprehensive approach to improving domestic energy efficiency is envisaged in the Plan, including, for example, all homes having lofts and wall cavities insulated where possible by 2015.

Table 1.1 sets out Scotland's key targets for emissions reductions alongside those of the UK Government. Scottish Government has not set a specific emissions reduction target for the housing sector. However, given that homes account for such a significant proportion of emissions (even without electricity, the residential sector contributed 14% of total emissions in 2008), the sector will need to make a significant contribution to the targets. The Scottish Government's report, *Low Carbon Scotland: Meeting the emissions reduction targets 2010–2020*, which sets out how the Government plans to achieve the 2020 target, envisages a 36% reduction in residential emissions (excluding electricity) on 1990 levels by 2020. The section on Homes and Communities includes the introduction of minimum standards for private housing as a proposed enabling measure.

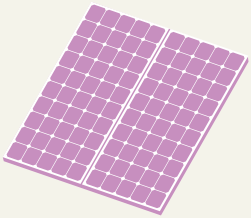
Along with the other devolved administrations, the Scottish Government has the responsibility to address fuel poverty. The Scottish Fuel Poverty Statement was published by the Scottish Executive in August 2002. The Statement has a target to eliminate fuel poverty, as far as is reasonably practicable, by November 2016 and achieve a 30% reduction from the 2002 figures by 2006. However, the latest statement, published in November 2010, suggests that, particularly due to rising fuel prices, levels of fuel poverty have increased significantly. In 2009, an estimated 770,000 households (representing 32.7% of total households) were in fuel poverty, compared to 293,000 households (representing 13.4%) in 2002 (Scottish Government, 2010d). Data from the

TABLE 1.1 UK GOVERNMENT AND SCOTTISH GOVERNMENT TARGETS ON CLIMATE CHANGE AND ENERGY

SCHEDULE	UK GOVERNMENT	SCOTTISH GOVERNMENT
Emissions reduction by 2050 on 1990 levels	80%	80%
Emissions reduction by 2020 on 1990 levels	34%	42%
Emissions reduction from homes by 2020	29% on 2008 levels	36% on 1990 levels (excluding electricity*)

*Although not stated as a target, the Draft Report on Proposals and Policies refers to this figure as being achievable based on the policies and proposals put forward (Scottish Government, 2010f.)

Scottish House Condition Survey shows clearly the connection between low levels of energy efficiency and increased likelihood of fuel poverty. Regulation of energy performance could therefore play a critical role in helping to address fuel poverty.



1.3.2 Existing and proposed regulation

As well as the provisions for minimum standards in the Climate Change (Scotland) Act 2009, the UK Energy Bill includes enabling powers for the introduction of regulation in the private rented sector after 2015 'if a review shows that voluntary improvements have not been made under the Green Deal' (DECC, 2010a). Under these provisions, if the Secretary of State considers that regulations are necessary and will not adversely impact on the supply of properties in the sector, landlords would be required to install measures requested by tenants or local authorities for which there is funding available through the Green Deal or Energy Company Obligation (ECO), ensuring there is no upfront financial cost to the landlord. The regulations could also require local authorities to request improvements to the worst performing properties.

There is, therefore, some overlap between the powers in the Climate Change Act and the powers in the Energy Bill but the powers in the Act provide the opportunity for Scottish Government to introduce regulation which is wider in scope, since the provisions are not restricted to the private rented sector. Furthermore, the powers in the Energy Bill are discretionary, whereas those in the Climate Change Act are not.

A number of related regulations are already in place:

Building standards for new build
The energy standard was raised significantly in October 2010, and is to be raised further in 2013 and 2016 with a view to achieving net zero carbon homes by 2016/17. In addition, a sustainability standard is under development that aims to set optional higher levels of carbon and energy targets, include wider aspects of sustainability, and clearly recognise developments that meet or exceed the 2010 standards.

Building standards for extensions and upgrades
The energy aspects of these standards were also raised in 2010.

Tolearble standard
This is effectively a public health intervention which specifies a very basic standard of acceptability for homes, which can be enforced by local authorities. It includes a requirement for a basic level of insulation.

Scottish Housing Quality Standard
The Scottish Housing Quality Standard is a set of criteria which local authorities and registered social landlords must ensure they meet by 2015. It is based on a number of broad quality criteria, one of which is energy efficiency.

Energy Performance Certificates (EPCs)
EPCs were introduced in response to the European Directive on the Energy Performance of Buildings. EPCs are mandatory for all homes being rented or sold, but implementing the recommendations is voluntary.

1.3.3 Supporting and enabling measures

There is a very wide range of existing and planned measures to support and enable improvements in domestic energy efficiency.

ECO
IN 2012 A NEW ENERGY COMPANY OBLIGATION WILL FOCUS ON FUEL POVERTY AND HARD-TO-TREAT HOMES

At the UK level, these include:

- the **Carbon Emissions Reduction Target** (CERT), which requires the main energy suppliers to achieve domestic emissions savings through providing for energy saving measures in people's homes. CERT will run until 2012 before being replaced by a new **Energy Company Obligation** (ECO), which is expected to focus more on fuel poverty and hard-to-treat homes. It should be noted that CERT is currently structured so that the improvements funded are additional to what is required by regulation. Introducing minimum standards without reform of this aspect of the supplier obligation could result in Scotland losing investment. We are aware that Scottish Government has already raised this issue with DECC and it will need to be addressed in relation to the private rented sector regulation proposed in the Energy Bill. If the additionality rules

were amended, regulations could act as a significant lever to attract higher levels of supplier funding for Scotland than has historically been the case;

- alongside the new Energy Company Obligation (ECO), in 2012, the UK Government will introduce the **Green Deal**, in which households will receive energy efficiency measures from participating providers and will pay back the costs over time through the savings they make on their energy bills;
- the **Community Energy Savings Programme** (CESP), a smaller scale pilot scheme in which the main energy suppliers provide a range of energy measures to properties in low income neighbourhoods as part of an area-based, whole-house approach. CESP will conclude in 2012;
- the **Feed-in-Tariff** (FiTs), in which energy companies pay a guaranteed price for electricity generated from renewable sources, and the **Renewable Heat Incentive** (RHI), a similar mechanism for renewable heat; and
- the **Landlord Energy Saving Allowance** (LESA), which is a tax allowance (not a cash payment) that allows landlords to claim up to £1,500 against tax every year for the costs of buying and installing certain energy saving products for their rented properties. The products covered include cavity wall insulation, loft insulation, solid wall insulation, draught proofing, hot water system insulation and floor insulation. The availability of this allowance is due to end on 1 April 2015.

At the Scotland-level, supporting measures include:

- the **Energy Assistance Package** (EAP), which seeks to provide energy efficiency improvements and benefits checks to the fuel poor in Scotland;
- the **Home Insulation Scheme** (HIS), which provides supplementary funding to CERT to allow free and low-cost insulation measures to households in Scotland on an area-by-area basis;
- the **Universal Home Insulation Scheme** (UHIS), which provides universally free loft and cavity wall insulation to households in Scotland on an area-by-area basis;
- the **Energy Saving Scotland Home Loans Scheme**, which

FIGURE 1.1 POLICIES AND PROGRAMMES TO IMPROVE THE ENERGY EFFICIENCY OF HOUSING **Source:** Scottish Government (2010b).

SCOTTISH GOVERNMENT PROGRAMMES		UK GOVERNMENT/ ENERGY SUPPLIER		LOCAL GOVERNMENT/ LANDLORD PROGRAMMES	
DEMAND LED	AREA BASED	DEMAND LED	AREA BASED	DEMAND LED	AREA BASED
Energy Assistance Package Energy Saving Scotland Advice Centres Home Renewables Grant† Boiler Scrapage† Home Loans Pilot Energy Efficiency Design Awards	Home Insulation Scheme Universal Access Home Insulation Climate Challenge Fund	Carbon Emission Reduction Target (CERT) Feed in Tariff (FIT5) Renewable Heat Incentive (RHI) Green Deal/Energy Company Obligation (under development)	Community Energy Saving Programme (CESP)	Council Tax discounts Increase local uptake of Scottish & supplier schemes	Private Landlord Accreditation Scheme Energy Saving Scotland Small Busines Loans

WIDER SCOTTISH GOVERNMENT POLICIES - STANDARDS AND REGULATION
Building standards for new homes and extensions and for equipment such as replacement boilers and windows being updated in 2010.
Energy Performance Certificates
Scottish Housing Quality Standard (SHQS)
Powers to regulate all homes for energy efficiency
Planning: permitted development rights; support for microgen and low carbon district heating in SPP and NPF2

†These schemes are no longer accepting new applications.

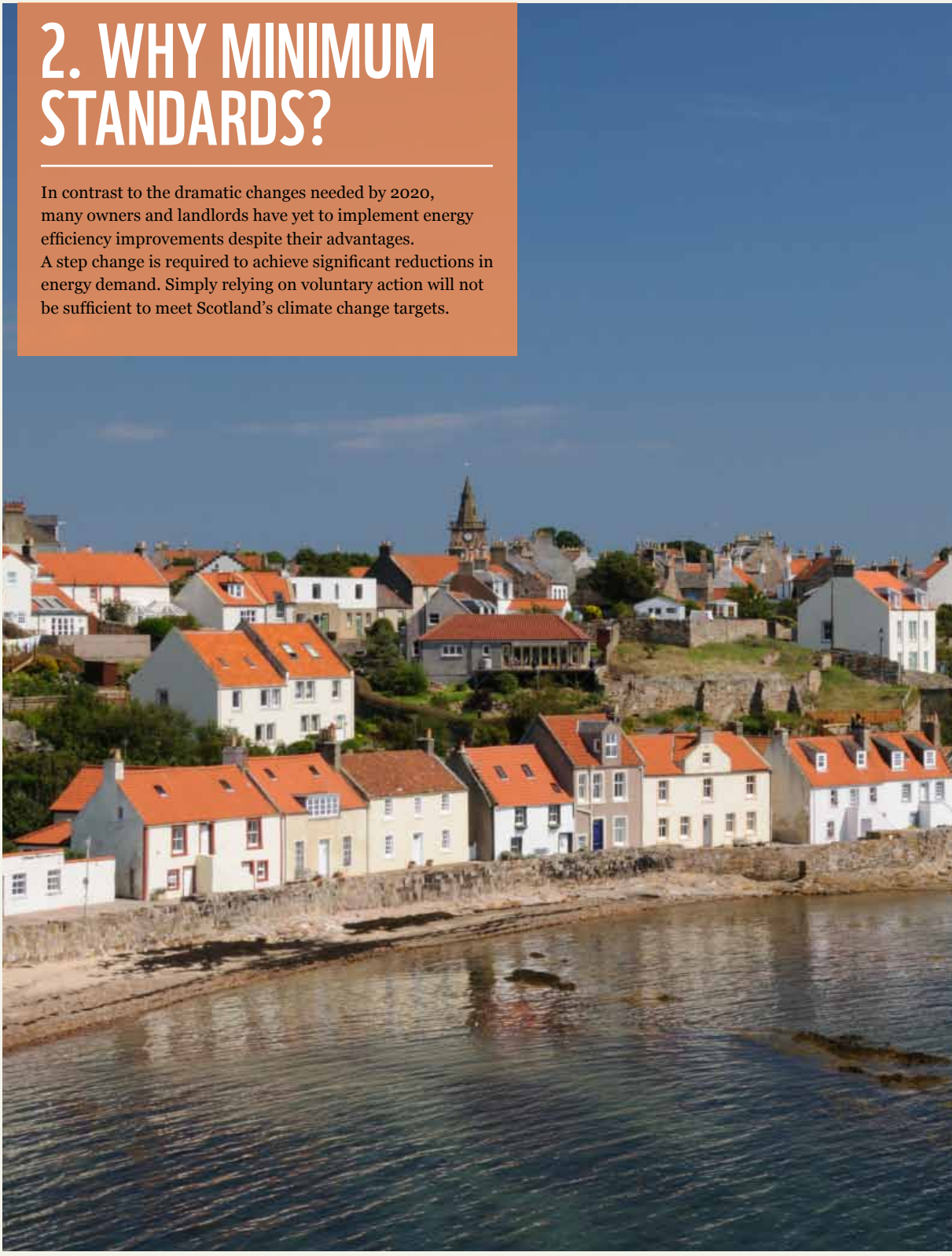
provides zero-interest loans of between £500 and £10,000 for insulation, heating and microgeneration measures for households in Scotland which are within an area covered by a HIS or UHIS;

- **Energy Saving Scotland Small Business Loans**, 0% fixed rate small business loans of £1,000 to £100,000 to help businesses install renewable energy technologies or measures that reduce energy consumption; and
- the **Energy Saving Scotland Advice Centres**, which provide advice, as well as signposting and administering grants scheme.

Conserve and Save (Scottish Government, 2010b) includes a useful diagrammatic overview of current policies and programmes to improve the energy efficiency of housing and this is shown opposite.

2. WHY MINIMUM STANDARDS?

In contrast to the dramatic changes needed by 2020, many owners and landlords have yet to implement energy efficiency improvements despite their advantages.
A step change is required to achieve significant reductions in energy demand. Simply relying on voluntary action will not be sufficient to meet Scotland's climate change targets.



THE NEED FOR A STEP-CHANGE

The DEMScot model demonstrates the dramatic improvements in the energy performance of Scotland's homes which are needed by 2020. One of the scenarios developed by the consultants who tested the model was based on the most cost-effective package of upgrade measures to achieve a 40% emissions reduction from housing from a 2005 base by 2020 (see appendix B for details). This is referred to as the '40% by 2020' scenario in the remainder of this report.

2.1 The need for a step-change

We have utilised DEMScot to provide an indicative profile of the energy performance of the housing stock in 2020 under this scenario[3]. As can be seen in table 2.1 and figure 2.1, almost all of the housing stock is improved to energy band A, B or C by 2020, with a small tail in band D and a tiny proportion of residual properties in bands E and F. The 'base case' figures included below are for the unimproved housing stock in 2009[4].

TABLE 2.1 INDICATIVE ENERGY RATINGS FOR THE HOUSING STOCK AS A WHOLE IN 2020 UNDER THE 40% BY 2020 SCENARIO APPLIED TO WHOLE HOUSING STOCK

RATING	BASE CASE (2009)	40% EMISSIONS REDUCTION (2020)
A	0%	7%
B	4%	52%
C	54%	31%
D	28%	7%
E	10%	1%
F	1%	1%
G	2%	0%

FIGURE 2.1 INDICATIVE ENERGY RATINGS FOR THE HOUSING STOCK AS A WHOLE IN 2020 UNDER THE 40% BY 2020 SCENARIO APPLIED TO WHOLE HOUSING STOCK

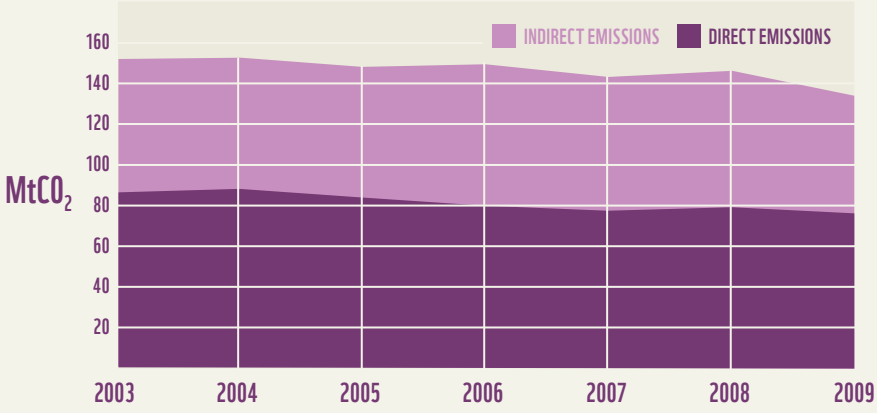
In contrast to the dramatic changes needed by 2020, the consultation on *Conserve and Save* noted that despite the advantages associated with energy efficiency improvements, many owners and landlords have yet to implement them and suggested that a 'step-change is required to achieve significant reductions in energy demand' (Scottish Government, 2009a, p.56). In the light of this and of the need for 'the energy efficiency of Scotland's homes and the extent of use of low carbon equipment needing to increase very significantly in a relatively short period of time' (p.78), it acknowledged that simply relying on voluntary action by householders and landlords may not be sufficient to meet Scotland's climate change targets. The responses to the consultation also demonstrated significant support for the introduction of standards (Scottish Government, 2010a).

'A STEP-CHANGE IS REQUIRED TO ACHIEVE SIGNIFICANT REDUCTIONS IN ENERGY DEMAND' (SCOTTISH GOVERNMENT)

The need for minimum standards is reinforced by data from the UK level. The Committee on Climate Change (2010), in its second annual progress report, suggest that there has been significant progress in installing basic home insulation measures but that the overall pace of progress in reducing residential CO_2 emissions is slow relative to what is required by the climate change targets. The Committee suggests that although there was a 7% fall in residential emissions in 2009, only a small percentage of this fall is attributable to energy efficiency measures. Instead, it suggests that the fall can largely be attributed to the recession and rising fuel prices. Between 2003 and 2008, only very modest annual reductions were achieved and some years witnessed small increases, as can be seen in figure 2.2. The trajectory for emissions reductions to 2022 required under the Committee's scenarios compared to the current trajectory is shown in figure 2.3.

The Committee on Climate Change therefore argue that a step-change is required in the implementation of domestic energy measures, particularly cavity wall and solid wall insulation (see figures 2.4 and 2.5). To achieve this it suggests that standards for minimum levels of energy performance should be considered, alongside the provision of additional incentives. It views minimum

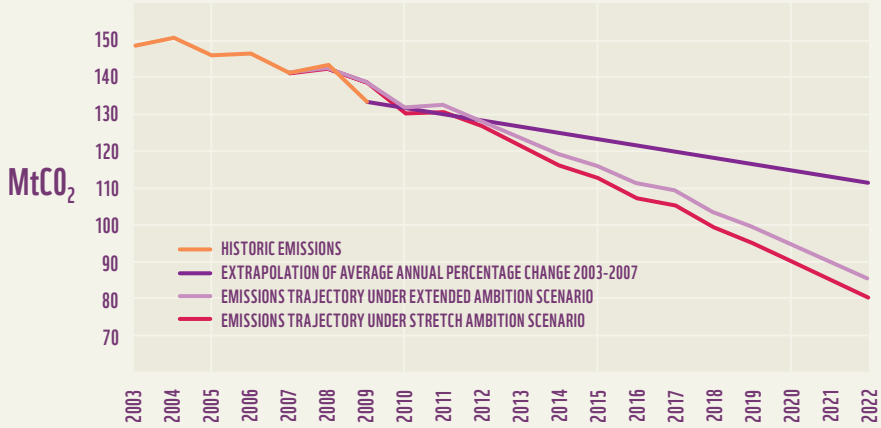
FIGURE 2.2 RESIDENTIAL CO_2 EMISSIONS (2003-2009)



Source: Committee on Climate Change (2010).

Note: 2009 emissions are provisional and based on consumption of electricity from power stationsonly.

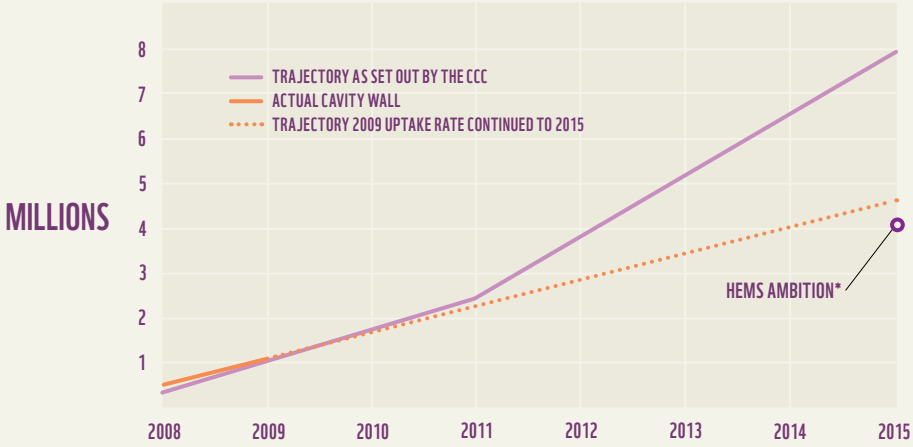
FIGURE 2.3 RECENT RESIDENTIAL CO_2 EMISSIONS AND REDUCTIONS REQUIRED UNDER CCC SCENARIOS (2003-2022)



Source: Committee on Climate Change (2010).

Note: 2009 emissions are provisional and based on consumption of electricity from power stationsonly.

FIGURE 2.4 CAVITY WALL INSULATION CUMULATIVE INSTALLATIONS (2008-2015)

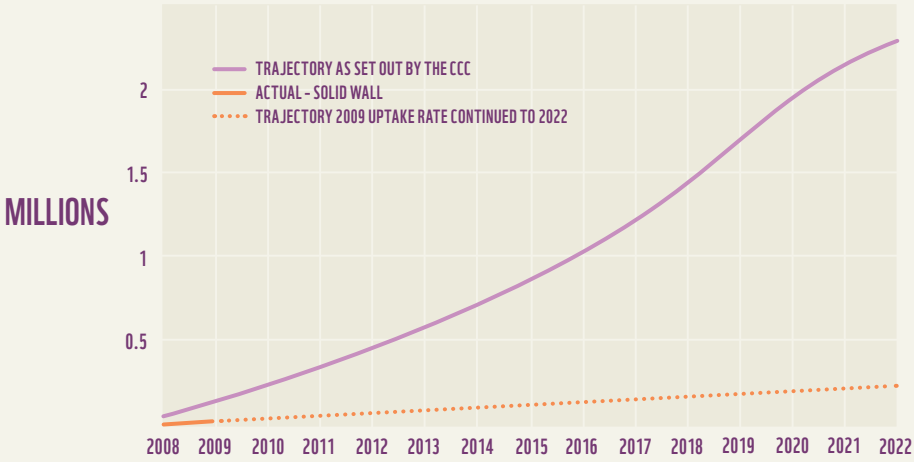


*DECC has clarified its ambition to insulate all lofts and cavities where practicable by 2015 (the HEMS ambition). DECC is aiming at 85% and 75% of all lofts and cavities respectively. (Committee on Climate Change, 2010. p,89.)

Source: Committee on Climate Change (2010).

Note: 2009 emissions are provisional and based on consumption of electricity from power stationsonly.

FIGURE 2.5 SOLID WALL INSULATION CUMULATIVE INSTALLATIONS (2008-2022)



Source: Committee on Climate Change (2010).

Note: 2009 emissions are provisional and based on consumption of electricity from power stationsonly.

standards as being particularly important in the case of hard-to-treat homes, where the cost of retrofit means that the 'Pay as you Save' approach proposed in the Green Deal will, it suggests, be an insufficient incentive in many cases (Committee on Climate Change, 2010, p.93).

Other countries have also found a reliance on voluntary action insufficient to deliver significant emissions reductions. The example of Denmark is described on page 32.

2.2 The example of the new-build sector

A number of commentators point to the use of regulation in the new-build sector as an exemplar for driving up the energy performance of existing homes, arguing that providing a clear trajectory for improving standards has provided clarity and certainty to house-builders and related industry, allowing them to plan ahead to achieve the major performance improvements required in cost-effective ways. The Existing Homes Alliance, for example, state:

'The Zero Carbon Homes target has focused the new build sector to invest, plan, develop supply chains and deliver low carbon housing at a clear trajectory towards its 2016 target. Regulation has given certainty on future standards and a specific timetable and this is a key lesson for the retrofit agenda.'

The clarity for business has come from clearly outlining milestones and the ambition... This has enabled the industry to plan for how they will deliver zero carbon homes. Different build types were tested as a result and this has led to the mainstreaming of lower carbon homes and cost reductions have been achieved in the process. This process should be adopted for the existing housing sector to drive the improvements and delivery of deep low carbon refurbishment.' (*Existing Homes Alliance*, 2010, p.29.)

2.3 The role of regulation

New forms of financing and financial incentives, particularly the Green Deal and ECO, may increase the take-up of energy measures. However, the scale and speed of the emissions reductions necessary demonstrate that regulation will need to play a significant role in driving take-up, particularly of the more costly measures. If regulation is simply utilised to 'fill the gaps', i.e. ensure the insulation of the remaining unfilled lofts and cavities, then we would argue, based on the figures presented above, that there is serious risk of the residential sector failing to make the necessary contribution to the emissions reductions needed by 2020 and beyond. As highlighted by the Committee on Climate Change, regulation will need to play a role in driving improvements even in hard-to-treat properties where expensive measures are involved.

Although regulation of existing homes presents different challenges, the experience of the new-build sector demonstrates the dramatic difference which regulation could make. Similarly bold regulation for existing homes should now be utilised for existing homes and this ambition ought to frame the Scottish Government's formulation of its approach to Section 64 of the Climate Change (Scotland) Act.

Case study: Denmark's experience of regulation

Denmark has the longest experience of any country of implementing energy performance standards for buildings. This has been through building regulations covering new buildings and renovation/extension of existing building, and through energy labels.

Energy rating labels on buildings were introduced in 1979. Since 1997, Denmark has required energy rating labels on all new and resale domestic and commercial buildings. Buildings are divided into three groups for rating purposes: large, small and industrial. Denmark was the first country to institute the European Energy Performance Certificate mechanism. The labelling report consists of a label (A to G) with individual recommendations on how to reduce energy consumption (as in the UK). The Danish label however is more detailed in that the rating has separate scales for electricity, heating and water. The cost of labels for dwellings is 650 Euros (Togeby et al. 2009).

In 2008, Danish Energy Agency commissioned an independent evaluation of overall energy-saving initiatives. This evaluation showed that ongoing energy saving initiatives, except for energy labelling of buildings, were effective, and that there were still large, cost-effective savings to be made (Energistyrelsen, 2009). RAP[5] (2010) highlight the fact that the Danish Government concluded that the labelling of the energy performance of homes had not resulted in a significant proportion of the proven and economically attractive savings being realised. Following this evaluation a number of revised energy-saving initiatives were brought forward.

The Danes chose to use their building regulations as the key instrument to tighten energy efficiency requirements on existing buildings. This was linked to an amended form of energy labelling which introduced a requirement that points out that when major renovations take place, energy improvements specified in the energy label must be implemented (Energy Efficiency Watch, 2009).

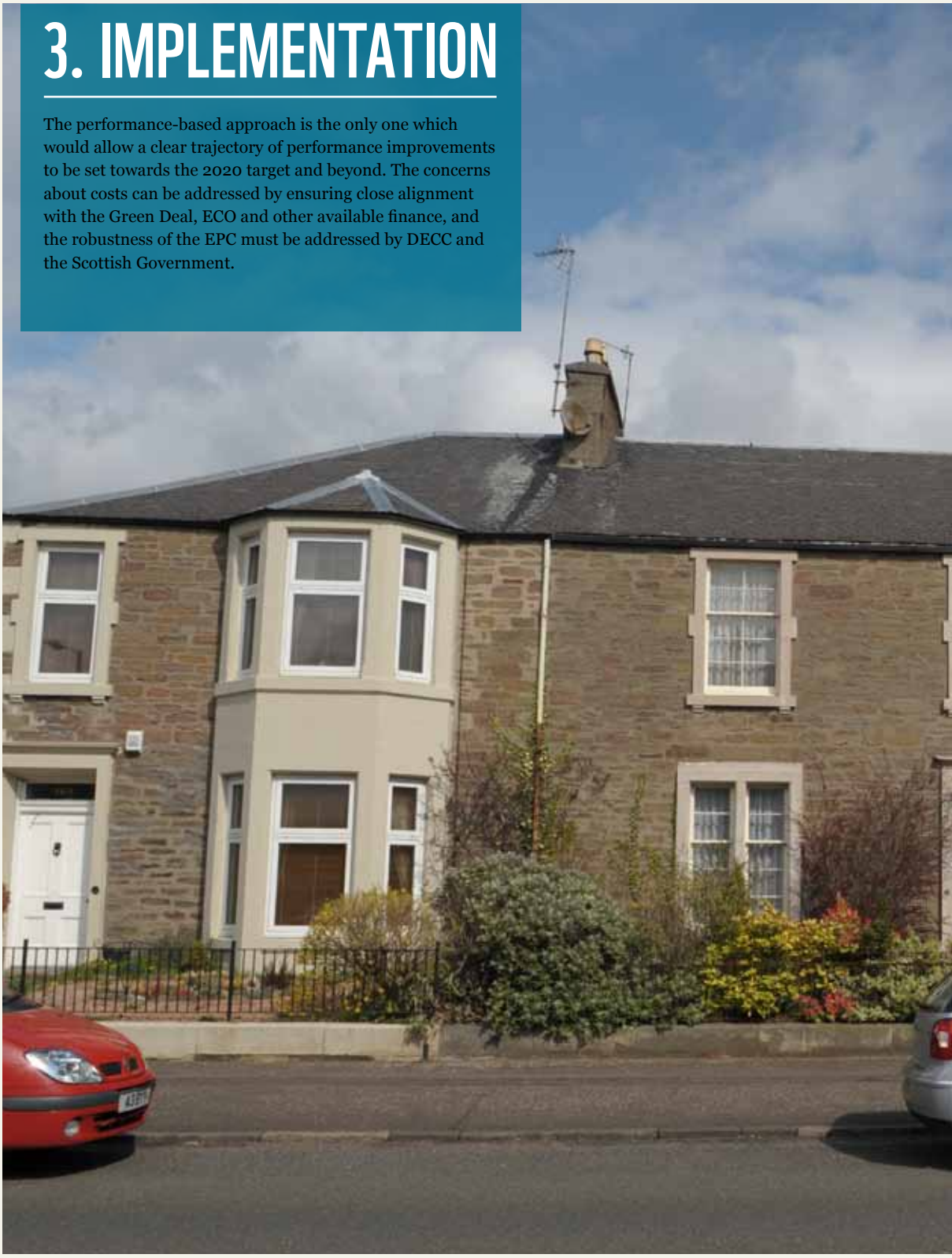
The aim of the revised Danish 2010 Building Regulations is to reduce energy use by 25% compared to 2005 regulations. Requirements for existing buildings relate to

major renovations, change of heating supply, replacement of boilers, windows, and roofs (RAP, 2010). The tightened energy efficiency requirements have been applied to building components in connection with replacement, renovation, and extension. There is also provision for extending regulation '...so that the requirements can apply in connection with maintenance and minor replacements and not just in connection with large-scale conversions and renovations as applies today. For example, these requirements will apply for all replacements of windows and circulation pumps. Energy savings in existing buildings are best and most cost-effectively achieved in connection with renovation and replacements. We must ensure that energy-efficient solutions are chosen in these situations. Otherwise, due to the long durability of building materials etc, we will miss the chance of gaining energy savings for many years to come.' (*Energistyrelsen* 2009).

As such, the Danes are pursuing a form of measured-based regulation of energy performance, applied to specific building components to improve the energy efficiency of existing housing.

3. IMPLEMENTATION

The performance-based approach is the only one which would allow a clear trajectory of performance improvements to be set towards the 2020 target and beyond. The concerns about costs can be addressed by ensuring close alignment with the Green Deal, ECO and other available finance, and the robustness of the EPC must be addressed by DECC and the Scottish Government.



3. IMPLEMENTATION ISSUES

3.1 Setting the standards

3.1.1 A prescriptive measures-based approach

Experience in Berkeley, California (see case study on page 39) demonstrates the success of prescriptive measures-based implementation of mandatory energy performance standards. In this type of approach, regulations require the installation of a list of specified energy measures. The track record of this approach, albeit limited, is an important consideration for the policy decisions which need to be taken in Scotland.

However, some stakeholders consulted during this research pointed to the difficulty of being able to provide a framework which incorporates a sufficiently wide range of measures to be capable of improving the very wide variety of housing types in Scotland. There were also doubts about whether installation of particular measures would necessarily guarantee improved performance or deliver savings greater than repayments on finance. This could be important if pay-as-you-save approaches to financing measures are adopted e.g. Green Deal. Concern was also expressed about whether such an approach might stifle innovation, whether it could easily evolve with changes in the measures available and whether it could deliver the scale of emissions reductions necessary. These types of concerns have resulted in Berkeley moving to alternative performance-based approaches, as described in the case study.

3.1.2 A performance-based approach

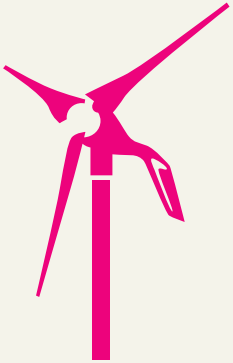
In a performance-based approach, instead of requiring specific measures to be installed, specific standards of energy performance could be required. This could use, for example, the A-G rating in energy performance certificates (EPCs). The main advantages of such an approach are that it would allow flexibility in the measures which could be used to improve the performance of individual properties, it would be relatively easy to communicate to property owners and it would build on the exisiting EPC system. It could

also encourage innovation and give greater certainty to the energy, carbon, and financial savings that result from the improvements. In addition, it could provide a ready means of ramping up performance standards over time. Such an approach would require fairly sophisticated assessments of the energy performance of properties before and after improvement, the results of which could provide useful data on the energy performance of the Scottish housing stock.

However, this approach could mean that property owners face some uncertainty regarding the costs which would be accrued in achieving the standards. It would be critical, therefore, for the recommended measures to be linked to available finance (particularly the Green Deal and ECO) and a cap on costs may need to be considered, as in the Berkeley case study below.

A further key question is how the performance standard would be assessed and expressed. The Energy Performance Certificate (EPC) system is the obvious means for measuring performance. However, it was recognised by the stakeholders consulted that this system would need to be significantly redesigned to make it fit for this purpose (this issue is discussed in detail in section 3.10). A major concern would be whether the methodology for ascribing energy bands could be made sufficiently robust to withstand potential legal challenge if these energy bands were used in regulation. Developing an assessment process which is sufficiently robust but which is not prohibitively costly is a key issue, as highlighted by the recent Berkeley experience. The current review of the EPC system undertaken by DECC provides an opportunity to address these issues.

3.1.3 A tailored 'measures-based' approach



Instead of requiring the achievement of specific energy bands or a list of measures prescribed by Government, an alternative approach would be to require the implementation of the measures identified by the assessment of each individual property. This is the type of approach which is implied in Section 64 of the Climate Change (Scotland) Act and would allow the measures required to be tailored to individual properties. The assessment would be linked to EPC bandings, but the requirement would be for the implementation of the measures.

The EPC system is currently under review and a new system will be introduced in 2013. As part of that review, the UK Government

is seeking to ensure close integration with the Green Deal (DECC, 2010b, p.10). This opens up the opportunity for a system in which EPC and Green Deal assessments not only identify appropriate measures but also provide a route for them to be implemented at no upfront or overall cost to the consumer, as well as highlighting the opportunity for additional measures, with funding opportunities/ incentives signposted. To avoid duplication and to deliver maximum value to property owners, this would either require the EPC system and Green Deal system to utilise the same methodology for assessing and specifying measures or for all EPC assessments in Scotland to be extended to include any additional elements required under the Green Deal assessments.

EEPH (2010) provides a useful explanation of the importance of energy assessments moving from identifying cost-effective measures to cost-optimal packages. Whilst 'cost effective' looks at simple payback, 'cost optimal' looks at the lifecycle costs or net present value (NPV) of an improvement package. The cost-optimal solution is the one which gives the greatest return when subtracting the installation costs from lifetime energy savings. The cost-optimal package definition allows the inclusion of a wider range of expensive measures alongside cheaper measures, e.g. external wall insulation would not pass the traditional 'cost-effective' test, but if installing it as part of a package, the addition of external wall insulation increases the NPV.

The European Commission's proposals for the recast of the Energy Performance of Buildings Directive calls for the implementation of 'cost-optimal' improvements to existing buildings, so it is likely that EPCs will move in this direction, but it is unclear whether Green Deal assessments will do the same. In terms of delivering deep emissions reductions, it is crucial that it does so, and this would allow regulation to play a far greater role in emissions reductions.

Scottish Government could, therefore, use the powers granted under Section 64 of the Climate Change (Scotland) Act 2009 to introduce regulation which requires the implementation of all cost-optimal packages of measures identified by EPC/Green Deal assessments. This would effectively be an extension of the regulation which has been proposed for the private rented sector, and for which there are enabling powers in the Energy Bill, but they would be extended to the owner-occupied sector and, in the case of the private rented sector, would not be dependent on the measures being requested by a tenant.

Apart from allowing the required measures to be tailored to individual properties, the principal advantage of such an approach would be that the measures required could be directly linked to the available finance. The measures included would also evolve over time as technologies, techniques and building science develops (DECC intends to update the list of Green Deal measures annually), although it would be difficult to set a clear trajectory for improving performance over time towards the 2020 and beyond targets.

As already stated, it would also be dependent on EPC and Green Deal assessment processes being sufficiently closely aligned for the cost-optimal packages of measures identified by the EPC process to be eligible for Green Deal funding, and this is far from certain. There would also be a concern that requiring the implementation of a prescribed and comprehensive cost-optimal package of measures (or even a less demanding list of cost-effective measures if this is the route which the Green Deal goes down) may be considered overly rigid and onerous, heightening the risk of the system being subject to legal challenge.

Case study: Berkeley– moving from a measures-based to a performance-based approach in order to achieve climate change targets

The City of Berkeley in California, USA, has the longest experience of regulating for minimum energy standards in existing private homes.

Berkeley has a population of approximately 104,000 and contains 47,000 residential properties. The Berkeley Residential Energy Conservation Ordinance (RECO), adopted in 1982, has required 500-700 homes per year to install water and energy savings measures. The regulations apply to all residential properties and are triggered by:

1 the sale or transfer of the property; or
2 major renovation of the property (where the works exceed a value of $50,000) – this trigger point was added following an amendment to the RECO in 1991.

500-700
HOMES PER YEAR WERE REQUIRED TO INSTALL ENERGY AND WATER SAVING MEASURES SINCE 1982 IN BERKELEY, CALIFORNIA

14%
REDUCTION IN RESIDENTAL GAS CONSUMPTION SINCE 2000 IN BERKELEY, CALIFORNIA

The original RECO adopted a prescriptive measures-based approach, in which property owners were required to install ten basic energy and water saving measures, covering:

- toilets
- showerheads
- taps
- water heaters
- hot and cold water piping
- exterior doors
- duct work and chimneys
- loft insulation
- common area lighting (for multi-unit buildings only)

For properties being sold, responsibility for compliance can be passed to the buyer, who must undertake to ensure compliance with the RECO within 12 months of the sale. The responsibility for compliance cannot be transferred more than once for any individual property.

Limits have been set on the amount of money that homeowners have been required to spend to achieve compliance:

- 0.75% of the final property sales price for single homes or single structures containing two homes;
- 0.75% of the final sale price for each structure, when the sale involves more than one structure of two housing units or less;
- $0.50 per square foot when any one structure with three or more housing units is sold or transferred; or
- 1% of renovation costs when a property is undergoing a renovation of $50,000 or more.

Assessments are conducted by auditors from Community Energy Savings Corporation (CESC), a non-profit organisation.

Approximately 10,000 residential units have been affected by the RECO since its adoption. The precise carbon savings which have been achieved are not known. The City keep records of compliance with the RECO but don't record which measures have been installed as a result of the RECO, i.e. they do not record if particular measures are already in place or not applicable. However, it is known that total residential natural gas consumption in the community has declined by

14% since 2000 and it has been estimated that the RECO has resulted in annual CO2 reductions of approximately 5,000 tonnes.

The Berkeley Climate Action Plan, introduced in 2008, called for an enhancement of the RECO to achieve deeper and more sustained energy savings, in line with the City's targets for reducing greenhouse gas (GHG) emissions of 33% by 2020 and 80% by 2050. Like Scotland, residential building energy use in Berkeley is responsible for just over a quarter of Berkeley's GHG emissions, so improvements in the energy performance of homes will need to play a critical role in meeting these targets.

Aside from seeking to achieve deeper and more sustained cuts in energy use, there are a number of other drivers behind the enhancement of the RECO. A number of the measures in the prescriptive approach are no longer seen to be consistent with the latest building science. Furthermore, because the list is mandatory, it is limited to those measures which are publicly acceptable, and not necessarily those which save the most carbon. Of particular concern is the need to encourage air sealing of properties, something which is not included in the original RECO and which can be made more difficult to achieve if attempted after the installation of loft insulation, which is included in the RECO. Moving the RECO to a performance-based approach which utilises state-wide assessment procedures will also allow Berkeley homeowners to access a wider range of rebates and financing opportunities which are available for voluntary improvements, e.g. state- and regional-wide financing programmes and rebate programmes offered by the utility companies, thereby potentially capturing deeper energy savings than required by the RECO.

The assessment process utilised for establishing performance is the California Whole House Energy Rating System, known as HERS II. HERS II generates detailed data on energy consumption and efficiency, provides a rating certificate (scoring each home on a scale between 0 and 250) and recommendations for cost-effective improvement measures. These measures are voluntary but it is hoped that enhancing

eligibility for financing and rebate programmes will encourage uptake. In addition, a number of mandatory measures have been retained, including duct sealing, low flush toilets, efficient showerheads and taps, water piping insulation, door weather stripping, fireplace closures and high efficiency lighting for the common areas of multi-unit properties.

The transfer to a new performance-based approach has not been without its problems. The extent of diagnostic testing and analysis required under the HERS II system, and the nature of the software tools, means that producing a report costs between $600 and $1000 for a single family home. These costs have been a major barrier. Difficulties have also been experienced in the supply of HERS-trained assessors. The new system has at least partially stalled as a result of these difficulties. Consideration is being given to making greater use of the Federal Government's Home Energy Scoring Tool, a far simpler 38-point assessment which can be completed in under an hour and at much lower cost, and which appears similar to an EPC.

Following the publication of the Climate Action Plan, consideration was also given to setting a date for all properties to comply with the new RECO, irrespective of whether they were being sold or renovated. These proposals were met with significant local resistance, including negative press coverage, and have now been put on hold.

3.1.4 Overview

Table 3.1 presents an overview of the pros and cons of the three potential approaches to setting standards discussed above. The performance-based approach is the only one which would allow a clear trajectory of performance improvements to be set towards the 2020 target and beyond and we therefore recommend that this is the approach which is adopted by Scottish Government. The concerns about costs can be addressed by ensuring close alignment with Green Deal, ECO and other available finance, and the robustness of the EPC assessment process is already being addressed by DECC and Scottish Government.

TABLE 3.1 AN OVERVIEW OF THE PROS AND CONS OF THE THREE POTENTIAL APPROACHES TO SETTING STANDARDS DISCUSSED ABOVE

	STRENGTHS	WEAKNESSES
PRESCRIPTIVE MEASURES-BASED APPROACH	• Track record of successful implementation in Berkeley, California • Could be linked to existing EPC assessment process • Provides certainty regarding costs to householders • Relatively simple to communicate	• Likely to have limited impact on emissions unless a complex system developed which accounts for diversity of housing stock • Inflexible approach, which may generate resistance
PERFORMANCE-BASED APPROACH	• Greater flexibility for property owners and may encourage innovation • Would allow clear trajectory of performance improvements towards emissions reduction targets • Relatively simple to communicate	• Could generate concerns about extent of costs to property owners (although this could be addressed through linking measures to available finance and considering a cap on costs) • Likely to require significant improvements to robustness of EPC assessment process (without significantly increasing costs) and close alignment with Green Deal and ECO
TAILORED MEASURES-BASED APPROACH	• Required measures tailored to individual properties • Opportunity to link required measures to available finance, particularly Green Deal and ECO • Opportunity to require cost-optimal packages of measures which could deliver significant emissions reductions	• Requirements may be considered inflexible and overly onerous by property owners, which could generate resistance • Uncertainty regarding extent to which cost-optimal packages could be funded through Green Deal and ECO

3.2 Costs

£1
EVERY £1 SPENT KEEPING HOMES WARM SAVES THE NHS 42 PENCE

There would be direct and indirect costs associated with the introduction of regulation. Direct costs are those which would be borne by Scottish Government and any other public bodies involved in the implementation of the regulations themselves, e.g. for enforcement activities, awareness-raising activities, advice and support. The indirect costs would be those which result from implementing measures to achieve the standards, e.g. installing insulation, a more efficient heating system or microgeneration. The scale of both the direct and indirect costs will vary considerably depending on the approach to regulation which is adopted.

Some information on direct and indirect costs is available from the Scottish Government's Partial Regulatory Impact Assessments (Scottish Government, 2009b), which examined different potential approaches to regulation with varying scope and levels of compulsion, including:

- the base case, which was a continuation of the current approach, i.e. requirements for EPCs with voluntary uptake of measures.
- Option 3, which involved EPCs being required for properties for sale or rent, with a requirement to meet minimum energy performance standards which would result in a 10% reduction in the energy use of the property.

The key findings from the assessments of these options are presented in the discussions below.

3.2.1 Direct costs

250,000
THE GREEN DEAL COULD CREATE UP TO 250,000 JOBS BY 2030

The Partial Regulatory Impact Assessments assumed that there would be two main elements of the direct costs to Government: (1) the costs of publicising the requirement in the first year, estimated at £550,000, and (2) enforcement costs, estimated at 5% of the cost of generating an EPC for each home. The resulting costs to Government relating to the three options described above are shown in table 3.2.

Based on these figures, the direct costs of introducing minimum standards for all homes sold or rented would be approximately £12.6m over 10 years. However, the assumptions behind these costs are not stated and we would argue that a system of regulation which is linked to house sales, landlord registrations (discussed in section 3.6 and 3.10) and Green Deal assessments could be largely self-enforcing. All measures carried out with Green Deal or other

TABLE 3.2 COSTS TO SCOTTISH GOVERNMENT OF REGULATION

	BASE CASE (VOLUNTARY)	OPTION 3 - MINIMUM STANDARDS FOR ALL SALE/RENT	DIFFERENCE
ONE-OFF COSTS	£0.6m	£1.6m	£1m
ANNUAL COSTS	£0.7m	£3.3m	£2.6m
LIFETIME COSTS	£6.6m	£19.2m	£12.6m
PRESENT VALUE OF COSTS	-£5.5m	-£15.9m	-£10.4m
NET PRESENT VALUE	-£5.5m	-£15.9m	-£10.4m

Source: Scottish Government (2009b).

public financing such as ECO, HIS and EAP are recorded in the HEED database and it is likely that such a system will continue for future finance mechanisms. Allowance would only need to be made for monitoring of the HEED database, enforcement in cases where the measures were not carried out and for assessing any DIY installation of measures carried out without such financing.

A further consideration is that the assessments do not include any financial savings which could be achieved from regulating improvements in energy efficiency. For example, the annual cost to the NHS in England of treating winter related disease due to cold private housing has been estimated at £859m (Department of Health, 2010). This does not include additional spending by social services, or economic losses through missed work. It has been estimated that every £1 spent keeping homes warm can save the NHS 42 pence in health costs (Department of Health, 2010). Given that Option 3 would involve direct and indirect costs of over £900m (see table 3.3 below), significant savings could be achieved overall. Very significant financial benefits could also accrue from the employment which regulation could generate, e.g. in the insulation or microgeneration industries. DECC have estimated that the Green Deal could lead to the creation of up to 250,000 jobs by 2030[6].

TABLE 3.3 COSTS AND BENEFITS OF REGULATION TO HOMEOWNERS

		BASE CASE (VOLUNTARY)	OPTION 3 – MINIMUM STANDARDS FOR ALL SALE/RENT	DIFFERENCE
COSTS	ONE-OFF COSTS	-	-	-
	ANNUAL COSTS	£23.7m	£75.5m	£51.8m
	LIFETIME COSTS	£284.3m	£905.4m	£621.1m
	PRESENT VALUE OF COSTS	-£239.5m	-£762.5m	-£523m
BENEFITS	AVERAGE ANNUAL ENERGY SAVINGS	-£1.2m	-£8.8m	-£6.6m
	LIFETIME ENERGY SAVINGS	-£25.9m	-£194.5m	-£168.6m
	PRESENT VALUE OF ENERGY SAVINGS	-£10.0m	-£75.3m	-£65.3m
	AVERAGE ANNUAL CO_2 SAVED	0.04 $MTCO_2$ pa	0.3 $MTCO_2$ pa	0.26 $MTCO_2$ pa
	ANNUAL CO_2 SAVED IN 2020	0.07 $MTCO_2$ pa	0.56 $MTCO_2$ pa	0.49 $MTCO_2$ pa
	LIFETIME ANNUAL CO_2 SAVED	0.89 $MTCO_2$	6.69 $MTCO_2$	5.8 $MTCO_2$
COST-EFFECTIVENESS	NET PRESENT VALUE (£M)	-£249.5m	-£837.8m	-£588.3m
	NET PRESENT VALUE PER TONNE CO_2 SAVED	-£279.7m	-£125.2m	£154.5m
	PRESENT VALUE OF BENEFITS FROM CO_2 SAVED	£31.3m	£290.5m	£290.5m

Source: Scottish Government (2009b).

3.2.2 Indirect costs

The indirect costs (i.e. costs of measures) associated with the Base Case and Option 3 from the Partial Regulatory Impact Assessments are presented in table 3.3.

Annual costs to homeowners of requiring minimum standards for all homes sold or rented would therefore amount to an additional £51.8m. However, the analysis assumes that the whole costs of measures are borne by homeowners, i.e. there is no subsidy whatsoever. In reality, the funding available will equate to far more than these costs. It is estimated that current CERT investment alone is worth up to £100m pa in Scotland (Scottish Government, 2009a).

It should be borne in mind that the above analysis is based on applying minimum standards which achieve a 10% reduction in the energy use of a home. Far higher reductions will be needed to achieve the climate change targets, meaning far higher costs, particularly where more expensive measures are involved.

Using the 40% by 2020 scenario in DEMScot, the costs of achieving emissions reductions which are in line with the scale demanded by the Climate Change targets can be estimated. If the costs of the upgrade package in the 40% by 2020 scenario were spread across the whole of the housing stock (not just homes sold or rented, as in the Partial Regulatory Impact Assessment figures), the average cost per dwelling would be approximately £6,250. Since this is an average figure for the whole housing stock, the costs for some homes would be higher than this. Existing Homes Alliance (2010) demonstrates that avoiding piecemeal approaches and instead delivering large scale programmes of whole-house approaches can generate very significant cost savings which reinforces the need for policy, finance packages and regulation to support such an approach.

£3,000
MOST OF GREAT BRITAIN'S REMAINING F AND G BRANDED HOMES CAN BE BROUGHT TO AN E BAND FOR LESS THAN £3,000

In the short term, there is an argument for regulation to focus on the worst-performing homes. Research into the costs of improving the energy performance of the worst-performing housing has been conducted by EST (2010) and Consumer Focus (2010) and the findings suggest that costs are relatively low. EST concluded that most of Great Britain's remaining F&G banded homes (which make up around 7% of the Scottish housing stock) can be brought to an E band for less than £3,000. Consumer Focus suggests that 40% of such properties can be brought to band E for far less – an average

cost of £270 per property. It also suggests that of those properties in bands E, F and G, two thirds can be improved all the way to Band D for less than £3,000 per property.

However, EST also suggests that there is a clearly identifiable population of more expensive to improve homes, which would cost more than £5,000 to bring into the E band. These were 15% of the F&G banded stock in Great Britain in 2005. EST suggests, in line with the discussion in section 3.2 above, that these 'hard to make decent' homes are particularly prevalent in the private rented sector.

It should be noted that just moving all F and G-banded homes to an E-band would not deliver the emissions reductions necessary to achieve the climate change targets. Furthermore, simply moving properties to band E is not necessarily the most cost-effective way to make improvements to energy efficiency when the longer term goal is to go above this target.

3.2.3 Price caps

One of the advantages of a measures-based approach is that the indirect costs (for implementing the measures) will be well understood and can be controlled. This should help to avoid situations in which undue burdens are placed on property owners. However, the imposition of a price cap on the level of spending by any consumer to achieve a required energy performance standard would be another way of providing certainty and achieving greater acceptance of regulation under a performance-based approach.

With the RECO in Berkeley, California, the maximum cost of the required measures to be installed is capped at a percentage of the sale value of the property. In Scotland, it might be easier to relate maximum costs to the rateable value of the property and this would then cover properties in the private rented sector. A price cap should be considered but more importantly, regulation needs to be closely tied to available funding through the Green Deal and ECO to ensure that upfront and overall costs are minimised.

3.3 The scope of minimum standards

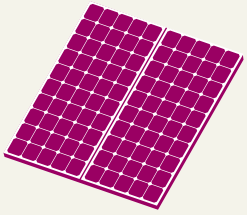
A number of organisations, including the Committee on Climate Change (2010), the Existing Homes Alliance in England (2010) and Friends of the Earth (2010), have called for minimum standards in

9%
OF PROPERTIES (14,500 HOMES) IN THE RENTED SECTOR HAVE A POOR ENERGY RATING SCORE

the private rented sector. As noted in section 2, provision is made for regulation in this sector from 2015 in the UK Energy Bill. There are good reasons for focusing on the private rented sector. Firstly, there is a higher percentage of homes with poor energy performance in the private rented sector than in owner-occupied housing. The 2009 Scottish House Condition data shows that 9% of properties in the private rented sector (approximately 14,500 homes) had a 'poor' NHER (National Home Energy Rating) score[7]. As shown in table 3.5, this is three times higher than in the owner-occupied sector and nine times the rate of the social rented sector. This data is drawn from a statistically representative national sample.

Secondly, regulating the private rented sector is likely to be far less controversial than introducing regulation across the private sector. Since landlords are seen to be providing a service from which they derive financial reward, regulating this service is likely to be far more acceptable from a political perspective than regulation which places (potentially expensive) requirements upon owner occupiers.

Thirdly, regulation is seen to be particularly important in the private rented sector because of the lack of incentives for landlords to improve the energy performance of their properties. The benefits, e.g. warmer homes and lower bills, accrue largely to the tenants rather than to the landlords who have to pay for the improvements. Regulation is seen as one way of overcoming this barrier to investment.



However, limiting regulation to the private rented sector in Scotland would result in a limited contribution to emissions reductions. A further reason why in England discussion of regulation has focused on the private rented sector is that this sector makes up a much higher percentage of the housing stock than in Scotland. There are nearly 3.1 million private rented homes in England, representing 15% of the housing stock. However, the latest figures available from Scotland suggest that the private rented sector represents only 7% of the Scottish housing stock, or 161,000 homes (Scottish Government, 2010c).

We have used the DEMScot model to demonstrate what emissions reductions would be achieved if the 40% by 2020 scenario were applied across the whole of the housing stock, across the whole of the private housing stock and across just the private rented sector.

TABLE 3.5 NHER BAND BY HOUSEHOLD TENURE (%)

	NHER BAND				
TENURE	POOR	MODERATE	GOOD	TOTAL	UNWEIGHTED SAMPLE SIZE
OWNER-OCCUPIER	3	48	49	100	2,100
LOCAL AUTHORITY/ OTHER PUBLIC	1	30	69	100	517
HOUSING ASSOCIATION/ CO-OP	1	23	76	100	383
PRIVATE RENTED	9	41	51	100	324

The results are shown in table 3.6 and figure 3.1 on page 51. It is clear from this that the level of emissions reductions which can be achieved by just focusing on the private rented sector in Scotland are very limited compared to the private stock as a whole.

The bulk of the carbon savings (over 75%) to be achieved under this scenario come from the owner-occupied sector, which demonstrates how critical this sector is to the achievement of climate change targets. There are further reasons for introducing regulation across the private sector, including:

- limiting regulation to the private rented sector could lead to such properties being sold and taken out of the rental market. We have no evidence to suggest that this will be the case but introducing regulation across the private sector stock would help to ease these concerns; and
- the issue of cross-tenure buildings. Tenements and other buildings containing multiple homes often also contain different tenures. Since the implementation of energy measures would often require co-operation between homeowners in these properties, this could be undermined if not all of them were subject to the same regulation. Achieving co-operation between homeowners in such properties is a significant issue

for addressing energy performance generally (e.g. it has been identified as an issue in delivery of the Home Insulation Scheme). Regulation across the board could help to facilitate such co-operation whereas regulation just in the private rented sector could seriously undermine it.

3.4 Phasing in regulation over time

Applying high energy efficiency standards to all of Scotland's 2.4 million homes at the same time would, in theory, be the fastest and most direct way of raising the energy efficiency of Scotland's housing stock. This would encourage property owners to implement a package of improvements at one time rather than having gradual implementation over time, which would enhance cost-effectiveness (see table 3.3) and lead to earlier emissions reductions.

TABLE 3.6 MODELLING OF CARBON SAVINGS WHEN APPLYING THE '40% BY 2020' PACKAGE OF MEASURES TO DIFFERENT TENURES USING DEMSCOT V2.3

ELEMENT OF HOUSING STOCK UPGRADED	CARBON SAVINGS RELATIVE TO BASE CASE ($MTCO_2$)
ALL HOUSING STOCK	3.98
OWNER-OCCUPIED AND PRIVATE RENTED	3.31
PRIVATE RENTED ONLY	0.30

However, unless standards were set at a very basic level, this could raise significant problems in terms of the capacity of suppliers/ installers, assessors and those responsible for enforcement.

In response to this conundrum, the Existing Homes Alliance in England (2010) is arguing for a two-part approach to minimum standards:

1 a **Green Deal aspirational standard** to ensure clarity on the depth of retrofit required over time to be achieved under the

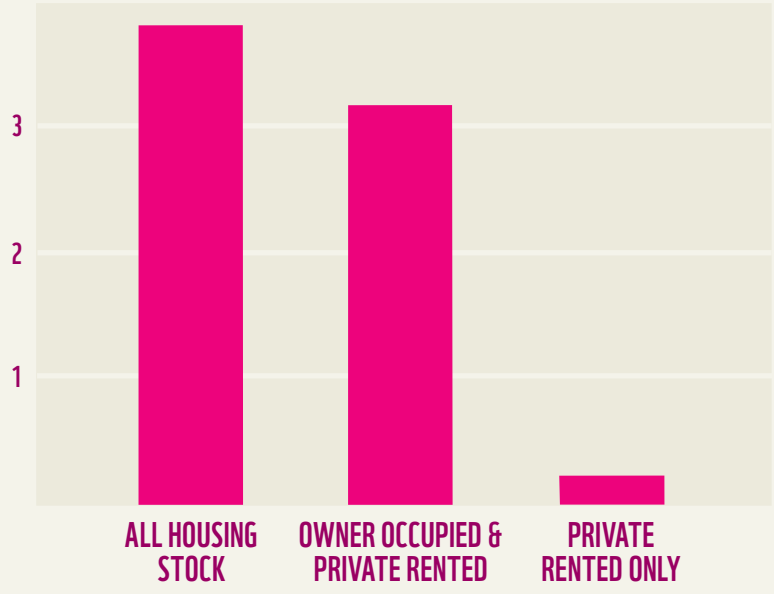
Green Deal which should be reflected in the survey, report and recommendations to the homeowner; and,

2 a **mandatory minimum standard**, acting as a backstop with mandatory minimum energy performance ratings for all tenures linked to the point of rental and sale to ensure all homes, where possible, are improved and the obligation is spread fairly across the housing market and all tenures. (p.31)

The Alliance suggests that the mandatory minimum would be set in order to ensure that all homes deliver the 2020 and 2050 targets, i.e. it would incrementally increase until it was in line with the aspirational standard. This would allow householders to anticipate future rises, and adopt a whole-house approach, if they choose to.

Some support was expressed for such an approach during the stakeholder workshop, although there were concerns about the capacity of industry (manufacturers and installers) to deliver,

FIGURE 3.1 CARBON SAVINGS RELATIVE TO DEMSCOT BASE CASE FROM WHEN APPLYING THE '40% BY 2020' PACKAGE OF MEASURES TO DIFFERENT TENURES



particularly where specialist measures are involved, such as those for hard-to-treat properties. Additional concerns were also expressed about quality assurance. It was suggested that there are quality problems at the moment for energy efficiency measures (e.g. poorly fitted loft insulation) and that these could be exacerbated if implementation of minimum standards was too rapid. It was suggested that the additional costs of proper quality assurance need to be factored in to the approach which is adopted. The Green Deal could help through its plans to require accreditation of advisers and installers.

The work on low carbon skills and wider work on the low carbon economy, which is being taken forward by Scottish Government and a wide range of partners, needs to address these issues as a matter of urgency.

If a performance-based approach were adopted, a two-part approach (aspirational standard and mandatory minimum) could be adopted. To tackle the worst-performing homes there is a strong argument for regulation to focus on F&G-rated homes first. A lead-in period should be allowed but, from 2015, all homes being sold or rented which fall in to these bands could be required to be uprated to band E or above. A trajectory could then be set for the standard to increase towards 2020, with the 2020 standard acting as the 'aspirational standard'. The figures from DEMScot (see table 2.1 and figure 2.1) suggest that to achieve a 40% reduction in emissions from housing by 2020, the vast majority of houses would need to be at band C or above by then.

40%

THE REDUCTION IN HOUSING EMISSIONS ACHIEVED IF THE VAST MAJORITY OF HOUSES REACH BAND C OR ABOVE BY 2020

If the tailored measures-based approach to setting the standard were adopted, as put forward in section 3.1.3, then raising the standard over time would be less straightforward, since the measures required would be determined by the assessment process in each individual case. However, the measures which are deemed to be cost-effective or cost-optimal, and which would therefore be required under such an approach, will be impacted by the subsidies and other financial incentives available. For example, the ECO is expected to play a significant role alongside the Green Deal in supporting the take-up of solid wall insulation. Scottish Government could therefore monitor the level of energy savings being achieved by the regulation over time and effectively raise the standard by adjusting its financial support for energy efficiency as necessary to keep emissions reductions on track.

3.5 Phasing in regulation geographically

F&G

THERE IS A STRONG ARGUMENT FOR REGULATION TO FOCUS ON F&G-RATED HOMES FIRST

The majority of stakeholders consulted for this project were against the introduction of standards on an area-by-area basis. Such an approach was thought to have very problematic equity issues. However, it was suggested that the roll out of support and enforcement could be on such a basis in order to alleviate capacity issues.

Focusing support on an area-by-area basis was seen to be particularly important in achieving improvements in mixed tenure blocks. In such properties, an 'enveloping' type approach would be most practical and cost-effective. The consent of all householders, whether they were homeowners or tenants, would be required in this situation, something which could be facilitated by intensive, localised support.

An area-based roll out of support would tie in with the creation of 'Low Carbon Zones' for tackling fuel poverty as advocated by Brenda Boardman (2007). She states that:

'The economies that come from the scale of treating a whole street are substantial and reduce the required contribution from private homes, making a full opt in more likely. A householder can dissent from the process, but this may mean higher expense at a later date, for instance to comply with the minimum standards linked to Energy Performance Certificates.'

Such assertions are supported by the figures for costs variability in table 3.1. An area-based roll out of support backed by an intensive publicity campaign may also provide a more manageable, planned and cost-effective approach for advice agencies, assessors and installers. Some stakeholders suggested that this might also mean that strict enforcement would only be applied after an area campaign had been completed.

However, if the main triggers for the regulation were the sale and rental of properties (discussed in section 3.6), the properties affected would be geographically dispersed so an area-based approach to enforcement and support would not be logical. If, at any stage, the regulation was applied to all homes, area-based roll out should be given consideration.

3.6 Trigger points

The stakeholders consulted for this project suggested that multiple trigger points will be needed in order to achieve widespread application of the standards. The point of sale was seen as the most obvious trigger point but this was felt to be insufficient on its own because of the relatively low level of turnover in the market. According to the Registers of Scotland, the average annual number of sales in the last 7 years is 123,350 homes (approximately 5% of homes), although there have been significant variations from year to year. The number of sales in 2009/10, for example, was less than half the figure for 2006/7.

Other trigger points put forward by stakeholders were re-mortgaging, transfer/change of title, inheritance, tenancy change (i.e. point of rental or re-rental), changes to council tax (particularly important for rented sector) and extension/refurbishment.

3.6.1 Point of sale (any other forms of transfer/change of title)

Consumer Focus Scotland (2011) found that many stakeholders felt that enforcing a minimum standard at the point of sale was a practical approach. The main concern was that on its own this would result in only a slow application of the standard through the owner-occupied housing stock. This is because householders move infrequently and in the current economic situation the rate of house sales is more likely to fall than to increase. The application of the standard could have an adverse impact on house sales but such adverse impacts may be avoided with the provision of effective financial support mechanisms, as discussed in section 3.11.

In order to catch the maximum number of owner-occupied properties, other trigger points must be considered. These might include all transfers or changes of title, thereby picking up properties that are inherited by or gifted to new owners.

Remortgaging is another potential trigger point but this is problematic as the law relating to mortgages is a UK Government responsibility and so falls outside the Scottish Government's remit.

3.6.2 Point of extension/refurbishment (other applications for planning and building regulations approval)

This trigger point provides the other most significant means of catching owner-occupied properties but it would also apply to private rented properties. Stakeholders expressed some concern about proportionality, citing the circumstance where householders want to make a very small improvement to their home and are then expected to spend large sums to bring their homes up to the minimum standard. This concern could be ameliorated by the availability of effective financial mechanisms like the Green Deal. The alternative would be to only use this trigger point for major extensions or refurbishments. This might tie in more effectively with how the Building Regulations apply to extensions. Under this system, when work is done that alters or dismantles an element of the building that is part of the insulation envelope, the level of insulation of the completed job must meet the standards (Scottish Government, 2009). In addition, new provisions give owners extending their dwelling the option either to upgrade the energy performance of the existing building fabric where it performs poorly, or to build the proposed extension to more challenging fabric standards (Scottish Government, 2010b).

3.6.3 Point of rental (and landlord registration, changes to council tax)

While using point of rental is an easily recognised trigger point, it is not one that is regulated. In many instances it is a transaction between landlord and potential tenant without any other parties being involved. So it would rely on tenants being aware that there is a minimum energy performance standard, understanding an EPC and checking that a property complies with the standard before taking up a letting.

Consumer Focus Scotland (2011) reports that consultees supported applying a minimum standard at the point of rental (alongside wider regulation of all private sector housing) due to the high turnover in parts of the sector. Stakeholders consulted for this project, while generally supporting the use of this trigger, also indicated some problems that would need to be overcome. A representative of private landlords pointed to the very low level of awareness amongst both landlords and their tenants about energy efficiency in general, EPCs and the impact on running costs. This

low level of awareness would need to be addressed for effective policing the standard, as discussed later.

A point at which the private rented sector is regulated is the requirement for private landlords to be registered with their local authority. Regisitration lasts for three years and involves landlords making a declaration that they comply with all legal requirements relating to the letting of houses. Stakeholders suggested that this process could therefore be utilised for achieving compliance with minimum energy standards although the current effectiveness of the system was questioned.

Stakeholders suggested registering for council tax as an additional trigger for the private rented sector. For instance, private landlords would need to notify their local authority when their properties were void in order to pay reduced council tax. This could be a good time to undertake improvement works and would only require the council tax department of the local authority to send out an automated notification to whatever agency is promoting the regulation and to the landlord.

3.6.4 Additional points

Incorporating trigger points such as sale and rental will be critical in any system of regulation but, because of the relatively slow rate of turnover of properties, particularly in the owner-occupied sector, it will be important for minimum standards to be launched in such a way that consumers are encouraged to achieve the standards even outside of these triggers. The benefits to consumers, particularly from participating in the Green Deal, will therefore need to be clear and clearly communicated, as discussed in section 3.9.

Setting a date by which all properties must meet the standards also requires consideration. The difficulties which Berkeley has experienced in trying to move towards a 'date certain' approach highlight the consumer reaction issues which such an approach might raise. In addition, the capacity issues relating to the assessment and installation of measures in all 2.4 million Scottish homes would be significant. However, the ability to eliminate upfront costs should ameliorate much of the potential negative reaction so, providing that the scale of available Green Deal and other finance was sufficient and industry capacity issues were addressed, a clear trajectory should be set for all homes to be compliant with the standards. We would argue that this is essential

with the hugely demanding longer-term (2050) emissions reduction targets in mind.

3.7 Exemptions

The Energy Efficiency Partnership for Homes (2010), drawing on previous work by Scottish Government Social Research (2008), highlight the significant percentage of properties in Scotland which are 'hard-to-treat'. It estimated that, of the 2.3m homes in Scotland, the following fall in to one of the 'hard to treat' categories (note that there is some overlap between the categories):

- 25% solid wall
- 5% timber frame
- 23% tenement
- 3% high-rise flats
- 4% flat roofs
- 1% mansard roofs
- 12% off-gas

DEMScot has been utilised to give an indication of the scale of the contribution which hard-to-treat homes will need to make in achieving emissions reductions from housing (see table 3.7). In DEMScot, 'hard-to-treat' homes include:

- those in which cavity wall insulation is not feasible;
- those in which roof insulation is not feasible;
- those in which neither cavity wall or roof insulation is feasible; and
- high rise.

2020
HARD-TO-TREAT HOMES CONTRIBUTE A LARGE PROPORTION (36%) TO THE 40% EMISSIONS REDUCTION SCENARIO BY 2020

As can be seen in table 3.7, hard-to-treat properties contribute a very significant proportion (approximately 36%) to the 40% emissions reduction scenario by 2020. Historic (pre-1919) properties also play a significant role, contributing approximately 24% of emissions reductions in this scenario. These figures clearly highlight the need for exemptions to the regulation to be kept to a minimum. This view was shared by the stakeholders contacted during the research for this study, including representatives from Historic Scotland, Edinburgh World Heritage and Changeworks.

Examining the figures for energy bands in the DEMSCot '40% by 2020' scenario (see table 2.1 and figure 2.1), suggests that 2% of properties are likely to remain in bands E and F, which gives an indication of the scale of exemptions which might be required under a performance-based approach.

TABLE 3.7 ANALYSIS OF HARD TO TREAT PROPERTIES USING THE '40% BY 2020' PACKAGE OF MEASURES

ELEMENT OF HOUSING STOCK UPGRADED	CARBON SAVINGS RELATIVE TO DEMSCOT 2.3 BASE CASE ($MTCO_2$)
ALL HOUSING STOCK	3.98
NO HARD-TO-TREAT PROPERTIES	2.53
HARD-TO-TREAT PROPERTIES ONLY	1.45
PRE-1919 PROPERTIES ONLY	0.94

The Existing Homes Alliance in England has argued strongly that standards should be set 'on the premise that all homes are going to have to have a once-and-for-all retrofit to make them fit for 2050' and that 'there should be a mechanism for exemptions but the bigger picture is for Government to tackle the incongruity of climate change policy with other areas, e.g. policy governing conservation areas' (Existing Homes Alliance, 2010, p.31).

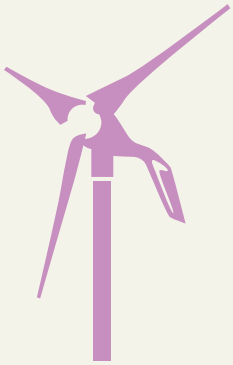
Similarly, *Carbon Countdown for Homes* (WWF Scotland, 2008) argued that we must mainstream the measures used to treat hard-to-treat homes and concluded, on the basis of case study examples, that historic and hard-to-treat homes can be brought up to a good energy performance standard – it will just cost more. Experience and understanding of the issues is developing all the time and Historic Scotland, in particular, is taking a lead in researching and promoting energy efficiency in traditional buildings. One of the actions in *Conserve and Save* (Scottish Government, 2010b) is for Historic Scotland to carry out research and case study projects, and disseminate findings to and through relevant partners, publications and digital media, in order to improve provision of advice, skills and qualifications for the public and professionals on energy efficiency improvement in traditional housing. In addition it is to include energy efficiency in domestic properties in its existing

and future regeneration and grants programmes, such as the Conservation Area Regeneration Scheme[8].

The EEPH report (2010) includes a range of recommendations for mainstreaming measures for hard-to-treat homes, particularly solid wall insulation:

'These measures must be mainstreamed semantically, conceptually, structurally (making use of trigger points), politically (through regulation, such as around F and G-rated homes; and through integration, such as linking to the Renewable Heat Incentive, Feed in Tariff and Pay As You Save), and most importantly in terms of availability (through mass market approaches like Warm Front, Supplier Obligation)'

(EEPH, 2010, p.2).



Their recommendations include ensuring that minimum standards do not exclude solid wall insulation (EEPH, 2010, p.7).

3.8 Relationship to existing standards

The Tolerable Standard came into effect in 2009 through the Housing (Scotland) Act 2006 and applies to all tenures of housing. As a result, local authorities can require owners to undertake works to houses which are sub-standard, which can include houses which fail the Tolerable Standard. The Tolerable Standard includes a requirement for houses to have satisfactory thermal insulation. However, this requirement is at a very basic level of insulation and is well below the suggested minimum standard proposed here.

The 2006 Act also extends the scope of local housing strategies (LHS). It requires local authorities to set out in their LHS, a strategy for ensuring compliance with the duty to close, demolish or improve houses which do not meet the Tolerable Standard (Scottish Government, 2009). The means of policing used by local authority is not specified. Tenants can also report substandard housing to their local authority. It has been argued that the minimum energy performance standards could eventually be incorporated into the Tolerable Standard in order to provide another means of enforcement. However, we would suggest that the two standards are serving very different functions and should be kept separate.

The Scottish Housing Quality Standard (SHQS) applies to all tenures of housing. It is the instrument being used for implementing one of the Scottish Government's key housing targets, which is to improve the standard of social housing by 2015 to meet the housing quality standard defined in 2004. The energy efficiency criteria of the standard includes a basic level of energy efficiency - at least 100mm of loft insulation, cavity wall, hot water tank and pipe insulation where appropriate, and a full, efficient central heating system such that the dwelling achieves an NHER score of 5 or an SAP score of 50 (for mains gas heating systems) and 60 for other types of heating systems. Around 95% of social housing already meets NHER 5 or SAP 50/60 and therefore satisfies one aspect of the energy efficiency criteria of the SHQS (Scottish Government, 2009). In practice, the requirement to meet the SHQS has focussed on providing an efficient heating system and meeting the appropriate NHER. SHQS has been criticised by Energy Action Scotland and others as being inadequate for lifting households out of fuel poverty and it recommends that all Scottish homes have an energy rating of NHER 8 or better in order for them to be 'fuel poverty proof'.

In *Carbon Countdown for Homes* (WWF, 2008a), it is recommended that Scottish Government establishes minimum energy efficiency performance standards (related to the EPC scale) for existing social housing to be applied through a revised SHQS. It will be necessary for standards for social housing to converge with those for owner occupied and private rented sectors as there will be times when high rise block/tenements etc. will contain properties with different tenures. Without parity between the energy efficiency standards required in the SHQS and the proposed minimum energy performance standard for private housing there will be real difficulties in efficiently improving properties to meet both standards.

It will also be vital that standards in the social housing sector should not be allowed to slip back in comparison to the private sector. It should be noted that in *Conserve and Save*, Scottish Government states that:

'The requirements of the Climate Change (Scotland) Act 2009 are such that by 2020 social housing will need to meet higher levels of energy efficiency beyond those arising from the

achievement of the SHQS by 2015. We will work with all social landlords to develop an appropriate standard beyond the SHQS to help meet the requirements of the Act. As noted above, we will engage with the UK Government to seek to ensure that social landlords in all parts of Scotland are able to take full and fair advantage of financial support from any future GB-wide programmes.'

(Scottish Government, 2010b).

3.9 Consumer reaction

In the consultation with stakeholders, it was suggested that the most important factor determining consumer reaction will be the availability of effective financial mechanisms to allow owners to comply with the regulation without creating an undue financial burden, whichever trigger points are utilised. The Green Deal was seen to be particularly important in this regard, but other sources of affordable finance were thought to be needed in addition, such as a low/zero-interest energy-efficiency loans. This is discussed further in section 3.11.

Having a cap on the expenditure required to achieve the standards was seen by some stakeholders to be important in terms of consumer reaction. Including provision for the requirements to be passed on to the next owner (see section 3.10.5) was also seen to be important.

Stakeholders suggested that there might be a more positive consumer reaction to regulation if there was a greater consciousness of the energy efficiency of properties, e.g. through more effective use of EPCs. This chimes with Scottish Government (2009a) assessments of consumer attitudes which show that home energy consumption is not seen as a key area of action even amongst those who consider themselves climate change aware. Focusing on the positive aspects of the regulation, particularly the potential for financial savings, will also be critical.

Focused awareness-raising and support on a region-by-region basis, as discussed in section 3.5, drawing on the experience of the digital switchover, was seen by stakeholders as a valuable model.

The Consumer Focus Scotland (2011) report, Energy efficiency in

private sector housing in Scotland: regulation and the consumer interest, examines regulatory issues from a consumer perspective in more detail than has been possible in this study.

3.10 Enforcement

The Scottish Government (2009a) put forward a range of options for managing the delivery of a system of regulation and enforcement of energy standards for housing. This could involve:

- creating a new agency;
- expanding the role of an existing agency; or
- offering this role to local councils.

As discussed in 3.2, the extent of the enforcement required could be significantly reduced by developing close links between the regulations and the Green Deal, ECO and other financing. A system of regulation which is linked to such financing could be largely self-enforcing. All measures carried out with Green Deal or other public financing such as ECO, HIS and EAP are recorded in the HEED database so return visits by assessors should not be necessary in the vast majority of cases. Allowance would only need to be made for monitoring of the HEED database, enforcement in cases where the measures were not carried out and for assessing any DIY installation of measures carried out without public or energy company subsidy or financing.

3.10.1 Point of sale

At the point of sale, it was suggested that the market could inform buyers and sellers and assist with compliance. This would mean, in effect, that solicitors acting on behalf of buyers would check compliance with the standard, measured through a more robust and mandatory EPC process, as a legal requirement during conveyancing.

Enforcement for any non-compliance will rest with the local authority as it does for EPCs. Flexibility should be allowed, such that the buyer can take responsibility for carrying out the upgrade requirements within 12 months. A further enforcement mechanism will be needed to account for these instances. Local authorities will need to be responsible for ensuring that the EPC is updated following completion of the measures, and it will be important to ensure that the costs of carying this out are incorporated within the upgrade requirements so that the enforcement function can be properly resourced.

It recognised that it would be difficult for the Scottish Government to impose requirements on mortgage lenders for either mortgaging and re-mortgaging as this is controlled by UK wide legislation/ regulation.

3.10.2 Point of rental

Involving local authorities in ensuring compliance with energy performance standards at the point of landlord registration would be a new responsibilty and so stakeholders had real concerns about resourcing and capacity, as stated earlier.

As well as ensuring that any role given to local authorities with regard to regulation was properly resourced, tenants could play a significant role in the enforcement process. For this to be effective the following would need to be addressed:

- raising tenant awareness of minimum energy performance standards and EPCs. Scottish Government should require landlords to give tenants information about the proposed standard and the benefit of lower fuel bills and greater comfort.
- it would need to be backed by failure to comply with the standard being grounds for deregistering or fining landlords and local authorities would require additional resources to effectively police additional regulations; and
- tenants could seek recourse on failure to comply to the standard through the Private Rented Housing Panel (which is the body set up to deal with tenants complaints).

The Energy Bill currently before the UK Parliament gives powers to the Scottish Government to put in place regulations to ensure that a landlord 'does not unreasonably refuse a request by the tenant of the property to consent to the making of relevant energy efficiency improvements.' (Energy Bill – Explanatory Notes). This sits with provisions to introduce the Green Deal. On its own, however, we do not believe this will be sufficient. The majority view from the consultation on *Conserve and Save* was that the Repairing Standard would be an inadequate mechanism for applying minimum standards because it requires a tenant to make a complaint before action can be triggered (Scottish Government, 2010). We would argue that the same is true of the Energy Bill provisions and that the trigger should not be a tenant request but the point of rental itself and the point of registration with the local authority.

3.10.3 EPCs

Since December 2008, home owners wishing to sell their homes have been required to produce a Home Report, which is accompanied by an EPC and a full Energy Report. Landlords have been required to provide EPCs at the point of rental since January 2009. Owners selling their buildings but not through the Home Report have also been required to provide EPCs at the point of sale since January 2009.

Considerable attention has already been paid to the important role which EPCs, linked to Green Deal assessments, should play in the regulatory process. However, whether the EPC system is used in regulation or not, significant improvements to the system are needed. This was a clear message from the consultation on *Conserve and Save*, in which, 'almost all respondents felt that current EPCs, while useful for raising awareness, were now not fit for purpose' (Scottish Government, 2010a, p.17).

In considering the role which could be played by the EPC system in regulation, stakeholders in this study suggested that it would need to be significantly adapted through the adoption of a more robust assessment methodology. The use of rdSAP in its current form was considered inappropriate for this purpose and could not reasonably be used for enforcement. In particular, it was suggested that the assessment methodology needs to (a) take in to account a wider range of types of house construction (b) consider a wider range of measures, and (c) take into account climatic variations.

An alternative suggestion was for the EPC to be based on NHER. NHER is used by the Scottish House Condition Survey and the Scottish Housing Quality Standard, and the Scottish Government is considering using it for fuel poverty eligibility assessment (it currently uses SAP). NHER also has the benefit that it takes location and climate into account, whereas the current version of rdSAP does not.

As already discussed, it will be particularly important for the EPC methodology to be aligned with the methodology to be used in Green Deal assessments. DECC is currently conducting a review of EPCs to ensure they are fit for purpose for Green Deal.

Participants also suggested that there would need to be close links between enforcement and quality assurance. It was suggested that

there is a need to make more use of professional accreditation for surveyors, installers and manufacturers.

In this context, it should be noted that both quality assurance of assessment and provision of information on assessor organisations are amongst the issues addressed within the recast of the European Directive on EPCs, which will be implemented for January 2013. The Scottish Government will consult publicly on recast proposals around the middle of 2011. This may provide an opportunity to amend Scottish implementation of EPC requirement to make it fit for the implementation of minimum standards.

Quality assurance is also a key issue being addressed in the formulation of the Green Deal. DECC suggests that the system will include installer accreditation, product and material certification, Codes of Practice covering complaints and customer redress, and warranties covering materials and installation. This further reinforces the benefits of closely linking minimum standards regulation with the Green Deal.

3.10.4 Passing on upgrade requirements

In the RECO in Berkeley, California, anyone selling a property that is not already compliant with the latest Californian building regulations can either invest in the appropriate measures and demonstrate compliance (via an inspection) prior to sale, or they may register with the city that the duty to comply will be passed on to the buyer. In the latter case, the duty must be carried out within one year of the purchase and cannot be passed on to a subsequent buyer, should the property change hands within this period.

Such an approach allows for some flexibility in the market without the risk that some properties may slip through the net due to frequent transfers of ownership. This approach has stood the test of time in Berkeley and there seems to be no reason why it should not be adopted in Scotland although consideration would need to be given to enforcement in instances where the requirements

are passed on. A body, most likely the local authority, would need to be responsible for updating the EPC assessment, and it would be important to ensure that the costs of carrying this out are incorporated within the upgrade requirements so that the enforcement function can be properly resourced.

3.11 Finance mechanisms

3.11.1 The Green Deal

The Green Deal is a major element of the Energy Bill introduced into the House of Lords on 8 December 2010 and which, at the time of writing, is still progressing through Parliament. It is anticipated that the Green Deal will roll out in the second half of 2012.

The Government has set out in a policy briefing relating to the Bill how it anticipates the Green Deal will work (see box below).

Green Deal finance will be available to homeowners, landlords and tenants – so it will cover all existing private housing and so it should be a very significant support mechanism for minimum performance standards. As it requires no payment of upfront costs it should remove a major deterrent to voluntary compliance with a minimum standard for most households. As such, it forms a critical element of the package of measures needed alongside and in conjunction with regulation. However, we have argued strongly that to have most impact it must:

1. be integrated with the EPC process, such that the measures identified through the EPC process can be funded through the Green Deal; and
2. be based on identifying the cost-optimal package of measures, rather than individual cost-effective measures.

How the Green Deal will work

Green Deal Finance will create a new legal mechanism allowing the obligation to repay the costs of energy efficiency measures to attach to the energy bill at a property, rather than to an individual. The obligation to pay will pass to the new occupier or bill payer should the applicant (of the Green Deal) move away. This scheme will let householders, private landlords and

businesses enjoy the benefits of energy efficiency measures and the energy bill savings they can bring, without the need for up-front finance from the customer. Payments will be collected through energy bills.

Provisions are likely to include:

- ensuring an accurate and accredited assessment takes place as the first step to a Green Deal, so consumers have confidence that the measures are right for their property;
- ensuring only accredited measures are installed, by appropriately-qualified installers, giving consumers confidence that the measures are high-quality; and
- limitations over how much finance can be attached in this way, to ensure that only packages of measures which are likely to pay for themselves over time are included.

Consumer protection measures:

- requirement for energy suppliers to collect Green Deal payments, and pass these onto the finance provider;
- the liability to make Green Deal Payments to rest with the person who pays the energy bill for the property; and
- that people are informed of whether there is a Green Deal Finance arrangement in place (before assuming responsibility for paying energy bills for a particular property).

The key principle, or golden rule, for accessing Green Deal finance is that the charge attached to the bill should not exceed the expected savings, and the length of the payment period should not exceed the expected lifetime of the measures. This is not a Government guarantee, but a guideline for customers that, typically, they should be able to expect to gain more efficient, less wasteful properties with no additional net cost from the Green Deal.

3.11.2 Energy Company Obligation (ECO)

There will be circumstances when the Green Deal will be inadequate on its own to deal with the needs of particular households – such as some fuel poor households and those living in hard-to-treat properties. The UK Government is proposing that this gap be filled by the new Energy Company Obligation (ECO)

which will be focussed on such households and properties and is to be designed to be combined with the Green Deal in one package (DECC, 2010b). By linking minimum standards regulation with the Green Deal, as suggested in 3.1, this could be a means of attracting a greater share of ECO to Scotland, although this would be reliant on removing the current additionality rules relating to the supplier obligation. This issue will also need to be addressed in relation to the UK Energy Bill Private Rented Sector proposals.

3.11.3 Financial support in addition to the Green Deal/ECO

While the combination of the Green Deal and ECO should provide a good general purpose financial support mechanism for achieving minimum standards, there remain questions about the scale of available finance and whether finance will be available for a sufficiently broad range of measures. This is critical as it will determine whether the Green Deal incentivises and makes possible the whole-house packages which are needed to radically improve the energy performance of dwellings and avoid a piecemeal approach.

Once the arrangements for the Green Deal and ECO have been finalised, Scottish Government will need to examine what finance and support will be needed, alongside the range of other support (see section 1.3), to incentivise whole-house approaches. This might include, for example, shifting the balance from basic measures (as in HIS and UHIS, for example) towards grants and loans for more expensive measures, particularly solid wall insulation. In addition, the UK Government could give consideration to extending the Landlords Energy Saving Allowance (LESA) for private rented homes. This tax allowance for energy saving measures is available up to £1500 per property. If the value were increased, it could help to incentivise whole-house approaches in this sector. This could be further encouraged by extending the Energy Saving Scotland Small Business Loan scheme.

Case study: Germany – Federal Energy Conservation Ordinance and DENA/KfW loan scheme

Germany instituted the Federal Energy Efficiency Ordinance in 2007, and then revised it with stronger standards in 2009. The revised ordinance contains the following key elements:

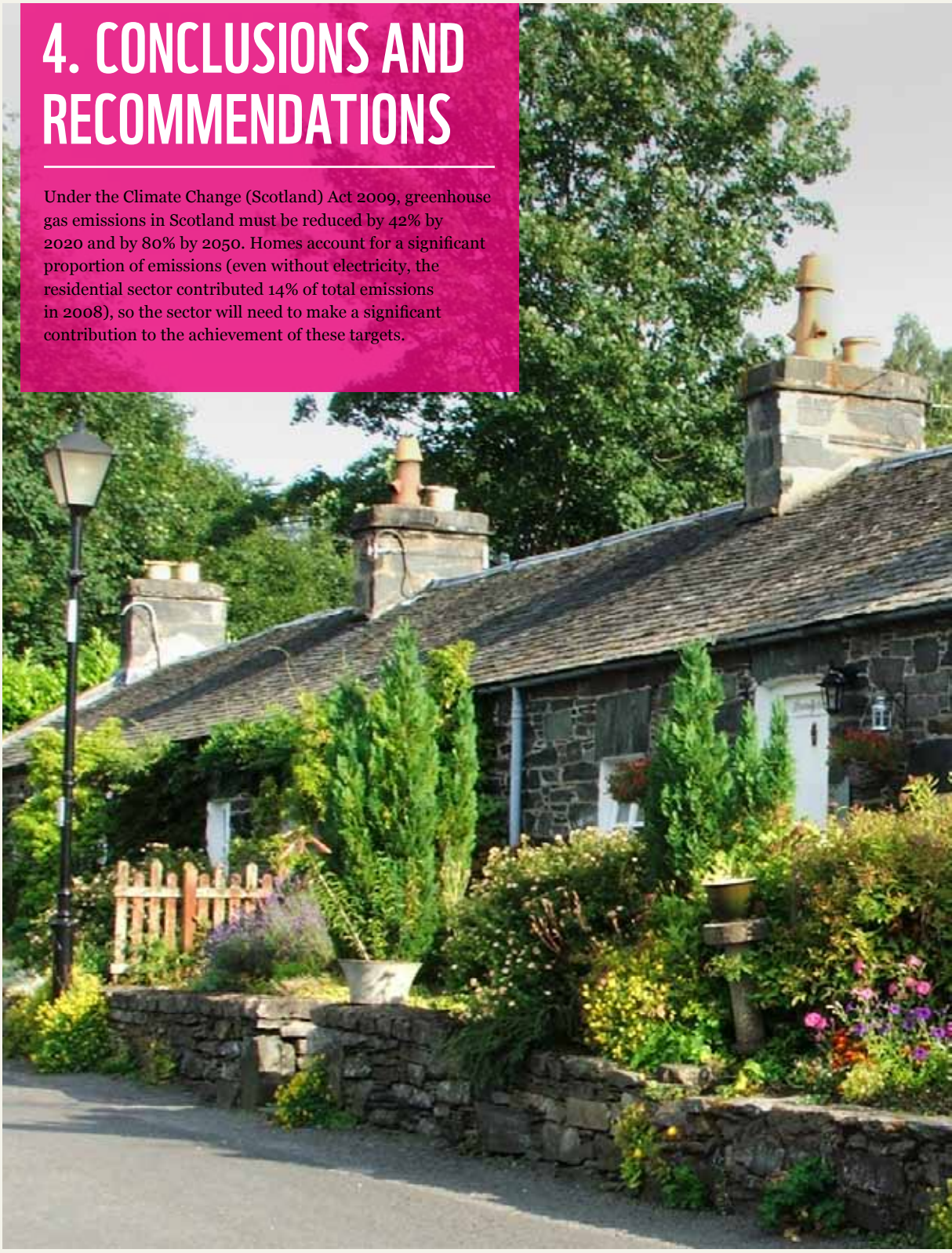
- increasing the efficiency performance for new buildings and existing buildings, across all sectors, by 30%;
- insulating uninsulated spaces between floors;
- the step-by-step elimination of electric hot-water tanks from designated buildings, by 2020, depending on the size of the building, the number of housing units, and how well it is insulated;
- incentives for installing renewable energy measures. Excess energy produced by these measures, beyond the building's energy requirements, can be sold back to the grid; and
- requirement for an Energy Passport, a 4-page energy performance certificate, for every home when it is sold or made available for lease. (RAP, 2010)

This ordinance works alongside the existing DENA/KfW loan scheme. The loans can be for up to 100% of the cost of energy efficiency improvements up to a maximum of £38,000 per dwelling with long payback periods and subsidised interest rates (typically 1.95%). Improvements must be specified by an energy consultant and must result in the building achieving or exceeding the current building standards. Conditions are most generous for measures with the greatest energy saving potential (Consumer Focus Scotland, 2011). In 2007 the cost of this scheme to the Government was €850m which stimulated €5bn in loans - a leverage ratio of almost 6:1 (EHA, 2009).

While the loan scheme has been widely cited as a success story it is not without fault. The Existing Homes Alliance (2009) point out that loans are not attached to properties but to householders. Therefore given the long life of many of the measures, consumers may feel it is 'unfair' to have paid for someone else to benefit from lower bills should they move out of their home. RAP (2010) also points to the modest rate of take up citing figures that show 230,000 homes improved each year in Germany compared to the more than 20 million households in Germany that need to be tackled.

4. CONCLUSIONS AND RECOMMENDATIONS

Under the Climate Change (Scotland) Act 2009, greenhouse gas emissions in Scotland must be reduced by 42% by 2020 and by 80% by 2050. Homes account for a significant proportion of emissions (even without electricity, the residential sector contributed 14% of total emissions in 2008), so the sector will need to make a significant contribution to the achievement of these targets.



4. CONCLUSIONS AND RECOMMENDATIONS

Although no sector-specific target has been set, *Low Carbon Scotland: Meeting Emissions Reduction Targets 2010–2022* (Scottish Government, 2011a) envisages a 36% reduction in residential emissions (excluding electricity) on 1990 levels by 2020.

Along with the other devolved administrations, the Scottish Government also has the responsibility to address fuel poverty, and has a target to eliminate fuel poverty as far as is reasonably practicable, by November 2016 (Scottish Executive, 2002).

In order for these targets to be delivered, it is now clear that a step-change is required in the implementation of domestic energy measures. Alongside the existing support available, the introduction of the Green Deal and new Energy Company Obligation (ECO) could play a significant role in delivering this step-change. However, experience from the new-build sector in the UK and experience gained in other countries, suggests that further regulation is now necessary if the climate change and fuel poverty targets are to be met.

42%
GREENHOUSE GAS EMISSIONS IN SCOTLAND MUST BE REDUCED BY 42% BY 2020 AND BY 80% BY 2050

As required by the Act, the Scottish Government published its report, *Regulation of Energy Efficiency in Housing*, in March 2011, setting out the Government's approach to these powers (Scottish Government 2011b). The report makes clear the government's intention to use regulation where necessary to supplement support and advice. It also states that regulation should cover both rented and owner-occupied housing, and sets out a process to prepare for regulation.

There is a real opportunity for the Scottish Government to introduce regulation which demonstrates a clear grasp of the challenges which need to be faced and the opportunities available, and which can act as an exemplar for the other UK administrations and internationally. There is a need to gear up for a large scale programme of whole house energy packages, facilitated and incentivised by the Green Deal and other support, but backed by regulation which plays a key role in driving the emissions reductions needed from the domestic sector by 2020 and beyond.

Based on the research presented in this report, we make the following specific recommendations for the introduction of minimum energy standards in Scotland:

The Standard

1. From 2015, all homes being sold or rented which fall in to bands F and G on the Energy Performance Certificate (EPC) should be required to be uprated to band E or above. A trajectory should also be set for the standard to increase towards 2020, with the 2020 standard acting as an 'aspirational standard', i.e. allowing property owners to achieve the standard earlier than required and adopt whole-house approaches should they choose to. Figures from the Scottish Government's housing energy model suggest that to achieve a 40% reduction in emissions from housing by 2020, the vast majority of houses would need to be at band C or above by 2020.

2. Scottish Government should work with the UK Government to ensure close integration between the Green Deal and EPC assessment processes to avoid duplication, minimise costs to householders and ensure direct links between the measures identified by the EPC process and the funding available through the Green Deal and Energy Company Obligation (ECO).

3. Scottish Government should work with DECC and Ofgem to ensure that the current additionality rules relating to CERT do not apply under the ECO. This will allow regulation to act as a lever for increased Green Deal and ECO spend in Scotland, rather than a barrier to such spend.

4. The upcoming recast of the European Directive covering EPCs provides the opportunity to make the system a suitably robust mechanism for the implementation of regulations. This should include changing the methodology so that it is sensitive (a) to the very wide range of housing and construction types in Scotland, and (b) to the very significant climatic variations across the UK.

Finance and Support

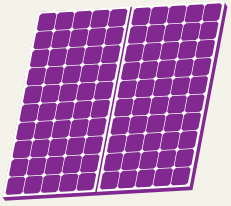
5. The Green Deal and future ECO, alongside other measures, will be critical to the acceptance and success of regulation. Once the arrangements for the Green Deal and ECO have

been finalised, Scottish Government will need to examine what further finance and support will be needed, to incentivise a large scale programme of whole-house packages. This might include, for example, shifting the balance from basic measures (as in HIS and UHIS, for example) towards grants and loans for more expensive measures, particularly solid wall insulation. In addition, the UK Government should give consideration to extending the Landlords Energy Saving Allowance (LESA) for private rented homes to help incentivise whole-house approaches in the private rented sector.

6. Scottish Government should closely monitor the level of energy savings being achieved by the regulation in conjunction with other measures over time and adjust its financial support for energy efficiency as necessary to keep emissions reductions on track towards the 2020 target. In particular, it will be imperative to ensure that the package of subsidies and financial incentives alongside regulation is helping to drive genuine whole-house approaches to improving energy performance.

7. Scottish Government should ensure that the awareness raising and support associated with the introduction of the standards, to emphasise the financial benefits of compliance, so as to encourage compliance even outside of these triggers.

8. The provision of sufficient finance and support mechanisms will be critical in minimising negative consumer reaction and this would be one of the principal benefits of aligning regulation with the Green Deal.



Scope

9. Although there is a higher percentage of homes with poor energy performance in the private rented sector, the regulations should apply to all private housing, i.e. private rented and owner-occupied homes, in order to:

    i. ensure equity across the housing sector;

    ii. achieve emissions reductions on a scale which is commensurate with the climate change and fuel poverty targets; and

    iii. accommodate the high percentage of mixed tenure domestic buildings in Scotland, where cooperation between householders is necessary for the

implementation of many measures.

10. Multiple trigger points will be needed in order to ensure widespread application of the standards. They should include:

    i. point of sale, transfer and change of title;

    ii. during extension/refurbishment, linked to existing requirements under Building Regulations; and

    iii. point of rental, landlord registration and change to council tax.

11. 'Hard-to-treat' properties will need to make a very significant contribution to the emissions reductions needed by 2020 so exemptions from the regulations need to be avoided, whilst allowing some flexibility for the hardest-to-treat or most sensitive properties. Instead, ongoing work is needed to ensure that planning policy is consistent with the challenges of climate change and to mainstream the measures for hard-to-treat homes, particularly solid wall insulation.

12. The standards for private sector housing and the energy aspects of the Scottish Housing Quality Standard (SHQS) need to be aligned in order to avoid difficulties in mixed tenure buildings.

Enforcement, Capacity and Skills

13. Local authorities will need to play an enforcement role with regard to the private rented sector. Concerns regarding their capacity to play such a role, and carry out their existing related regulatory activities in relation to the private rented sector, need to be addressed.

14. Tenants could also play a significant role in the enforcement process. To encourage this, passing on information regarding the standards and the benefits of compliance, should be a requirement for landlords.

15. At point of sale, buyers and sellers will be informed of the regulation through the conveyancing process. Solicitors will assist with compliance with the regulation and enforcement for any non-compliance will rest with the local authority. This is similar to the process for implementing the EPC requirement. Flexibility should be allowed, such that the buyers can take responsibility for carrying out the upgrade requirements within 12 months. A further enforcement mechanism will be needed

to account for these instances. Local authorities will need to be responsible for ensuring that the EPC is updated following completion of the measures, and it will be important to ensure that the costs of carrying this out are incorporated within the upgrade requirements so that the enforcement function can be properly resourced.

16. The Government's work, in association with partners, on the low carbon economy, needs to give urgent consideration to the capacity of industry to deliver the large scale programme of upgrades which are needed in Scotland. In particular, consideration needs to be given to skills, quality assurance and the supply of materials and technologies.

Minimum standards of energy performance clearly have a role to play as part of a package of measures to tackle climate change emissions and eradicate fuel poverty. This report sets out how effective regulation can be introduced which helps householders save money, does not place undue burden on owners, landlords or tenants, or on regulatory authorities while at the same time moving Scotland's homes up the scale towards low and zero carbon. This bold approach is necessary to make meeting Scotland's ambitious climate change targets a reality.

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APPENDIX A SECTION 64 OF THE CLIMATE CHANGE (SCOTLAND) ACT 2009

64 Living accommodation: assessment of energy performance and emissions

1 The Scottish Ministers must, by regulations—
(a) provide for the assessment of—

(i) the energy performance of living accommodation;

(ii) the emission of greenhouse gases produced by or otherwise associated with such accommodation;

(b) require owners of such accommodation to take steps, identified by such assessments, to—

(i) improve the energy performance of such accommodation;

(ii) reduce such emissions.

2 The regulations may in particular include provision about—

(a) the circumstances in which the regulations apply;

(b) the living accommodation to which the regulations apply;

(c) the persons who may be required to have assessments carried out;

(d) the periods within which such assessments must be carried out;

(e) the procedure and methodology for assessing the energy performance of living accommodation;

(f) the procedure and methodology for assessing the

greenhouse gas emissions produced by or otherwise associated with living accommodation;

(g) the persons who may carry out such assessments;

(h) the issuing of certificates, following such assessments, including the form, manner and content of such certificates;

(i) the form of any recommendations, contained in such certificates, as to the improvement of the energy performance of, and the reduction of emissions produced by or otherwise associated with, living accommodation;

(j) the manner in which and periods within which persons must take steps to comply with any recommendations contained in such certificates;

(k) the registration of such certificates;

(l) the disclosure of information which is entered in the register;

(m) subject to subsection (3), the enforcement authority in relation to the regulations;

(n) subject to subsection (5), the functions of that authority;

(o) the keeping of information and its production to the enforcement authority;

(p) the enforcement of the duties imposed by the regulations;

(q) offences in relation to failures to comply with requirements of the regulations.

3 The enforcement authority provided for in the regulations is to be such person or body as the Scottish Ministers consider appropriate.

4 The regulations may provide for the functions of the enforcement authority to be exercised by two or more such authorities and about the functions of each such authority.

5 The functions of the enforcement authority may include power to levy charges to recover the reasonable costs incurred by it in exercising its functions under the regulations.

6 The Scottish Ministers must, no later than 12 months after the day on which this section comes into force, publish a report setting out—

(a) what measures they intend to take to reduce emissions from living accommodation; and

(b) when they intend to make provision as mentioned in paragraphs (i) and (j) of subsection (2).

7 In this section, 'living accommodation'—

(a) means a dwelling; and

(b) includes—

(i) any building having a total useful floor area of 50m2 or more; and

(ii) any common areas, associated with such a dwelling.

APPENDIX B DEMSCOT ASSUMPTIONS FOR THE 40% BY 2020 SCENARIO

TABLE B.1 UPGRADE PACKAGES

NO.	OPTION	YES / NO	PLANNED UPTAKE	REALISTIC MAXIMUM UPTAKE	PERCENTAGE OF STOCK AVAILABLE	PERCENTAGE OF STOCK SELECTED	NUMBER OF DWELLINGS SELECTED
1	Changed user behaviour	No	100%	100%	100%	0%	0
2	Cavity wall insulation	Yes	60%	60%	40%	24%	624,828
3	Solid wall insulation	Yes	50%	90%	20%	10%	255,093
4	Loft insulation	Yes	98%	98%	61%	60%	1,557,815
5	Floor insulation	No	90%	90%	55%	0%	0
6	Short term upgrade package	Yes	100%	100%	86%	86%	2,235,413
7	Low energy lights	No	100%	100%	98%	0%	0
8	Solar water heating	Yes	60%	80%	90%	54%	1,401,248
9	Double or secondary glazing	Yes	60%	100%	19%	12%	301,868
10	Advanced heating controls	Yes	100%	100%	25%	25%	654,709
11	Boiler upgrade	Yes	100%	100%	56%	56%	1,438,855
12	Biomass boiler	Yes	80%	100%	7%	6%	145,642
13	Combined heat and power (CHP)	No	10%	50%	77%	0%	0
14	Ground Source Heat Pump (GSHP)	Yes	40%	50%	12%	5%	129,031
15	Air Source Heat Pump (ASHP)	No	20%	80%	14%	0%	0
16	Community heating with CHP	Yes	10%	10%	57%	6%	148,080
17	Improved electrical appliances	No	100%	100%	100%	0%	0
18	Photovoltaic	No	80%	80%	100%	0%	0
19	Wind turbine	No	30%	30%	22%	0%	0

TABLE B.2 COSTS PER DWELLING OF UPGRADE PACKAGE ELEMENTS

NO.	REF	OPTION	YES / NO	NO. OF DWELLINGS THAT MAY BE UPGRADED	EMBODIED CO_2 (KG PER DWELLING)	TOTAL EMBODIED CO_2 (TONNES)	COST PER DWELLING (£)	TOTAL COST (£M)	MAX UPTAKE	UPTAKE SELECTED	KG/£
4	4	Changed user behaviour	No						100%	0%	
2	2	Cavity wall insulation	Yes	1,041,380	410	255,867	500	312	60%	60%	0.819
3	3	Solid wall insulation	Yes	510,185	573	146,168	5,500	1,403	90%	50%	0.104
1	1	Loft insulation	Yes	1,589,607	53	82,253	500	779	98%	98%	0.106
5	5	Floor Insulation	No		319		1,200		90%	0%	0.266
6	6	Short term package: Draught proofing	Yes	189,842	90	17,086	30	6	100%	100%	3.000
	7	Pipe lagging	Yes	2,235,413	199	444,177	30	67	80%	100%	6.623
	8	Shutters	Yes	390,965			200	78	50%	100%	0.000
	9	Radiator shelves	Yes	2,178,822	69	149,249	500	1,089	90%	100%	0.137
	10	Radiator foils	Yes	2,178,822	6	13,073	30	65	95%	100%	0.200
	11	Cylinder insulation	Yes	625,928	97	60,840	30	19	95%	100%	3.240
7	12	Low energy lights	No		9		60		100%	0%	0.152
10	15	Solar water heating	Yes	2,335,413	2,041	2,859,947	4,000	5,605	80%	60%	0.510
11	16	Double or secondary glazing	Yes	503,113	524	158,179	3,700	1,117	100%	60%	0.142
12	17	Advanced heating controls	Yes	654,709	216	141,417	300	196	100%	100%	0.720
8	13	Boiler upgrade	Yes	1,438,855	1,797	2,341,458	2,500	3,257	100%	100%	0.719

COTINUED

NO.	REF	OPTION	YES / NO	NO. OF DWELLINGS THAT MAY BE UPGRADED	EMBODIED CO_2 (KG PER DWELLING)	TOTAL EMBODIED CO_2 (TONNES)	COST PER DWELLING (£)	TOTAL COST (£M)	MAX UPTAKE	UPTAKE SELECTED	KG/£
9	14	Biomass boiler	Yes	182,053	6,829	900,669	9,000	1,187	100%	80%	0.759
15	20	Combined heat and power (CHP)	No		3,235		4,500		50%	0%	0.719
16	21	Ground Source Heat Pump (GSHP)	Yes	322,577	7,189	520,956	10,000	725	50%	40%	0.719
17	22	Air Source Heat Pump (ASHP)	No		6,110		8,400		80%	0%	0.727
19	24	Community heating with CHP	Yes	1,480,800	2,000	169,626	3,000	254	10%	10%	0.667
18	23	Improved electrical appliances	No		500		600		100%	0%	0.833
13	18	Photovoltaic	No		1,456		8,000		80%	0%	0.182
14	19	Wind turbine	No		2,427		8,000		30%	0%	0.303

NOTES

1 The full text of Section 64 of the Climate Change (Scotland) Act 2009 is included in appendix A.

2 The model is open-source and available from http://www.scotland.gov.uk/Topics/Built-Environment/Housing/supply-demand/chma/marketcontextmaterials/DEMSCOTversion2

3 DEMScot was not designed as a way to model Energy Performance Certificates (EPCs), needed to comply with the European Energy Performance of Buildings Directive (EPBD). EPCs use SAP, the BRE's Standard Assessment Procedure, which has some different assumptions and is not directly comparable to DEMScot outputs. However, for illustrative purposes you can use DEMScot to provide indicative energy bands to show how the profile of the housing stock might change under different DEMScot scenarios.

4 Note that even without upgrades, the overall rating of the housing stock would improve by 2020 because of new build.

5 The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors.

6 Taken from DECC Press Release 2010/104 www.decc.gov.uk/en/content/cms/news/pn10_104/pn10_104.aspx

7 The NHER system rates dwellings on a scale of 0 (poor) to 10 (excellent) based on the total energy costs per square metre of floor area. Dwellings rated 7 or more are labelled as 'good' energy efficiency and those rated 2 or less are 'poor'. In 2009, 55% of dwellings were rated 'good' and 3% 'poor'.

8 This fund provides financial assistance for area based regeneration and conservation initiatives undertaken by local authorities.

Minimum standards in numbers

100% RECYCLED

25%

Houses account for 1/4 of Scotland's greenhouse gas emissions

ZERO

UK Government states that emissions from homes need to be at or near zero by 2050

£3,000

The average cost to upgrade 2/3 of Scotland's E,F and G rated homes is less than £3,000 per property

42%

Greenhouse gas emissions reduction required in Scotland by 2020

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony and nature.