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Home energy efficiency - review of evidence on attitudes and behaviours

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1. Introduction

- This report reviews the evidence on householders' attitudes and behaviours in relation to home energy efficiency, focusing on the different measures that the householder can take to improve the energy efficiency of their property.
- The Scottish Government is considering a proposal to regulate energy efficiency in private housing. This report informs discussions around how those regulations might be framed.
- *Key findings:*
  - In Scottish households, there has been widespread uptake of energy efficiency measures such as double glazing, loft insulation and cavity wall insulation. Uptake of solid wall insulation and boiler upgrades is much lower.
  - In Scotland, uptake has been higher in social sector housing than in the private sector.
  - There are a wide range of Individual, Social and Material factors that influence uptake of energy efficiency measures.
  - The evidence suggests there are particular barriers to energy efficiency improvement in private rented housing and in rural homes.
- *Key conclusions:*
  - There is considerable potential in targeting 'trigger points', as these are times in the life of the home when many of the Individual, Social and Material barriers to uptake may be weakened.
  - Although there is evidence of public support for a regulatory approach to energy efficiency in the private sector, many people are protective about the private domain of the home and so may remain hard to convince of the need for regulation.

1.2 Context

The Climate Change (Scotland) Act 2009 set targets to reduce Scotland's greenhouse gas (GHG) emissions by at least 42% by 2020 and 80% by 2050. The proposals and policies for meeting these emission reduction targets were outlined in Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027: *The Second Report on Proposals and Policies* (RPP2). This included a proposal for the Scottish Government to consider regulating energy efficiency in private housing. Emissions from housing account for 29% of GHG emissions from Scottish households (Scottish Government 2013a). In the UK in 2009, 60% of domestic energy consumption went towards space heating, with a further 18% used for water heating (Scottish Government 2012). There is therefore substantial scope for reducing household emissions by tackling the energy efficiency of the Scottish housing stock.

1.3 Key behaviours targeted in this review

The Scottish Government's *Low Carbon Scotland: Behaviours Framework* sets out ten Key Behaviour Areas (KBAs) in which individuals and households can make a significant impact in reducing their carbon emissions. These KBAs were identified in order to help channel the efforts of policymakers and other stakeholders towards encouraging activities amongst individuals and households that have the potential to deliver the greatest value in terms of carbon emissions reductions.

This review concentrates on literature relating to aspects of two of these KBAs:

- **Installing a more energy-efficient heating system** (e.g. by replacing inefficient boilers with condensing boilers)
- **Keeping the heat in** (e.g. installing insulation, double glazing and draught-proofing)

The focus here is on these physical adaptations to housing. But it is also important to consider how people engage with the technology associated with these energy efficiency measures. This report therefore incorporates evidence on people's awareness and understanding of how to operate their heating system's controls (e.g.

adjusting heating and hot water thermostats and programming timers) (section 5.5). This relates to another of the KBAs:

- **Better heating management** (turning down the heating thermostat to between 18°C and 21°C, reducing the hours the heating is on, and turning down the hot water thermostat to a maximum of 60°C).

Where evidence is available on differences in attitudes and behaviours amongst different types of stakeholder e.g. owner-occupiers, landlords (private and social), tenants (private and social) these are highlighted in the report.

2. Methods

2.1 Literature search

This desk-based review concentrates on evidence from Scotland and the rest of the UK. It includes academic literature and 'grey' literature published by relevant governmental and non-governmental organisations, including evaluations of specific schemes or initiatives.

The relevant academic literature was sourced using the Web of Science[1] database and Google Scholar. Search terms employed included 'energy efficiency'; 'retrofit (+ energy)'; 'energy + household/housing'; 'energy efficiency + barrier/motivation'; 'energy + tenant/landlord/owner-occupier'; 'insulation'; 'boiler + efficiency/efficient'. To source relevant 'grey' literature, the websites of the following organisations were also searched:

- Scottish Government
- UK Government - includes publications by the Department for Energy and Climate Change (DECC) and the Department for Environment, Food and Rural Affairs (DEFRA).
- Energy Savings Trust
- Consumer Focus Scotland / Consumer Futures
- Citizens' Advice Scotland

The literature uncovered in the searches was screened for relevance. In addition, outputs from the Scottish Government's Climate Change Behaviours Research Programme (CCBRP) which had not been sourced through searching were also screened for inclusion. Sources dating from 2008 onwards were included in the review. Both quantitative evidence (e.g. from household surveys) and qualitative evidence (e.g. from interviews, focus groups etc.) were included in the review. Where figures are quoted in the text these relate to large-scale surveys of representative samples of the population, unless otherwise specified. Such data is useful for gaining an understanding of the prevalence of certain attitudes and behaviours in the populations of interest. Qualitative research, e.g. studies using focus group methods, does not aim to generate this type of generalisable evidence. Rather, this type of research aims to reach an in-depth understanding of complex issues, generating findings that are grounded in the perceptions and beliefs of participants' as described in their own words. In this review, qualitative evidence was found to be particularly valuable in respect to understanding the complexities of people's use of heating controls, barriers to energy efficiency in linked dwellings, and attitudes towards policy interventions (e.g. Energy Performance Certificates and regulatory approaches).

Robust evaluation research can provide useful evidence on the impact of schemes and pilot initiatives, as well as feedback on both what works and which aspects of schemes might be improved in future delivery. Several evaluations were included in the review process. These provided useful evidence on why people participate in energy efficiency schemes, and the factors that contribute to the success of particular schemes. However, in several cases it was difficult to confidently assess the *impact* on uptake of energy efficiency measures due to a lack of control groups, gaps in the data, and modest survey response rates. Few examples of controlled intervention studies were found, reflecting the challenges associated with conducting this type of research in 'messy' real-world

[1] The Web of Science platform is the foremost citation index used to search academic literature. Its content covers over 12,000 of the highest impact journals and over 160,000 conference proceedings from across the globe.

settings. The recent examples of controlled interventions that were found do, however, point to a potential for greater use of controlled trials to assess potential energy efficiency interventions, which could help to strengthen the evidence base on home energy efficiency behaviours in Scotland and the rest of the UK.

It should also be noted that most of the evidence sources reviewed did not differentiate between the attitudes and behaviours of owner-occupiers, private sector tenants and social sector tenants. In many cases the research was focused on owner-occupied households.

2.2 Analytical framework

Analysis of the evidence was guided by the 'ISM' - Individual, Social and Material – framework. This framework is the Scottish Government's preferred approach to considering behaviour change in the areas of energy and climate change. The ISM approach considers a wide range of factors influencing behaviour change, combining numerous behavioural models used across social science disciplines to reach an integrated understanding of why people behave the way they do. In doing so the ISM model frames factors influencing behaviours within three contexts (see fig. 1). This is explained in the *ISM User Guide* and accompanying *Technical Guide*:

*"**The Individual context** – This includes the factors held by the individual that affect the choices and behaviours he or she undertakes. These include an individual's values, attitudes and skills, as well as the calculations he or she makes before acting, including personal evaluations of costs and benefits.*

***The Social context** – This includes the factors that exist beyond the individual in the social realm, yet shape his or her behaviours. These influences include understandings that are shared amongst groups, such as social norms and the meanings attached to particular activities, as well as people's networks and relationships, and the institutions that influence how groups of individuals behave.*

***The Material context** - This includes the factors that are 'out there' in the environment and wider world, which both constrain and shape behaviour. These influences include existing 'hard' infrastructures, technologies and regulations, as well as other 'softer' influences such as time and the schedules of everyday life."*

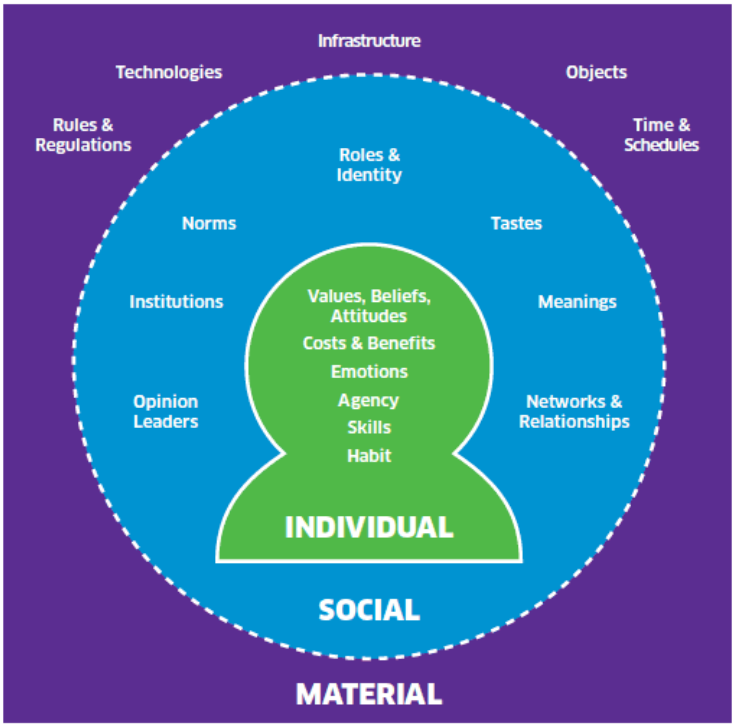

Figure 1: The ISM framework (Source: Darnton and Horne 2013).

Throughout this report the relevant ISM factors (e.g. Values, Beliefs, Attitudes; Costs & Benefits; Institutions, Infrastructure) are underlined in the text.

3. Knowledge and awareness of household energy efficiency measures

Before outlining the Individual, Social and Material influences on the uptake of energy efficiency measures it is necessary to consider the extent of householders' awareness about these measures. Not only is awareness a prerequisite for adoption of home energy efficiency measures, but some research indicates that people hold more positive attitudes towards measures they are more familiar with (Scott et al. 2014).

3.1 Knowledge and awareness of home energy efficiency measures

General awareness about some energy efficiency improvements that can be made to the fabric of domestic properties is high. However, public awareness varies considerably between the different measures. DECC conducts regular large-scale surveys to track awareness and attitudes to energy and climate change issues (DECC 2014a). These surveys are representative of households in the UK. Table 1 below shows the most recent results from DECC's tracker survey.

Table 1: UK householders' awareness about different energy efficiency measures (DECC 2014d).

	% of respondents		
	Haven't heard of	Haven't thought about	Total haven't heard/ haven't thought about
Replacing older gas boiler with condensing boiler[1]	3%	13%	16%
Installing/ topping up loft insulation[2]	2%	6%	8%
Installing double glazing[2]	1%	3%	4%
Installing cavity wall insulation[2]	4%	11%	16%
Installing solid wall insulation[2]	19%	23%	42%
Installing underfloor insulation[2]	11%	30%	41%

[1] Data collected Dec 2013; [2] Data collected Mar 2013

Table 1 suggests that awareness about the possibility of replacing older boilers, installing double glazing, loft insulation, and cavity wall insulation is very high. However awareness about solid wall insulation in particular is much lower - with almost 1/5 reporting that they have never heard of it. Table 1 also highlights that, particularly in the case of boiler replacements and cavity wall insulation, these measures not being 'top of mind' is perhaps a more pressing problem than people simply not having heard of them since a greater proportion of people reported not having thought about taking up these energy efficiency measures than reported not having heard of them at all.

Another aspect of awareness relates to knowledge about what is already in place in the property. It has been reported that 6% of people in Scotland report not knowing whether they have cavity wall insulation or not. In addition, more people report having solid wall insulation than representative data based on physical home surveys shows is the case. This suggests public confusion over the language used and/or as to whether walls are solid or not (EST 2010).

4. Uptake of energy efficiency measures

The Scottish House Condition Survey (SHCS) is the primary source of evidence on the uptake of home energy efficiency measures in Scotland. Some of the data collected by the SHCS is not reported annually. This report used the most up-to-date figures available in published reports of SHCS findings. The SHCS 2008/10 asked about the work and repairs that had been done to respondents' homes within the previous year. It found that 11% of households had undertaken at least one energy efficiency improvement. However, only 26% of households that had any work or repairs done to their home reported energy efficiency improvements as part of this. Private rented dwellings were least likely to have had an energy efficiency improvement carried out in the past year. Only 5% of these households reported an energy efficiency improvement, compared to 11% of social rented and 12% of owner-occupied households (Scottish Government 2012).

Table 2 below shows reported levels of recent adoption of specific energy efficiency measures, from a representative survey of Scottish energy consumers.

Table 2: Scottish energy consumers' self-reported uptake of measures in 2 years leading up to Feb 2012 (Consumer Focus Scotland 2012).

	% reporting adoption in previous 2 years
Installed new heating system	3%
Installed cavity wall insulation	7%
Installed loft insulation	12%
Improved loft insulation	5%
Installed double glazing	6%
Installed draught proofing	5%

The following sections examine the overall level of uptake of different types of home energy efficiency measures in Scottish households. These estimates of the overall uptake are based on physical surveys carried out by SHCS surveyors, rather than reports of householders.

4.1 Energy efficient boilers

The SHCS in 2010 reported that 84% of households use a boiler as their primary heating source. Of these, 22% had condensing/condensing combi boilers (Scottish Government 2012).

4.2 Heating controls

In 2010, 69% of Scottish households with central heating reported having both time and temperature controls. A further 15% reported having a time clock only, and 8% a thermostat only (Scottish Government 2012). Of those that reported having a thermostat, 90% reported using it to manage how their home was heated. A slightly smaller proportion (85%) of those with time programmers reported using them to adjust the hours the home is heated for. Although there were no reports found of how uptake of heating controls in Scotland may differ according to tenure, there is evidence that private rented dwellings in England are less likely to have a full set of heating controls (i.e. a central timer, thermostatic radiator valves, and room thermostats) than other tenures (Munton et al. 2014).

4.3 Loft insulation

The SHCS reports uptake of home energy efficiency measures including insulation. Table 3 shows the proportion of lofts with varying levels of insulation. As at 2012, 88% of lofts had at least 100 mm of insulation. This leaves 12% of lofts with less than 100 mm or no loft insulation at all. This represents an estimated 216,000 dwellings that could benefit greatly from loft insulation (Scottish Government 2013b).

New build homes in Scotland are now required to have at least 300 mm of loft insulation. Only 17% of all lofts had this high standard of insulation in 2012; however this proportion has risen steeply from just 5% in 2010 (Palmer and Cooper 2013). The Energy Saving Trust recommends a minimum 270 mm of loft insulation.

Table 3: Uptake of loft insulation measures in Scotland (Scottish Government 2013b).

	% of dwellings with lofts		
	Private sector[1]	Social sector	All tenures
No loft insulation installed	2%	0%	2%
100 mm+ of loft insulation	87%	93%	88%
300 mm+ of loft insulation	16%	21%	17%

[1] Includes both owner-occupied and private rented housing

Table 3 also shows that the social sector is performing better than the private sector (which includes both private rented and owner-occupied housing) in its uptake of loft insulation. Energy efficiency improvements in the social sector have been driven by the Scottish Housing Quality Standard (SHQS). The SHQS was introduced in 2004 and

sets minimum standards, including for the energy efficiency, of housing let by local authorities and Registered Social Landlords to be met by 2015.

4.4 Wall insulation

Around three-quarters of dwellings in Scotland have cavity walls. Table 4 shows that around 66% of these dwellings have cavity wall insulation (CWI). This figure has risen by 10% since 2008. The majority of uninsulated cavity walls are classed as standard (20% of all cavity walled dwellings), however many are classed as hard to treat (15% of all of all cavity walled dwellings). Hard to treat cavity walls (HTTCs) are more expensive to insulate. These include buildings with three or more storeys, those that are severely exposed to the elements, at risk of water penetration, of a non-traditional building type, and/or with partially filled, narrow or uneven cavities or with CWI that has failed. It should be noted that it is becoming increasingly difficult to identify CWI installations (the signs can fade or get covered up). This may mean that the SHCS underestimates the number of dwellings with CWI.

Table 4: Uptake of cavity wall insulation in Scotland (Scottish Government 2013b).

	% of dwellings with cavity walls		
	Private sector[1]	Social sector	All tenures
Insulated	66%	66%	66%
Not insulated - standard	22%	16%	20%
Not insulated – hard to treat	13%	19%	15%

[1] Includes both owner-occupied and private rented housing

The proportion of dwellings with CWI is the same in the private sector as in social sector housing (table 4). However, a greater proportion of cavity walls in private sector housing are classed as standard and uninsulated, whereas a greater proportion of cavity walls in the social sector are HTTCs. This difference is likely due to differences in building types and ages, and the higher proportion of multi-storey dwellings in the social sector (Scottish Government 2013b).

A quarter of dwellings in Scotland have solid walls or other (non-cavity) types of construction. These walls are more expensive to insulate and may be classified as hard to treat (HTT). As at 2012, just **11% of dwellings with solid/other walls had wall insulation**.

Table 5 shows the uptake of wall insulation measures in dwellings built before 1983. Homes built after 1982 have been subject to higher building standards requirements for insulation. Uptake of both CWI and internal/external insulation in these older properties has been higher in the social sector (where improvements have been driven by the SHQS) than in the private sector. The majority (68%) of all pre-1983 private sector housing remains untreated.

Table 5: Uptake of retrofit wall insulation in older dwellings in Scotland (Scottish Government 2013b).

	% of pre-1983 dwellings		
	Private sector[1]	Social sector	All tenures
None	68%	48%	63%
Cavity	27%	37%	30%
Internal or external	5%	15%	8%

[1] Includes both owner-occupied and private rented housing

4.5 Double/triple glazing

As at 2010, **92% of dwellings had double glazing**. Only a very small number of homes (less than 1%) had triple glazing (Scottish Government 2012).

4.6 Differences in uptake between demographic groups

A survey commissioned by Consumer Focus Scotland highlighted differences between socio-demographic groups in their reported uptake of measures like installing insulations, double glazing and upgrading heating systems

(Consumer Focus Scotland 2010b). The following groups were more likely to have made such energy efficiency improvements to their home:

- Middle aged and older consumers
- Higher socio-economic groups
- Households with more than one person
- Rural households

Tovar (2012) examined group differences in uptake in greater depth by applying statistical models to representative data based on physical home surveys, as collected by the English House Condition Survey (years 2004-2007). This research broadly agreed with the above findings for Scotland, finding older people (60+ years), households with more than one occupant, and those not living in cities to be more likely to have higher levels of investment in energy efficiency measures in their home.

However, this study of the English housing stock highlighted that **differences between socio-economic groups are complex**; absolute levels of income did not have an independent effect on the level of energy efficiency investment in the home. Rather it appears that housing tenure and whether a household receives benefits may be more important factors than income itself. Those in receipt of benefits were more likely to report high levels of energy efficiency measures in their home (possibly due to greater eligibility for grants and support). There was also an independent effect of tenure on home energy efficiency. Living in **social rented housing** was also associated with a greater level of energy efficiency investment in the property**. Renting in the private sector** was, however, associated with low levels of energy efficiency measures in the property. The particular barriers to uptake of energy efficiency measures in private rented housing are discussed further in section 5.1.3.

4.7 Willingness to adopt measures

Figure 2 shows the distribution of the responses UK householders give when asked about different energy efficiency measures in relation to their home (DECC 2014d). This shows that the proportion of householders that demonstrate a willingness to adopt measures but have not already done so (represented by green bars in the chart) is quite limited. Lack of knowledge and awareness (the purple bars in fig. 2) and householders not feeling that it is their decision to make because they rent (teal bars) are important reasons why many have not adopted particular measures (as discussed above). However many simply report that they don't want to, or probably won't (red bars in the chart). This proportion is particular high for solid wall insulation (20% of respondents) and underfloor insulation (22%). However, in respect to upgrading an older boiler to a condensing boiler, a greater proportion report that they are thinking about/would like to do this than say they don't want to/probably won't do this (14% compared to 12%).

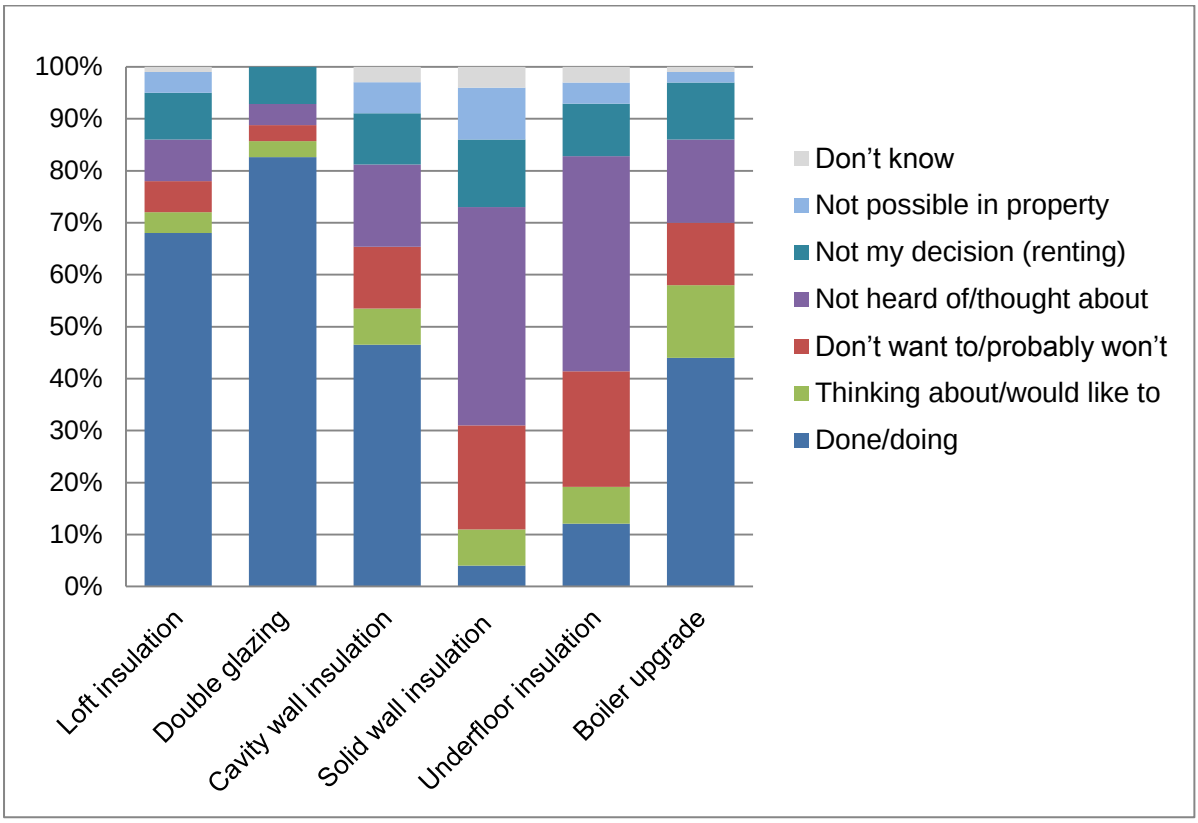

Figure 2: UK householder attitudes to adopting energy efficiency measures (DECC 2014d). A breakdown of responses is provided in table form in Annex A.

5. Factors influencing uptake of home energy efficiency measures

This section discusses the available evidence on the factors that influence decisions on whether to adopt or invest in energy efficiency measures in the home. These factors are considered here in relation to the ISM – Individual, Social and Material - framework (see section 2.2).

5.1 The Individual context

5.1.1 Financial costs and benefits

One of the main barriers to adopting energy efficiency measures in the home is the financial cost involved, both in terms of upfront costs and long payback periods (Caird et al. 2008, Lainé 2011c, Brook Lyndhurst and Ecometrica 2011, Dowson et al. 2012).

Data from a survey conducted by the DECC and the Energy Savings Trust found that the main barrier to the **uptake of cavity wall insulation** (CWI) reported by Scottish householders is affordability – 25% of those who had the power to make decisions about investment in their home but did not have CWI in place gave this as the main reason (EST 2010). However, people's perceptions of the cost of CWI are often inaccurate. One quarter of people are reported to believe that CWI would cost them more than £600; more than double the market price at the time of the research (EST 2010). Affordability was also reported as a major barrier to loft insulation and solid wall insulation. Twenty-four per cent of non-adopters of **loft insulation** stated affordability as the main reason, however motivational factors relating to the perceived hassle involved (see next section) was the most common reason for not adopting (44% of respondents). Affordability was stated by 28% as the main reason for not adopting **solid wall insulation**; however lack of awareness was the most common reason given (45% of respondents). When external and internal solid wall insulation measures have been explained to participants over two-fifths have said these measures being 'too expensive' is a barrier to adopting them (42% for external, 43% for internal wall insulation) (EST 2010).

Financial costs are also reported to be the most common reason for not **upgrading an older boiler** in a (non-representative) survey of UK consumers (Caird et al. 2008). Even when financial assistance is available, costs may still be prohibitive. An evaluation of the 2010 UK Boiler Scrappage Scheme found that, amongst survey respondents who had received a £400 voucher towards a boiler upgrade but who had let it expire, the most common reason given for this was that the work was seen as still being too costly. Of the 145 000 vouchers issued through the scheme, 118 618 were successfully claimed after installation took place. Vouchers were issued over a period of 3 months, and were valid for 12 weeks after issue. The evaluation of the scheme included a survey of a small (non-representative) sample of 46 applicants whose voucher had expired. Of these, 20 reported that primary reason for letting the voucher expire was that the work was still too costly or that money problems had prevented the upgrade taking place (Murray and Law 2011).

Research on consumer **willingness to pay** for energy efficiency measures has found that householders are not willing to pay more than £4000 (the price people were willing to pay ranged from £0-£4000) (Lainé 2011c). Loan repayments may be seen as acceptable if they range between £30-50 per month, and although the preferred payback period is between 0-5 years, up to 15 years may be seen as acceptable. Interest rates on loans can act as a disincentive to investment – it is reported that:

'by switching from an interest-free loan to a 2% loan you will lose up to 20% of the people interested and by switching form a 2% to a 7% APR, you can lose a further 20%.'

(Lainé 2011c)

Considerations of costs and benefits are also key drivers of uptake of energy efficiency measures. The main motivations for people contacting Energy Saving Scotland advice centres (ESSac) is to access advice on grants (63% of clients) and longer term bill savings from energy efficiency improvements (58% of clients) (EST 2010)

The majority (68%) of respondents to a UK survey by EST and Defra in 2009 report that 'now times are tougher economically they are more interested than ever in how to save energy' (EST 2010). The **potential financial savings on fuel bills** are reported by many as a primary driver for energy efficiency improvements and interest in incentive schemes (e.g. Lawson 2010, DECC and EST 2011, Consumer Focus Scotland 2013, DECC 2014b). In a case study of an area-based energy efficiency scheme in deprived communities in England, the average savings residents expected was around £28 per month (Scott et al. 2014). However there is also evidence that people are often sceptical about the level of savings that would be realised, and this can be a barrier to uptake (Dowson et al. 2012, Consumer Futures 2013). Householders are often pleasantly surprised (but may still remain sceptical) when informed of the savings that could be achieved (EST 2010, Consumer Futures 2013).

Support schemes and financial incentives can help to overcome the barriers associated with (perceived and actual) costs of energy efficiency improvements. Many sources discuss **access to financial support schemes** as an impetus for the uptake of home energy efficiency measures (e.g. EST 2010, Consumer Focus Scotland 2010a, DECC and EST 2011). Consumer research indicates that householders prefer incentives to take the form of council tax and stamp duty rebates, and are more favourable towards financial incentives coming directly from the government as opposed to private sector companies (Lainé 2011c). Although providing access to loans can help to cover the up-front costs of installations, recent pilot studies undertaken in Fife and Orkney suggest that households may be reluctant to take on debt and prefer to use grant support or their own savings to finance solid wall insulation measures (EST 2013).

It can be difficult to assess how many efficiency improvements made under government supported schemes would not have gone ahead without the scheme's assistance. Having said this, an evaluation of energy efficiency support schemes in Scotland (conducted in 2008) reports that 80% of the grant recipients questioned said they would not have installed all of the energy efficiency measures that they had without the grant, though only 20% said they would not have installed any of those measures (Halcrow Group 2008). Evaluation of the Home Insulation Scheme reported that 60% of those who received insulation claimed that they would not have had it installed without the scheme (Scottish Government 2010). However, the majority (61%) of respondents in a sample of those who received assistance from the UK Boiler Scrappage Scheme said they would have replaced their boiler within a year

regardless (Murray and Law 2011). Public awareness of government grants and schemes available is discussed in section 6.1 below.

Although financial incentives can go some way to overcoming the cost barriers associated with home energy efficiency retrofits, the evidence suggests that even schemes offering free installations encounter challenges in engaging householders (EST 2010). Much of this may be down to the 'hassle factor' and other barriers discussed below. Another factor limiting take-up of free schemes is that owner-occupiers sometimes presume that they will not be eligible (Consumer Focus Scotland 2013). This may point to a need for clearer communication of the eligibility criteria for free schemes. Additionally, a small number of (particularly older) people, report a reluctance to accept 'hand outs' (Brook Lyndhurst and Ecometrica 2011).

5.1.2 The 'hassle factor'

Attitudes and beliefs about the hassle or inconvenience of energy efficiency improvements are another key barrier to uptake. This is most often reported in relation to installing insulation measures. Almost half (44%) of householders who have not installed **loft insulation** say that the reason is to do with motivational factors like the hassle involved in clearing loft space, or in having to commit time to the process of organising and having the work carried out (EST 2010). The inconvenience of losing storage space in the loft can also be a concern (Caird et al. 2008). The 'hassle factor' is also a key barrier to the uptake of **solid wall insulation**. Physical disruption and having to redecorate are the most commonly reported barriers to internal wall insulation (each reported by over 60% of non-adopters), with disruption cited as a barrier to external insulation for 33% (EST 2010).

Perceptions about the disruption and inconvenience that may be caused are a common reason why many people who show an initial interest in schemes drop out before work gets underway (Affinity Sutton 2011). Overcoming the disruption barrier is particularly important for engaging hard to reach groups like older people, and those suffering physical or mental ill health (DECC 2014c).

'Hand-holding', i.e. guiding people through the process of making an application and the different stages of having an audit conducted and insulation installed, can help to overcome the barriers associated with perceptions of hassle and inconvenience (Brook Lyndhurst, 2008). Offering loft clearance services alongside loft insulation may also be a promising approach, as highlighted by a recent pilot study by DECC, however the evidence is as yet inconclusive (DECC 2013). In this pilot intervention, one local authority acted as a control group, with residents offered loft insulation at a price of £179. In two other local authorities the offer included a loft clearance service alongside the installation for either a total cost of £369 (intervention group A) or £450 (intervention group B). Residents were contacted by mailshot. Due to the low overall level of uptake (highlighting the challenges of engaging people through leafleting) it was not possible to perform statistical comparisons. However, the results shown below suggest that fewer people dropped out of the process when loft clearance services were offered alongside insulation.

Table 6: Results of DECC loft clearance pilot intervention study (DECC 2013).

Group	No. of leaflets distributed	% converted to audit (no. of households)	% audits converted to installation (no. of households)
1) Control	24, 673	0.03% (8)	38% (3)
2) Intervention A	23, 848	0.07% (17)	94% (16)
3) Intervention B	24, 323	0.05% (11)	82% (9)

5.1.3 Specific individual barriers in rental properties

Tenure is a key influencing factor on the uptake of energy efficiency measures (Brook Lyndhurst and Ecometrica 2011, Tovar 2012, Scott et al. 2014). Figure 2 (in section 4.7) showed that between 7% and 13% of people (depending on the measure in question) report that it is not their decision whether or not to undertake improvements because they rent their home (DECC 2014a). A representative survey of Scottish consumers found that, amongst those who reported having taken no action on energy efficiency in the previous 2 years, the most common reason (given by 36%) was being a tenant (Consumer Focus Scotland 2012). This highlights a lack of agency - the capacity to undertake action - over energy efficiency matters perceived by tenants.

Housing tenure issues pose a particular barrier to the improvement of the energy efficiency of **flats**, since a high proportion of flats are rented, and there are specific Material barriers associated with linked dwellings (see section 5.3.2) (Pelenur and Cruickshank 2012, Consumer Futures 2013). Research on the English housing stock has also highlighted a significant **split between social and private rented properties** in terms of the investment made in energy efficiency improvements (see section 4.4).

It is therefore primarily **landlords' attitudes and actions** that determine levels of investment in energy efficiency in rented properties. As landlords do not live in their property, the balance between the financial costs and benefits of undertaking efficiency improvements differs to those applying to owner-occupiers. This **'split incentive'** - where landlords are responsible for making the financial investment, but tenants receive the benefits in terms of savings on fuel bills - is considered by some as a key barrier to uptake (Lainé 2011a, Consumer Focus Scotland 2011). Research on private landlords' attitudes to energy efficiency has found that although landlords demonstrate an increasing awareness about energy efficiency they are less inclined to invest in their rental properties than in their own homes as the main concern is to maximise financial returns (Lainé 2011a). However, tenants' attitudes can also pose a barrier to improvement of energy efficiency. There is some evidence on this factor with respect to social housing in Scotland; 1/5 of SHQS exemptions in 2011 were issued on the basis of tenants not wishing to have the work done (Scottish Housing Regulator 2012). The review found no evidence on how common it is for tenants in private rented housing to refuse energy efficiency improvements proposed by the landlord.

UK surveys of private landlords have found that the proportion who report taking energy efficiency into account when buying a property fell from 38% in 2005 to just 27% in 2009 (Harris Interactive 2009). However, over 90% of the landlords in these surveys reported having installed energy efficiency measures in rental properties, with the most common measures reported being the installation of double-glazing, programmable heating controls and loft insulation. It should, however, be noted that the extent to which this sample of landlords is representative of UK landlords in general is not clear from the research report. There were differences observed between the attitudes of commercial landlords letting several properties and buy-to-let landlords with only one rental property. The latter are more likely to have considered energy efficiency when buying property to let, and a greater proportion see improving energy efficiency as part of their responsibility as a landlord (Harris Interactive 2009).

The **perceived level of demand** for energy efficiency amongst renters is likely to influence the attitudes of landlords. Only one quarter of landlords believe that energy efficient properties are let more quickly (Harris Interactive 2009). Qualitative research conducted in Scotland found that tenants are unlikely to request energy efficiency improvements. Participants commonly reported 'putting up with' problems like draughts, and many reported that they would only contact the landlord about specific problems in the property, rather than potential improvements (Consumer Futures 2013). Despite this, there is some evidence that tenants may stay longer in more energy efficient rented properties (Tovar 2012).

5.1.4 Perceptions about effectiveness and reliability

Survey evidence suggests that 18% of consumers in Scotland report scepticism about the **effectiveness** of energy efficiency improvements or concern that they would lead to problems with **damp**, compared to just 6% in the UK as a whole (EST 2010). Negative perceptions of condensing boilers is an important barrier to their uptake - many believe that they are less reliable and have a shorter lifespan than other types of boiler (Caird et al. 2008).

Concerns about the quality of workmanship and longer-term support available if problems arise have been reported as a barrier to the uptake of free schemes for energy efficiency improvements (Consumer Focus Scotland 2013). It appears that some people think corners are more likely to be cut when the customer is not paying the bill for the work.

5.1.5 Thermal comfort

Making the home warmer and more comfortable is a common reported motivation for adopting energy efficiency measures (e.g. Caird et al. 2008, Affinity Sutton 2011, DECC 2014b). Warmth is the thing that people mention most often when asked about what it means to be comfortable in the home (Huebner et al. 2013). However, this highlights an important side-effect of energy efficiency improvement. There is considerable evidence that the actual reduction in energy consumption as a result of investment in energy efficiency is often much smaller than expected (Dowson et al. 2012, Tweed 2013). Part of this is thought to result from **'thermal comfort take-back'** - where the benefit of energy efficiency improvement is experienced in the form of higher temperatures in the home rather than reduced energy consumption and fuel bills (Hong et al. 2009, Sorrell et al. 2009, Dowson et al. 2012). This is a particular issue in fuel poor households which, prior to improvements being made, could not afford to heat the home to a comfortable level. Whilst this take-back effect may mean an increase in welfare for fuel-poor households, it also raises concerns about the implications of Green Deal finance for this group since repayments may not be balanced out by financial savings as expected (Booth and Choudhary 2013).

5.1.6 Values, beliefs and attitudes towards the environment and climate change

Environmental values, beliefs and attitudes are another important driver for the uptake of energy efficiency measures, though these are largely secondary to potential cost savings and improvements in thermal comfort (Crosbie and Baker 2010, DECC and EST 2011, Brook Lyndhurst and Ecometrica 2011). Research by DECC suggests that although those on lower incomes tend to be more concerned with saving money and making the home warmer, messages tapping into environmental values can be just as, or even more, effective in engaging those in higher income groups with energy efficiency (Databuild Research and Solutions 2014). Having said this, a study of individuals living in deprived communities in England found that although beliefs in climate change were not associated with willingness to invest in energy efficiency improvements, those who believed that humans have the ability to mitigate climate change reported greater willingness (Scott et al. 2014).

5.2 The Social context

5.2.1 Trust in institutions

Utilising trusted intermediary organisations can help in engaging people with energy efficiency schemes and initiatives, and has been seen to be a critical success factor in the implementation of area-based schemes (Russell 2012, EST 2010, Consumer Focus Scotland 2010a).

The institutions that people trust the most to give them impartial advice on energy efficiency measures are third sector organisations such the Energy Saving Trust, Citizens' Advice Bureau, charities and local community-based groups (EST 2010, DECC 2014a). Recent pilot interventions by DECC indicate that bottom-up delivery approaches utilising community groups and community support organisations result in greater uptake of energy efficiency schemes (Databuild Research and Solutions 2014). Six local pilots undertook a variety of community engagement activities to promote uptake of energy efficiency measures under a range of different schemes. These activities included direct mailing, door-knocking, community events and drop-in sessions, and awareness-raising through

local media and online social media. Each area was paired with a comparator area of a similar size, housing stock and demography, in which the same offers were available but were not actively promoted. In most cases where there was sufficient data to allow comparisons, the intervention areas outperformed the comparator areas in terms of metrics like referrals to schemes and installations carried out.

Research in Scotland suggests that the majority do not fully trust the UK government, Scottish Government or local councils to give impartial advice, often believing that these institutions have hidden or mixed motives (EST 2010). Energy suppliers are amongst the least trusted institutions; less than 10% of Scottish householders say trust energy suppliers (EST 2010). However, DECC's tracker survey reports that although only 12% of UK respondents said they would trust their energy supplier to provide advice about which heating system to install, even fewer said they would trust a housing association, landlord, and other private service providers such as Green Deal assessors and heating system manufacturers (DECC 2014a).

Similarly, consumer confidence in the gas and electricity, private rental, and home maintenance and improvement markets has been shown to be low compared to other markets. This has led to concern over the institutional framework for the delivery of energy efficiency schemes like the Green Deal (Lainé 2011c).

Householders also commonly report distrust in organisations that contact them about energy efficiency through cold calling or door-to-door sales, especially when offering free measures (EST 2010, Morrison 2013). In addition, some people, particularly vulnerable groups, may be put off by the idea of allowing delivery agents access to their home for the purposes of audits or installation of measures (Consumer Focus Scotland 2013). There is some evidence to suggest that doorstep contacts made by community groups may be much more effective in engaging residents than those made by private contractors (Databuild Research and Solutions 2014).

5.2.2 Social networks and norms

Householders' social networks and relationships may also have a strong influence on the uptake of energy efficiency measures. Friends and family are often the most trusted source of advice on energy efficiency (EST 2010, DECC 2014a). Evidence suggests that seeking information from personal contacts on energy efficiency is associated with higher rates of uptake of measures (McMichael and Shipworth 2013). Additionally, 28% of people say that they would be more likely to install energy efficiency measures if their friends and neighbours were doing so (EST 2010). Area-based schemes are particularly well-placed to capitalise on this influence of social norms.

The strength of norms around energy efficiency may, however, differ between different types of measures - case study research conducted in England found that participants felt more social pressure to adopt loft insulation and double-glazing than other measures such as external wall insulation and solar electric panels (Scott et al. 2014). Speculatively this may be linked to an increased awareness about these measures, as loft insulation and double-glazing were the measures that participants in the research reported being most familiar with.

5.2.3 Tastes and aesthetics

Tastes and aesthetic preferences are social phenomena which are developed collectively, and relate to people's identification with different social groups (Darnton and Evans 2013). Tastes and aesthetic considerations can act as both a driver and barrier to energy efficiency improvements. The most commonly reported barrier to external wall insulation (after the measure has been explained to research participants) is concern about the appearance of the property (47%), with a further 40% concerned that it changes the character of the home (EST 2010).

However, case study research by Scott et al. (2014) in deprived communities in the North of England found that when residents were asked what the 'best thing' about energy efficiency improvements proposed as part of an area-based scheme the most common response was that these would improve the appearance of the home or the neighbourhood. For many this was strongly related to pride in their community and a feeling that 'improved appearance equals improved respect'.

5.3 The Material context

5.3.1 Hard-to-treat homes

Constraints related to infrastructure (i.e. dwelling type, construction and energy supply) are a barrier to energy efficiency improvement for many householders (Brook Lyndhurst and Ecometrica 2011, DECC 2014a). Hard-to-treat (HtT) homes include those with: solid walls, no loft space to insulate, no connection to the gas network, high rise residential blocks and tenements, and timber-frame buildings constructed before 1982 (Dowson et al 2012, Roaf et al 2008). These properties cannot be improved easily or in a cost-effective way with improvements like CWI, loft insulation or modern gas central heating. At 2008, it was estimated that 0.7 million of Scotland's 2.3 million dwellings were classed as HtT homes (Dowson et al. 2012). Overall, 25% of properties had solid walls, 23% were tenement flats, and a further 3% were high rise flats, 5% were timber framed, and 5% had no loft space (Roaf et al. 2008). At the present time, approximately 10% of homes are located off the gas grid (Scottish Government 2013b).

There are particular material barriers to improving energy efficiency in rural Scotland. A higher proportion of homes in rural areas are HtT because they are more likely to be older homes with traditional solid stone wall constructions and/or lacking a connection to the gas network (Lainé 2011a). Overall, the majority (54%) of rural homes do not have a connection to the gas grid (Scottish Government 2013b). Lainé (2011a) also reports that government assistance schemes have tended to focus on urban areas.

Some high profile schemes e.g. CERT have also focused on standard, lower cost types of insulation (CWI and loft). In addition, some commentators have expressed concern about the potential for increasing uptake of solid wall insulation under the Green Deal. Since dwellings requiring external wall insulation are unlikely to meet the Green Deal's 'golden rule' (i.e. that expected financial savings must be equal or greater to the repayments made through energy bills over the term of the finance plan), the full cost of installation is unlikely to be covered by Green Deal finance (Booth and Choudhary 2013). Concern about the loss of internal space associated with internal wall insulation is also another material factor acting as a barrier to energy efficiency in HtT solid walled homes (EST 2010).

5.3.2 Linked dwellings

There are specific barriers noted in the literature in relation to linked properties sharing walls. These form part of the social as well as the material context - where walls form part of a communal infrastructure, energy efficiency improvements must be negotiated between a number of parties. There is evidence that lack of agreement between residents as to the sharing of responsibilities and costs for improvements are a key barrier to the improvement of Scottish tenements (Consumer Futures 2013). Qualitative research with tenement residents indicates that there are several factors that contribute to this problem:

- Those who will not benefit may not agree to contribute (e.g. those in ground floor flats with respect to loft insulation).
- There is a common perception amongst right-to-buy owners in buildings where some of the units are still social housing that the local authority is responsible for communal infrastructure.
- There is a more general lack of clarity and awareness surrounding the legal context of occupants' responsibilities. This includes a lack of awareness that installation of insulation is now considered as maintenance, and so only requires a majority (rather than unanimous) support to go ahead, under the provisions of the Tenements (Scot) Act 2004, as amended by the Climate Change (Scot) Act 2009.
- There is often a lack of willingness on the part of private landlords to contribute, or difficulty in contacting landlords through letting agents.

5.3.3 'If it's not broken….'

Some energy efficiency measures are most likely to be carried out when a problem arises. This is particularly the case in terms of central heating upgrades - evidence suggests that the majority of UK householders (68%) have never considered replacing their heating system. Of these people more than half (57%) stated that this was because their current system was still working, and a further 25% reported that they would only replace a system if it had broken down (Ipsos MORI and Energy Saving Trust 2013). The main reasons given by those that do upgrade are boiler breakdown (30%) and believing that the system would not last much longer or that repairs were needed too frequently (28%).

5.3.4 Rules and regulations

Buildings regulations have played an important part in raising energy efficiency standards in new homes, and in existing homes e.g. where extensions have been added (Palmer and Cooper 2013). Requirements for minimum levels of insulation on hot water tanks and for replacement boilers to be condensing types have also helped to improve energy efficiency of existing dwellings (Scottish Government 2012, Palmer and Cooper 2013). Compliance with regulations is not, however, commonly mentioned in research on householders' reported attitudes and motivations towards energy efficiency improvement. Section 6.3 considers evidence on public attitudes to regulations themselves.

5.3.5 Technology

There has been much interest in the value of technologies for communicating feedback on energy use to householders (e.g. Craig et al. 2014, Darby 2006). However, this review found no evidence addressing potential impacts on the adoption of structural energy efficiency measures as a result of feedback in the form of energy monitors/ in-home displays, heating controls or novel methods of visually communicating energy efficiency e.g. through thermal imaging. It is likely that a wider international review would be required to assess the evidence on this potential driver of energy efficiency in the home. Technology for the control of heating is discussed further in section 5.5.

5.4 Trigger points related to Time & Schedules

Trigger points are *"the times in the life of a home where energy-saving measures can be fitted as part of an existing or planned home improvement project"* (EST 2011). This may include:

- Moving to a new home
- Undertaking renovations or refurbishments in existing home
- Replacing failing infrastructure such as central heating systems

Such trigger points may coincide with 'moments of change' during people's life courses – "occasions where the circumstances of an individual's life change considerably within a relatively short time frame" – e.g. moving in with a partner, becoming a parent or growing the family, children leaving home, or retirement (Thompson et al. 2011).

Trigger points may therefore be seen as times when multiple aspects of the Individual, Social and Material contexts that influence people's attitudes and behaviours towards energy efficiency are changing. These are therefore key "windows of opportunity to reconfigure the dynamic and complex relations between inhabitants and the built environment" (Karvonen 2013).

At these trigger points some of the important barriers to change may be weakened (EST 2011). For example, barriers associated with hassle may be weakened at these points, since people are already prepared for disruption to routines and upheaval in the home environment. It can also be more cost effective to undertake energy efficiency improvements at this time, since contractors and equipment may already be on-site. Also, since householders may already be engaging with tradespeople who can offer professional advice on energy efficiency measures that may help to overcome barriers relating to an initial lack of knowledge and awareness.

Research by the Energy Saving Trust indicates that there is considerable potential to capitalise on the trigger points represented by renovations and refurbishments made by homeowners when moving home, or when improving or extending their current home (EST 2011).

This research found that:

- 22% of homeowners were planning or anticipating a major refurbishment within the next 3 years.
- **85% expressed a willingness to stretch their budget** to include energy efficiency improvements.
- Homeowners were, on average, **prepared to allocate an extra 10%** of their budget to doing so.
- Homeowners voiced more support for the idea of making energy efficiency improvements on a room-by-room basis, rather than undertaking a whole of house retrofit approach.
- Landlords, on the other hand, were more likely to favour a whole house approach, and were willing to allocate an extra 9% towards funding energy efficiency improvements.

The potential for trigger points occurring was seen to be highest for **families with younger children**. This group were, on average, planning three major refurbishments plus other minor works within the next three years, compared to those in other stages of life, who planned an average of 2.5 projects in that time frame. Families with dependent children were also planning more expensive renovations, so the total budget they were willing to put towards energy efficiency was consequently higher. Another group likely to be planning home improvement projects were **'empty nesters'**, typically those approaching retirement whose children are grown-up.

Other research supports this idea of trigger points. Waiting until other major renovations are undertaken is a common reason for not having installed cavity wall insulation (reported by 9% of non-adopters), or loft insulation (17%) (Thornton 2009). Another representative survey of UK homeowners found that, of those who were considering renovation work, just 11% were planning renovations focusing only on energy efficiency, whereas a further 35% were considering renovations that would improve both the amenity and energy efficiency of the home (Wilson et al. 2013). There is also evidence to suggest that the point at which people move to a new home – before lofts are boarded and/or used for storage - is a particularly important trigger point for the installation of loft insulation (Caird et al. 2008).

The negative side of this work on trigger points is that, although people may be more willing to take on energy efficiency improvement projects when moving to a new home, they may be less likely to invest in their current home if they foresee a move on the horizon (Tovar 2012).

Furthermore, although the point at which people move home may be a valuable trigger point to target intervention on home energy efficiency, moving home is not usually a frequent occurrence. Evidence from England suggests that the average (median) frequency at which people move home is every 8 years. How often people move depends to a large extent on tenure; the median frequency of moving is just one year for private renters, compared to 11 years for owner occupiers (Lainé 2011a). Scottish Government models suggest that within a 5 year period 78% of private rented homes will have changed hands at least once, compared to 41% of owner-occupied homes (Scottish Government 2011).

5.5 Factors influencing the use of heating controls

As noted above in section 5.1.5, the way people manage the heating of their homes impacts on the extent to which making improvements to the fabric of the building and its heating systems results in a reduction in energy use. It is therefore important to consider how behaviours around the use of heating controls factor in the benefits that might be achieved by upgrading heating systems. There is a lack of consistent evidence on the impacts of heating controls on energy use (Munton et al. 2014), with several studies having found no differences in energy consumption, room temperatures, and/or heating durations between homes with and without controls (Shipworth et al. 2010, Kershaw et al. 2010).

The ways in which people use controls such as timers, room thermostats and thermostatic radiator valves (TRVs) is very variable (even within a household), and evidence from quantitative and qualitative studies suggests that

many people do not use the controls that they have, or use them in an inefficient way (Consumer Focus 2012, Rubens and Knowles 2013, Munton et al. 2014). For example, DECC's Energy Follow Up Survey (based on a sample of participants from the English Housing Survey) found that 10% of respondents reported switching their heating on and off by use of a thermostat. Of the 77% that used a timer to control their heating, 14% had it timed to come on once a day and for an average of more than 10 hours on weekdays, compared to less than 7 hours for those whose timers were set to heat the home for two periods each day (Munton et al. 2014). Use of heating controls appears to be driven primarily by **desires for warmth** rather than saving energy, though this varies depending on occupants' budgets and underlying health conditions (Consumer Focus 2012, Rubens and Knowles 2013, Munton et al. 2014). **Problems operating controls** and **lack of understanding** about how the central heating system works are also key barriers to efficient heating management.

Data from the SHCS indicates that the vast majority of householders report finding it easy to control and use their thermostatic controls (98%) and time clocks (96%) (Scottish Government 2012). However, other research from Scotland and elsewhere in the UK suggests that problems may be more widespread. In a large-scale evaluation of the Scottish Government's Central Heating programme, 10% of respondents said they found their central heating difficult to use (Munton et al. 2014). Older people are particularly likely to report difficulty in using controls (Caird et al. 2008, Munton et al. 2014). A number of qualitative studies have examined the sources of these problems; these are summarised in Box 1 (Consumer Focus 2012, Rubens and Knowles 2013, Huebner et al. 2013, Munton et al. 2014).

Such barriers to efficient use of heating controls means that people often resort to what is easiest and most convenient e.g. using a thermostat as an on/off switch (Kershaw et al. 2010, Munton et al. 2014). Misperceptions and lack of knowledge about how the central heating system works can also act as a barrier to efficient use. The research documents confusion as to the differences between boiler and room thermostats, perceptions that having central heating on all the time is more efficient than turning it on and off, and uncertainty over whether turning radiators off/down means the boiler uses less energy (Shipworth et al. 2010, Consumer Focus 2012, Rubens and Knowles 2013).

Box 1: Usability issues with heating controls

Vision	Displays are often hard to read and controls are often in poorly lit places
Positioning	Controls may be too high or too low for users to easily reach, or hidden away in less accessible places like cupboards, or behind furniture
Dexterity	Small buttons, fiddly sliders and stiff radiator valves can pose difficulties
Thinking	User interfaces and menus may be complex and/or lacking in intuitive design. Manuals are often too technical or unclear and are easily lost

6. Awareness of and attitudes to policy interventions

6.1 Knowledge of different types of government grants and support

Evidence suggests that the majority of householders know that help is available for improving the energy efficiency of their home, however a significant proportion remain unaware of the existence of government grants and support. A survey commissioned by the Citizens' Advice Service in 2011 showed that around 1/3 of people in Great Britain do not know that support for installing insulation is available (Russell 2012). Research specifically focusing on awareness of previous Scottish Government energy efficiency schemes such as Home Insulation Scheme and Energy Assistance Package found that 61% of people were able to mention at least one scheme spontaneously (Consumer Focus Scotland 2013).

TV adverts, word of mouth, newspapers, leaflets, and direct and indirect communications from local authorities were the most common routes by which respondents first heard about the Scottish Government schemes

(Consumer Focus Scotland 2013). Others suggest that high profile launches, such as the Prime Ministerial launch of the UK Boiler Scrappage Scheme, may prove useful in raising awareness and uptake of schemes (Murray and Law 2011). Area-based schemes offer opportunities to achieve high levels of awareness through varied forms of community engagement, canvassing and word of mouth (CAG consultants 2010, Scott et al. 2014). However, raising awareness is not enough on its own - of those that had heard of the Scottish Government schemes, only between 6-13% had applied, depending on the scheme (Consumer Focus Scotland 2013). This suggests that tackling the other barriers to uptake discussed above is of critical importance for Scotland to achieve its ambitions in respect to home energy efficiency.

6.2 Knowledge and understanding of Energy Performance Certificates

Evidence on householders' knowledge of Energy Performance Certificates (EPCs) suggests a relatively high level of awareness of EPCs amongst UK homebuyers, but not necessarily a detailed level of knowledge about what is communicated in the EPC itself (Lainé 2011b, Watts et al. 2011). Many homebuyers do not recall having received an EPC, despite studies focusing on people who had moved since EPCs became mandatory for residential property sales (Lainé 2011d, Watts et al. 2011). There was also a wide gap between the proportions of buyers and renters who recalled receiving an EPC (79% of buyers did so, compared to only 33% of social renters and 31% of private renters) (Lainé 2011d).

All the available research on users' understanding of the EPC document itself relate to the previous (pre-2012) format of the EPC. This UK-wide research found that the majority (76%) felt that EPC ratings and recommendations were clearly laid out (Lainé 2011d). In focus groups carried out across the UK, including one in Scotland, members of the public reported that the A to G ratings provided are a key strength of the EPC, as they are easily understandable and indicate that the certification is an independent assessment process (Lainé 2011b). However, this research highlighted issues with the length and format of the EPC, the technical language used, and confusion between the Energy Efficiency Rating and Environmental Impact Rating charts used on the EPC. Feedback from consumers also emphasised the importance of communicating impacts in monetary terms at the outset of the document; most people find it much easier to understand energy savings in the form of fuel bill savings than in units of CO^2 or kWh (Lainé 2011b). As a result of this research the format of the EPC was updated to be more visually appealing, understandable and to emphasise potential monetary savings upfront.

Overall, it appears that homebuyers consider the EPC to be a useful resource, and the majority of people consider it important to see the EPC rating of a property before they buy (Watts et al. 2011). There is, however, limited evidence that the EPC influences actions. Only 17% of EPC recipients in the UK wide research by Consumer Focus report having acted on the recommendations (Lainé 2011d). Also, just 18% of recipients reported that the EPC influenced their choice of home; other factors like price, size, location, outdoor space, parking and amenities tend to take precedence over energy efficiency (Lainé 2011d). Despite previous research finding that 70% of people would consider re-negotiating on price if they discovered a house was energy inefficient, only a very small minority of those in the studies of people who had actually moved home reported that the EPC influenced their negotiations (Lainé 2011d, Watts et al. 2011). Nevertheless, there is evidence that homes with higher energy ratings fetch higher prices with one study on the English housing stock, commissioned by DECC, finding some evidence of a positive relationship (Fuerst et al. 2013).

6.3 Public attitudes towards the regulation of home energy efficiency

The Energy Saving Trust suggests that "much of the public are open to the prospect of Government taking a stronger approach to ensuring uptake of measures"; 43% of Scottish householders surveyed agreed that Government should take stronger action on carbon emissions – even if this means making people fit energy efficiency measures (EST 2010). However this still leaves more than half who did not agree.

Consumer Focus Scotland have conducted focus group research with members of their Consumer Network volunteer panel, exploring attitudes towards energy efficiency regulation (Consumer Focus Scotland 2011). This research found that most participants were in favour of "some form of regulation to compel homeowners and landlords to make energy efficiency improvements to their properties". It was generally felt that any regulation

should apply at the point of sale or rental. Opinion was divided between support for a measures-based and standards-based approach to regulation, with landlords tending to favour the former. Several forms of support for homeowners and landlords to comply with regulation were suggested, including: a sufficient lead in period, access to finance, clear information, access to assessors and contractors, education and information-giving on energy efficiency in general. Key concerns voiced by participants related to:

- The potential effect of reducing the supply of properties to buy and/or rent increases
- Non-compliance - with a feeling that enforcement would be most necessary in the rental sector, but challenging to implement
- A need for flexibility to ensure those in Hard to Treat homes, listed buildings etc. are not penalised. Approaches could include different target dates for different types of property, or applying maximum costs proportional to property value.

Research on proposed extensions to building regulations in England and Wales, conducted on behalf of the Energy Saving Trust, may also be useful in identifying the range of potential attitudes towards home energy efficiency regulation. Views on proposals to require homeowners to improve the overall energy efficiency of the entire property when undertaking other building works were explored in a series of focus groups. This research found that the proposals commonly evoked strong negative emotions; this was seen by some as government interference in the private domain of the home, and the majority preferred a voluntary scheme supported by incentives. Although the possibility of access to Green Deal finance made the proposals more acceptable for some, "many would still feel aggrieved about being forced do to extra energy efficiency work" , and a "significant minority felt the proposals were not reasonable... some claimed they would be put off doing improvement work to their property as a result" (IFF Research 2012). It is therefore clear that emotions can run high when homeowners are faced with the idea of being compelled to make energy efficiency improvements. It is possible, however, that targeting regulation at the point at which properties change ownership may help to soften these emotional responses. When looking to sell, emotional identification with the home may be weakened as occupants are already preparing to move on, however (as highlighted in section 5.4) people are currently less likely to invest in energy efficiency measures when they are planning a move (Tovar 2012).

7. Conclusions

Awareness of some energy efficiency measures (double glazing, loft insulation, boiler upgrades and cavity wall insulation) is high amongst the general public. **Awareness of solid wall insulation and floor insulation measures is, however, much lower** (section 3.1). Also, many people who *have* heard of solid wall and floor insulation measures report never having thought about adopting them. Future targeted awareness-raising efforts should therefore focus on these types of energy efficiency improvements. The research suggests that people tend to have more positive attitudes towards measures that they are more familiar with, and feel more social pressure to adopt them (Scott et al. 2014). This speaks to the power of social norms in influencing actions around energy efficiency.

In terms of the current **uptake** of home energy efficiency measures (chapter 4), this is relatively **high for some measures, notably double glazing, loft insulation and, to a lesser extent, cavity wall insulation**. There is however, much work to be done in overcoming the barriers to the uptake of **solid wall insulation and upgrading boilers** to energy efficient condensing types. Additionally, although the majority of lofts are insulated, many homes could benefit from top-up insulation. Most Scottish homes have forms of central heating controls, yet the evidence suggests that people's **behaviours around heating management often limit the extent to which controls promote energy efficiency** (section 5.5). Issues around the usability of controls are a barrier to effective heating management for some, particularly older, people. UK evidence on attitudes to different energy efficiency measures suggests that the proportion of people who show positive attitudes or willingness to adopt measures but have not yet done so is limited - this **lack of 'low hanging fruit'** suggests that to further increase uptake a change in policy may be needed (section 4.7).

It is clear from the evidence that **investment in energy efficiency measures is strongly related to housing tenure** (see chapter 4 and section 5.1.3). **Social sector housing in Scotland is performing better than the private sector** in terms of the uptake of insulation measures. Energy efficiency in the social sector has been driven by the SHQS, which introduced minimum standards for social housing in 2004, to be met by 2015. With respect to the private sector, levels of investment in energy efficiency in private rented homes are of particular concern. There are **unique barriers associated with the private rented sector**. Tenants require agreement from landlords to make improvements to the fabric of the property. Many report that because they rent it is not their decision to make, perhaps perceiving that it is the landlord's rather than the tenant's responsibility to make such investments in the property. This creates a split incentive where the landlord meets the cost whilst the tenant receives the benefits. Although the majority of landlords report making improvements to their properties (e.g. installing double glazing), there are few incentives for landlords to go further, especially as most perceive the level of demand for energy efficiency by tenants to be low. It is, however, important to note that private landlords are not a homogeneous group - attitudes towards improving energy efficiency are higher amongst landlords with small property portfolios than more commercial landlords.

The review highlights that key barriers to energy efficiency relate primarily to **Individual and Material factors** (chapter 5), and these may often interact. Individuals' considerations of the financial costs and benefits of taking action may depend heavily on the structural features of their property as implementing energy efficiency measures in Hard to Treat homes is very expensive and may not be cost effective. This interaction of Individual and Material factors poses a particular challenge to improving the energy efficiency of rural homes. Rural properties are more likely to be Hard to Treat since a greater proportion are older properties with traditional solid stone wall constructions and/or lacking a connection to the gas network. Another example of where Individual and Material factors interact is in the case of central heating upgrades - as the cost of a new boiler is high most people will only consider replacing an older model when it breaks down or appears to be nearing the end of its life. Overall, considerations of the **financial cost and benefits** of improving energy efficiency is often a foremost consideration in decisions about whether to invest, with cost being a particularly strong barrier to solid wall insulation and boiler upgrades (section 5.1.1). However, although financial incentives can help to overcome cost barriers, they do not address the many other barriers highlighted in the review - notably the perceived **hassle and inconvenience** involved (section 5.1.2). This is a particularly strong barrier to adoption of loft insulation and internal solid wall insulation. Evidence suggests that some Scots are also relatively sceptical about both the **reliability and effectiveness** of energy efficiency measures - with concerns about side-effects of installing insulation and the reliability of condensing boilers acting as a barrier to some (section 5.1.4) and many remaining sceptical about the fuel bill savings that might be achieved by installing energy efficiency measures (section 5.1.1).

Although Individual and Material factors are often reported as the main barriers to energy efficiency improvement, the review also highlighted the importance of **Social factors** in both driving and limiting the uptake of measures. Trust in the institutions that deliver energy efficiency schemes and carry out installations appears to be an important factor in the success of initiatives (section 5.2.1). **Whilst trust in community and third sector organisations is high, trust in private sector service providers is low**. This has important implications for the delivery of financial incentives to support a regulatory approach. People's networks and relationships are also important influencing factors for home energy efficiency (section 5.2.2). Out of all the potential sources of information, **people tend to trust their family and friends the most**, and are likely take their cues of how to act from those around them. There are also important interactions between Social factors and Material factors; there are particular **social barriers associated with linked dwellings**, where proposed improvements must be negotiated between a number of different parties with different attitudes and vested interests (section 5.3.2).

Overall, the evidence suggests that there is **support for the introduction of regulation for the energy efficiency of private sector housing, however many people may remain hard to convince** (section 6.3). Although evidence on trigger points (section 5.4) shows that people may be more willing to undertake energy efficiency improvements when they are carrying out other significant work on their property, many oppose the idea of being compelled to do so by Government. However, targeting the **trigger point of when people move home** may be an effective approach, and potentially more palatable to homeowners, as this is a time where the Individual, Social and Material contexts in which people act are changing significantly. This may offer opportunities to overcome some of

the barriers to home energy efficiency highlighted in the review. However, because moving home is not something that people (especially owner-occupiers) do on a frequent basis, the benefits of any intervention targeting this trigger point will take time filter through the housing stock.

8. References

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