Building Expertise: Identifying policy gaps and new ideas in housing eco-renovation in the UK and France

Tina Fawcett, Gavin Killip & Katy Janda
Environmental Change Institute
Oxford University Centre for the Environment
South Parks Road
Oxford OX1 3QY
UK

Keywords
renovation, residential buildings, policies and measures

Abstract
In order to meet national carbon and energy savings targets in both the UK and France, the housing stock needs to be renovated to a high standard of energy efficiency. However, current levels of activity are nowhere near sufficient to meet 2050 targets. The aim of this paper is to identify the policy gaps regarding eco-renovation in the UK and France, and to highlight some promising ideas which could successfully fill those gaps. First, different definitions of eco-renovation are presented, and these aspirational standards are compared with current policy goals. Then a brief description of housing and energy use in each country provides useful background information, and similarities and differences between the countries are identified. Summaries and comparisons of current policy are presented. The mechanisms the policy instruments aim to use to effect change are compared with what is known about 'barriers' to eco-renovation. Most policy focuses on reducing the cost to householders, much less is done to address other reasons for inaction such as lack of information, motivation or trust in professionals. Multiple gaps in current policy are identified, including lack of a roadmap to reach 2050 targets, lack of policy tackling non-financial barriers to action, and insufficient policy working with the building industry and other professionals. Case studies of a number of innovations in information provision and delivering eco-renovation are briefly presented. New policy ideas around eco-renovation are discussed, particularly 'over time' eco-renovation. These new business and social enterprise innovations and policy ideas could help filling in some policy gaps, but more remains to be done to achieve the very challenging task of renovating the whole housing stock to a high standard.

Introduction
Eco-renovation of the existing European housing stock is increasingly being recognised as a vital part of efforts to reduce carbon emissions from all sectors of the economy. A recent survey of hundreds of European experts highlighted the urgent need for extensive building renovation across the EU. The research concluded that while most EU countries have programmes in this field, it is becoming increasingly evident that these will not suffice to achieve significantly increased renovation rates (Egger, 2012). The same conclusion was reached by review of European-wide research (ECEEE, 2011). For example, in the UK it has been estimated that 600,000 homes should be renovated to a very high standard per year, if national 2050 carbon reduction targets are to be met (EST, 2010a). In reality, just hundreds of homes are renovated annually to this standard. While the gap between current levels of activity and what is required to meet 2050 carbon targets varies from country to country, in no EU country is activity of a sufficient scale.

This paper focuses on the UK and France, the countries being studied in the 'Building Expertise' project, jointly undertaken by the University of Oxford and EDF R&D (ECLEER). The three year research programme is investigating the roles of professions in the UK and France in delivering the work required to comprehensively refurbish the housing stock. The whole research programme is described in more detail by Nosperger et al. (2011). This paper focuses very much on the policy issues around eco-renovation. The main challenges for policy around eco-renovation of the housing stock are persuading millions

of home owners and landlords to invest considerable amounts of money to improve the efficiency of their properties, and, simultaneously, ensuring there is an adequately skilled building industry to carry out high quality eco-renovations – no easy tasks. As Oreszczyn & Lowe (2010:110) noted "Empirical evidence and experience suggest that it will be neither particularly easy nor particularly cheap to reduce energy use in buildings." What role can and should policy play in this transformation, and what examples and ideas from the UK and France can help take this ambitious agenda forward?

This paper begins by discussing definitions of eco-renovation. It then looks at present policy on eco-renovation in the UK and France and compares approaches in the two countries. Then a range of policy suggestions is put forward – from a variety of sources: the literature; experience in the non-residential sectors; innovative ideas being pioneered by subjects of our study; ideas that have emerged as a result of this study. These ideas are discussed in the light of experience and evidence from the UK and France and with regard to the current gaps in eco-renovation. The aim of this paper is to identify the policy gaps regarding eco-renovation in the UK and France, and to highlight some promising ideas which could successfully fill those gaps.

What is eco-renovation?

There is no universally agreed definition of what constitutes eco-renovation of housing, either in terms of the measures which should be installed, the targets to be reached or even the words which are used. In the literature, eco-renovation is currently variously defined using different metrics, although in many contexts a clear definition is missing. For some purposes, programmes and projects, specific definitions of eco-renovation (under various names) have been developed. Examples include:

- **Retrofit for the future (RFF)** (UK innovation project): This project aims to deliver tens of '*low carbon refits*' of low-rise social housing. Performance targets are a CO_2 target of 17 kg/m^2.yr, and a primary energy target of 115 kWh/m^2.yr. There is no specific target for space heating energy use, but if the targets are met, space heating requirements should necessarily be low (i.e. below 40 kWh/m^2.yr) (Retrofit for the Future 2011).
- **Passivhaus refurbishment standard (EnerPHit)** (international building standard)**:** This voluntary standard requires a heating demand below 25 kWh/m^2.yr while the permissable airtightness will be one air change an hour (PHI 2011).
- **Renovate Europe** (European industry-led campaign): This campaign, which targets all buildings, uses the phrase 'deep renovation'. "Whenever a building renovation takes place, all available energy saving technologies must be incorporated. This deep renovation can achieve a reduction in consumption of between 60 % and 90 %, for the majority of Europe's buildings." (Renovate Europe 2011)

Each of these programmes uses a different metric to define eco-renovation. RFF uses both carbon and energy targets, EnerPHit uses energy and airtightness targets and Renovate Europe's target is defined in terms of technologies. The RFF standards can be met, in part, by building integrated renewables, whereas the others cannot. All of these metrics implicitly exclude the influence of people on building energy use (discussed in more detail in Fawcett, 2011).

These standards are all much more demanding than most current policy in the UK and France can deliver, as illustrated in Figure 1. There is an energy-saving continuum between installing individual energy efficiency and renewable energy measures at one end, to whole house, comprehensive eco-renovation, where savings of up to 90 % of energy can be achieved. While there is clearly a considerable difference between, say, installing double glazing or loft insulation, and achieving a very demanding low energy standard like EnerPHit, there is a very large middle ground. Most current policy in the UK and France is not aiming to deliver comprehensive eco-renovations of individual homes, but to increase the energy efficiency/installation of renewable energy in the stock to a greater or lesser extent. Not only is most policy located in that zone, so too is most low energy household renovation activity.

There is an on-going debate about what the standards for eco-renovation should be, given both the need to achieve large carbon and energy savings, and the increasing cost of eco-renovation as standards rise (Galvin, 2010; Hermelink, 2010). This debate occurs in the space around whole house eco-renovation and tends to cover the 60–90 % range of carbon and energy savings.

While Figure 1 suggests there is a continuum of action between installing multiple energy efficiency and renewable energy measures and whole house eco-renovation, in fact whole house eco-renovation may require a quite different set of skills, technologies, techniques and levels of investment from installing individual measures. Many questions arise, e.g. is it necessary to have 'integrators' for whole house eco-renovation who can supervise the process of achieving 60 % or greater energy savings? These questions are being investigated in the 'Building Expertise' project (Nosperger et al., 2011) and are reported further in Killip et al. (2013).

For this paper, the term 'whole house eco-renovation' is used to cover all building renovation activities which aim to reduce carbon emissions by at least 60 % compared with pre-renovation emissions (either on a modelled or measured basis). It is therefore a measure of carbon savings delivered via energy efficiency, fuel switching plus use of household-level renewable energy, and does not count any carbon saving contributions from changes in grid electricity carbon intensity, or from behavioural change. It is used in this paper so that the scale of renovation under discussion can be understood, rather than being proposed as the 'right' figure to enable 2050 targets to be achieved. The main focus in this paper will be on changes to building fabric and heating and hot water systems, rather than on lights and appliances.

Housing in the UK and France

Table 1 gives basic information about population, households, housing and energy use in the UK and France. As the information shows, the UK and France are very similar in terms of population, average household size and therefore the number of households. However, built form differs considerably – France has many more flats and detached homes than the UK, where

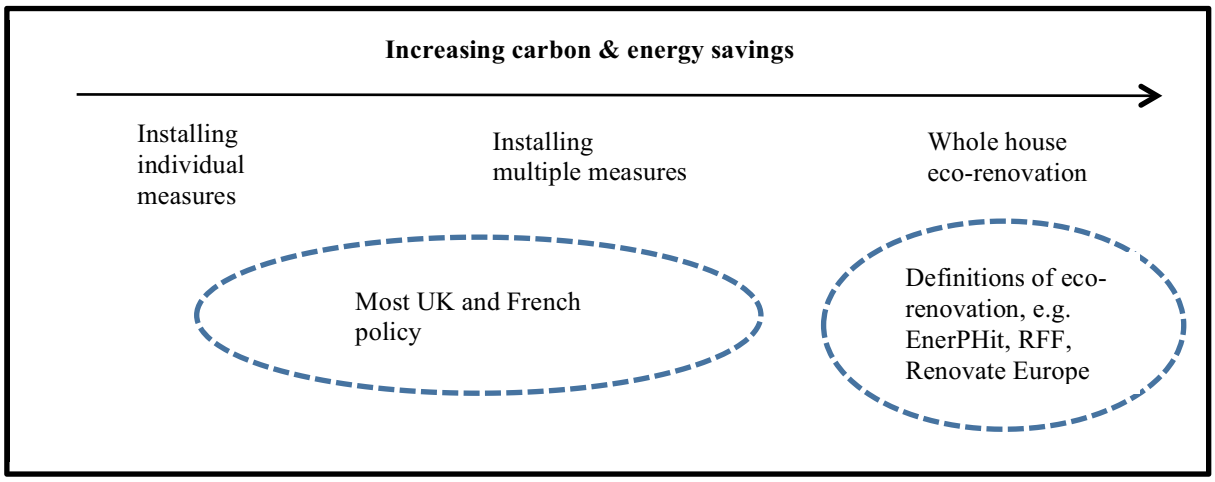

Figure 1. Diagram showing the range of low carbon and energy options for the residential sector, and how this relates to household-level action and current policy in the UK and France.

the majority of households live in semi-detached or terraced (row) houses. Tenure is similar in each country, with a little more of the housing stock in owner occupation in the UK. The vast majority of UK households use gas as their main heating fuel, with electricity being the second most important fuel. In France the picture is notably different, while gas is still the most common principal heating fuel, electricity is used to heat one third of homes, with oil being used by more than three times the number of homes in the UK. Another difference is that fuel used for water heating in France is not always the same as the heating fuel, with electricity being used to heat water by 45.5 % of households, compared with 33 % using electricity to provide heating (ADEME, 2011). In the UK, heating and hot water fuels are nearly always the same, given the dominance of gas boilers which supply both heating and hot water.

Another very important difference between the UK and France is the carbon intensity of electricity. France's electricity is much lower carbon at 0.077 $kgCO_2$/kWh compared with 0.47 $kgCO_2$/kWh in the UK (figures averaged 2008–10 (IEA, 2012)), and this of course influences the role seen for different energy sources in a low carbon future, particularly in the near future. The UK does have ambitious targets for de-carbonising the electricity supply set by the Committee on Climate Change (an advisory body to the government), but these have not yet been incorporated in legislation, and are currently the subject of considerable political and public debate (Harvey, 2012). Given low carbon electricity and current patterns of heating fuel use, France has far more opportunities for fuel switching to low carbon sources than the UK. When its electricity is less carbon-intensive, then the UK too may look to switching to electric heat pumps (which feature heavily in many future scenarios, e.g. UKERC, 2009) – and will be able to learn from French experience.

France is geographically considerably bigger than the UK, with four different climate zones (coastal oceanic climate (west), continental climate (east), Mediterranean climate (south), mountain climate (Alps, Pyrenees, Massif Central, Vosges and Jura ranges)). French regulations for new buildings take account of up to eight different climate zones, depending on the subject of regulation. Although average temperatures do vary from north to south in the UK, there is just one national climate zone, and geography does not explicitly play an important part in policy (although there are devolved decision-making powers in Scotland, Wales and Northern Ireland, so policy can vary between the different constituent countries of the UK).

One important comparison which is not currently possible to make with any degree of certainty, is the different thermal efficiencies of the building stock, either averaged over all buildings, or by building type. There is European-wide data available (www.odyssee-indicators.org) however, because of the many differences between different countries' built forms, building sizes, climates, construction methods and materials and so on, making a meaningful comparison between countries is problematic. For example, the Odyssee database seemed to show that French household electricity use was considerably higher than German household electricity use, and that France had lower space heating energy performance than most other EU countries. Two specialist reports commissioned by ADEME, looked in detail at the data and assumptions which led to these findings (Enerdata, 2011; SOWATT and Enerdata, 2011). In both cases the conclusion was the original comparisons were not necessarily reliable and that the apparent less good performance of the French residential sector may not be the case in reality. Based on current data, therefore, it is not easy to say whether France or the UK has need of a greater degree of improvement, or indeed which country's policies to date have been most effective. A great deal of additional research and analysis would be needed to do a reliable quantitative comparison.

In summary, the thermal characteristics of the UK and French housing stock are (probably) similar, as are patterns of ownership and number of households. There is a difference of built form, meaning that issues around communal vs. personal ownership of flats, which can delay renovation, are more prominent in France than the UK. There is more diversity of heating fuels and climates in France than the UK, requiring more differentiated policies to deliver low carbon and energy solutions.

Table 1. Housing and demographic information, UK and France.

		France*	UK
Population (millions)		63.5	62.3
Number of households (millions)		27.7	26.6
Average household size		2.29	2.35
Tenure (% of stock)	owner occupiers	62.0	69.9
	social housing	17.8	18.1
	private rental	20.2	11.9
Built form (% of stock)	Flats	33.9	14.0
	Detached house	43.5	25.6
	Semi-detached or terraced house	22.4	60.3
	Other	0.2	0.2
Main heating fuel (%)	Solid fuel	3.9 (3.6 of which is wood)	1.1
	Electricity	33	9.2
	Gas	44	83.9
	Oil	14.6	3.8
	Other	4	1.8

*Sources: France population, 1/1/12 estimate (INSEE, 2012), UK population, mid-2010 estimate (ONS, 2011); UK household number and size, 2011 (ONS, 2012); Tenure and Built form, figures for 2010 from (Eurostat, 2012), GB heating fuels, 2008 (Palmer and Cooper, 2011); France household numbers, main heating fuels (principal dwellings only), 2010 (ADEME, 2011). * All figures for France are for 'metropolitan France', i.e. France and Corsica, and do not include overseas territories such as Martinique and Réunion.*

Policy in the UK and France

In this section, the main renovation-related policies in UK and France are briefly presented.

In addition to national policies, EU Directives form part of British and French policy once they are transposed into national legislation. The most visible result of EU policy to date has been the introduction of Energy Performance Certificates (EPCs), known as 'Diagnostic de Performance Energétique' (DPE) in France, at the point of sale and rental for residential properties. These certificates were introduced in 2007 in the UK, and in 2006 in France. Energy performance was judged as quite or very important criterion by 84 % of those surveyed in France, 2010 when deciding which property to buy or rent (ADEME, 2011). The 2012 EU Energy Efficiency Directive includes obligations on Member States which will affect the residential sector to: set themselves indicative target for primary energy consumption in 2020; meet annual targets for building renovation , or equivalent energy saving on the central government estate; meeting binding energy saving targets through the deployment of a supplier obligation and/or equivalent policy measure/s; report regularly to the European Commission through a series of periodic National Energy Efficiency Action Plans (NEEAPs). Many of these policies are already present nationally in the UK and France; both countries have energy company obligations and reduction targets for the government estate.

FRANCE

In 2007, France organized the "Grenelle Environment" a round table for local and regional authorities, professional organisations, trade unions, NGOs and assorted public figures with aim of discussing environmental concerns and making long term decisions on the environment and sustainable development. From this process, there emerged a pledge to reduce carbon emissions by 75 % by 2050 from 1990, as well as a number of specific policies targeted at energy efficiency in existing buildings. These policies include a number of targets:

- 38 % reduction of energy consumption and 50 % of greenhouse gas emissions by 2020 in the building sector. These targets are based in part on a regulatory policy applied to new buildings.
- 400,000 housing units per year to be renovated starting in 2013, and 800,000 of the most energy-hungry social housing units by 2020.
- The energy renovation of all buildings belonging to the State and its public buildings to be started by 2011 (MEDDTL, 2010).

There are a considerable number of policies which offer financial incentives for installing energy efficiency measures/undertaking elements of eco-renovation, which can be aggregated. These include:

- VAT reduction on renovation work
- Tax credit for a specified eco-renovation measures (crédit d'impôt développement durable)
- Zero interest loans (l'éco-prêt à taux zéro (PTZ))

For more details see Table 2.

In 2010, survey data showed that governmental financial help was critical to 28 % of energy efficient renovations, with the tax credit being much more important than zero interest loans or grants (ADEME, 2011). Between 2005 and 2010, the tax credit scheme helped fund 8 million measures (including insulation, new heating systems and fuel switching) (MURE, 2012).

As mentioned in the introduction, a European-wide survey of energy experts has been undertaken, which gives insight in

how national experts regard their own country's energy efficiency polices and recent progress (Egger, 2012). Opinions were sought on energy efficiency across all sectors: transport; residential; and non-residential. In France, opinions are divided on the ambition of energy efficiency policies: half of the experts see policies as ambitious whereas the other half believes that the policy ambitions are rather low. Progress in the last three years was seen as relatively positive: 55 % think that a range or even many additional policies were introduced. The tax credit, enabled by energy performance certificates, was described as effective and very popular. However, experts expressed concern that it was not sufficiently promoting deep renovation (for example, significantly more efforts went into window replacement than insulating buildings). The introduction of the PTZ in 2009 was largely a response to the limited improvements being made to the thermal envelopes of buildings through the system of income tax credits. There is also some concern about the regressive nature of many policy measures, with funding from general taxation being used to support renovation undertaken by wealthier home owners. The reduced rate of VAT for renovation, has been characterised as 'an unjustifiable tax expenditure … one of the objectives of which is to support the building industry' (Boulhol, 2011:23).

Other relevant policies include a feed-in tariff (FIT) for microgeneration technologies, such as solar photovoltaics. But the tariff arrangements are not linked to policies and programmes designed to improve energy efficiency. In addition there are two accreditation schemes for skilled practitioners, each supported by a different trade association: the 'éco-artisan' scheme, supported by the Confédération de l'Artisanat et des Petites Entreprises du Bâtiment (CAPEB); and the 'pros de la performance énergétique' scheme, supported by the Fédération Française du Bâtiment (FFB). France has pioneered the QualiBAT voluntary training programme for building-related trades.

UK

The UK is in the process of moving from a system of energy company savings obligations ('Carbon Emissions Reduction Target' in their 2008–2012 form) which delivered high numbers of low cost individual energy saving measures, to the Green Deal which is a subsidised loan system. The Green Deal scheme is designed to enable and encourage people to undertake packages of eco-renovation work in their homes, rather than just installing individual measures, and thereby result in greater energy and carbon savings per property. Green Deal loans will be paid back via electricity bills and will be attached to the property, not the householder, and therefore could encourage longer-term investment thinking. The amount which a householder can borrow under Green Deal is limited by the 'Golden Rule', which is that loan repayments must not exceed expected reductions in energy bills. There will be a limit of £10,000 (€12,000) per household, with interest rates expected to be around 7.5 % (DECC, 2012b). A revised system of energy company obligations (now known as ECO) remains, but this will now focus on delivering high cost measures, in particular, solid wall insulation, and directing support towards low income households and those in fuel poverty (via three separate obligations : a Carbon Saving obligation, a Carbon Saving Communities obligation and an Affordable Warmth obligation). There are also other policies which encourage the installation of property-level renewables. Most long-established has been the Feed in Tariff (FiT) for solar PV, and this is now being joined by a new FiT-like scheme for renewable sources of heat, the Renewable Heat Incentive – RHI (DECC, 2012a).

There is considerable concern within the UK policy community that Green Deal will result in much lower carbon savings than those delivered under previous policy (Egger, 2012), with one estimate suggesting that it will only deliver a quarter of the savings which the previous policy would have delivered (Rosenow and Eyre, 2012). Some of this concern is about take-up and effectiveness: there are worries about the design of the policy, the costs to the householder, the difficulties for small businesses in getting involved in Green Deal work, and the limitations the Golden Rule will place on achieving significant energy and carbon savings. In addition, Rosenow and Eyre (2012) show that even if the Green Deal works as designed, the CERT policy it is replacing would have resulted in considerably higher savings had it been continued. The government has introduced a cash-back element to the scheme to try to encourage early adoption (https://gdcashback.decc.gov.uk/). This policy is still in the very early stages and it is too soon to know how effective Green Deal will be.

COMPARISON

There are a number of differences between policy in France and the UK:

- French schemes offer considerably more generous financial help per householder to fund eco-renovation;
- The French government has a target for the number of homes and socially rented homes it wants to see renovated per year; there are no such targets in the UK[1];
- There has been more focus in the UK on targeting help to vulnerable and low-income households, particularly those in fuel poverty. This follows from a considerable history of academic and social policy focus on fuel poverty (e.g. Boardman, 1991), a problem which is particularly acute in the UK compared to most EU countries, and which results in high excess winter death figures;
- Fewer policy instruments are being used in the UK than in France.

There are also similarities:

- Neither country has a detailed roadmap, or overall strategy, to comprehensively eco-renovate the housing stock, although France has made a start with the Grenelle process, and its renovation targets;
- Policy focuses on financially supporting installation of individual measures or packages of measures, but not whole house eco-renovation;
- Most policy action is on reducing renovation costs to building owners.

1. There are government estimates of measures to be installed under a combination of Green Deal and ECO, as stated in Table 2.- However, the UK government states: "Given the innovative and open market nature of the new Green Deal mechanism, the ability of the models used in this assessment to project with certainty the likely uptake of measures is limited." DECC, 2012b.

Table 2. Major policies influencing eco-renovation in the UK and France.

Policy	UK	France
VAT reduction on renovation	No – with limited exceptions of reduced rate of 5% for some specialised energy/carbon saving equipment (e.g. heat pumps, solar panels – but not double glazing or efficient gas boilers). Standard rate of 20%.	Yes – 5.5% compared with standard rate of 19.6%
Tax credit	No	Part of renovation expenses can be claimed as a tax credit - *crédit d'impôt développement durable*. Not available for DIY renovation.
Subsidized loans	Subsidized interest rates via Green Deal, estimated at 7.5% Amount of loan capped by 'Golden Rule' that repayments should not exceed predicted energy bill cost reductions the measures deliver. There is a limit per household of £10,000 (12,000 Euro).	Zero interest loans. *l'éco-prêt à taux zéro* (PTZ) Amount of loan depends on renovation measures, can be up 30,000 Euro for a 100m^2 dwelling. In 2010, around 150,000 loans were granted versus an objective of 200,000. The objectives are to reach 320,000 loans in 2012 and 400,000 per year from 2013 (MURE, 2012).
Energy company obligations	Yes – residential sector only - the Energy Company obligation (ECO). Historically UK obligations have delivered almost 3 times the annual energy savings of French schemes (comparison UK 2005-08, France 2006–09 (Bertoldi et al., 2010)). Targets are expressed in CO_2.	Yes – across several sectors. The first phase (2006-09) applied to all sectors not covered by EUETS, although over 80% of savings came from the residential sector. The second phase (2011–13) also includes motor fuels and has far more ambitious savings targets, which are expressed in final energy.
Energy surveys and labels at point of sale / rental	Energy Performance Certificate, introduced from 2007.	Diagnostic de Performance Energétique (DPE), introduced in 2006.
Targets for renovation	There are no targets for renovation or even installation of individual energy efficiency measures. There are government estimates of measures to be installed under a combination of Green Deal and ECO, e.g. 400,000 cavity wall insulation, 42,000 solid wall insulation measures in 2013.	From Grenelle 1, there is a national target that 400,000 housing units per year will be renovated starting in 2013, and 800,000 of the most energy-hungry social housing units by 2020.

Sources: General information – France: Charlier and Risch, 2012, UK: DECC, 2012b and as detailed in the table.

The policy challenges

UNDERSTANDING WHY PEOPLE DON'T UNDERTAKE LOW-ENERGY RENOVATIONS

An obvious starting point to designing policy to encourage eco-renovation, is to understand why people are not currently engaging in this activity. While there is no UK research directly asking people about their views on comprehensive eco-renovation, there is related research on installation of individual energy efficiency and renewable measures and on general household renovation. Research among households who had not taken up basic insulation measures (e.g. loft and cavity wall insulation) identified three types of barriers to action: information and awareness, motivation (inconvenience, not a priority) and affordability (EST, 2010b). Similar findings emerged from a study of energy efficiency, barriers and methods of overcoming them, with the additional importance of tenure being highlighted (Consumer Focus, 2012). Detailed qualitative research with households living in older, solid-walled properties investigated the wide variety of reasons for not undertaking renovation (not just eco-renovation) and highlighted a range of interrelated and sometimes rather intangible barriers to making home improvements. These included household values and preferences (similar to the 'motivation' barrier identified by EST), cost, poorly skilled, unreliable or costly professionals, lack of time and perceived difficulty (Mallaband, Haines, & Mitchell, 2012). In a study which included empirical work in France and four other European countries, the main barriers (identified by building owners and professionals) to undertaking energy efficient renovation were identified as: lack of information on energy saving measures and potential savings; high expense and opaqueness of costs; lack of incentives and changing policies (Beillan et al., 2011). These barriers, or reasons for inaction, are multiple, may be interrelated, vary from household to household and vary over time for the same household.

Understanding why the few people who do undertake ambitious eco-renovations have done so is also vital. Survey research undertaken with over one hundred householders who had opened their eco-renovated homes to the public in a variety of events in different UK locations, elicited the following top three reasons for undertaking retrofitting works: 1 – I am concerned about climate change; 2 – I am concerned about my children's

future; 3 – I want to save money (Watson, 2011). Interviews with a smaller number of householders confirmed these findings, with concern about climate change being the key motivating factor. Motivations of course relate to the context in which people find themselves. In Germany, with its very different policy environment of supporting ambitious eco-renovation through generous low-interest loans and some grant funding, motivations for undertaking eco-renovation are different. There, according to an extensive survey, the need to improve a building's appearance is often a trigger to undertaking eco-renovation (including solid wall insulation), with thermal comfort also being important (in the survey 'concern about CO_2/ environment' was not an available option in the motivation questions) (Novikova et al, 2011).

MULTIPLE POLICY OBJECTIVES

Policy around energy efficiency and eco-renovation of housing also intersects with a number of other policy spheres: employment & skills; health; housing shortage/market issues; social justice. Because eco-renovation can deliver changes such as increasing employment or better health, these are sometimes conceptualised as 'co-benefits'. However, as well as opening up opportunities for additional eco-renovation policies, concerns about effects in other spheres can place limits on the sorts of policy design which may be socially or politically acceptable.

In France, the low rate of VAT on renovation works is justified in part as policy which helps increase employment opportunities. However, in the UK while there have been many calls to expand the 'green economy', not least on the grounds that this would create many skilled jobs (e.g. IPPR, 2010), these calls have not been heeded to any noticeable extent. However, increasing the energy efficiency of the worst housing is seen as a key part of reducing fuel poverty in the UK. Additionally, in the UK is a keen awareness and scrutiny of the costs that environmental policy can add to energy bills (or general taxation), and this means that policies which re-distribute money away from the general population to the wealthy – as arguably happened with Feed-in-tariffs for solar PV – are likely to be controversial, and may be unsustainable. Arguments around re-distribution appear to be less prominent in France, possibly because energy efficiency and renovation policy is not so closely tied to social policy. It seems that energy efficiency/ eco-renovation policy is more closely linked to employment policy in France, and, by contrast, more closely linked to social policy/fuel poverty in the UK – leading, in part, to different policy priorities and designs.

THE CURRENT POLICY LANDSCAPE

Most government policies around eco-renovation focus on supplying information, reducing cost, reducing risk and creating obligations to act (Figure 2). Information can be provided via home energy certificates at the point of rental or sale, and advice services. Costs to households can be reduced directly by various forms of financial assistance, e.g. subsidies, low or zero interest loans, tax credits/exemptions, or reduced indirectly by helping reduce the costs of low energy/low carbon technologies and techniques via innovation and training support. Risks to businesses and the householders employing them can be reduced via support for skills development in the building industry, and a high quality accreditation system. More controversially, obligations can be placed on building owners to upgrade their property at the point of sale or rental, or when major (non-eco) renovation works are underway. In light of the size of the challenge, all of these sorts of policy, and more, are likely to be needed to move from where we are now to where we need to be.

Figure 2 illustrates that current eco-renovation/energy efficiency policy is largely focused around providing incentives to individuals to renovate buildings. However, the research tells us that an important reason for people not taking action, is that they simply aren't motivated to do so. None of the policies listed here address that 'barrier'. Quite what could address that barrier is a difficult issue, not covered here. Similarly, lack of confidence in building professionals is another important reason for inaction, and one which is only addressed by a minority of policies.

There are a number of important gaps in both UK and French policy, including:

- An overall strategy/roadmap to reach 2050 energy and carbon reduction targets;
- Policy focusing on increasing the number of whole-house eco-renovations;
- Policy which works with the building and renovation industries to encourage innovation, improve quality and reduce risks for customers;
- Policy which addresses the non-financial reasons people choose not undertake eco-renovation at various levels of ambition;
- Policy focusing on groups other than individual owner-occupiers (e.g. communities, landlords, tenants, building owners, copropriétés);
- Policy designed to operate in particular local and regional, rather than national, contexts;
- Support for voluntary groups/social enterprises which can work effectively to encourage change;
- Linking policy on improving buildings with changing energy-related choices and behaviours within those buildings.

This is not to say there is absolutely no policy in those spaces, just that more is needed.

New ideas and initiatives

INNOVATIVE APPROACHES FROM BUSINESS AND SOCIAL ENTERPRISE

In the course of the Building Expertise research project, individuals and organisations who are trying innovative approaches to increasing the ambition and uptake of eco-renovation have been interviewed. Brief descriptions of the activities of a selection of interviewees are given below (some of these examples are explored in further detail in Killip et al., 2013). In different ways, all offer either new information & advice or new routes to eco-renovation, largely outside of current policy initiatives. These activities are currently small-scale, reaching at the very most, a couple of thousand house-

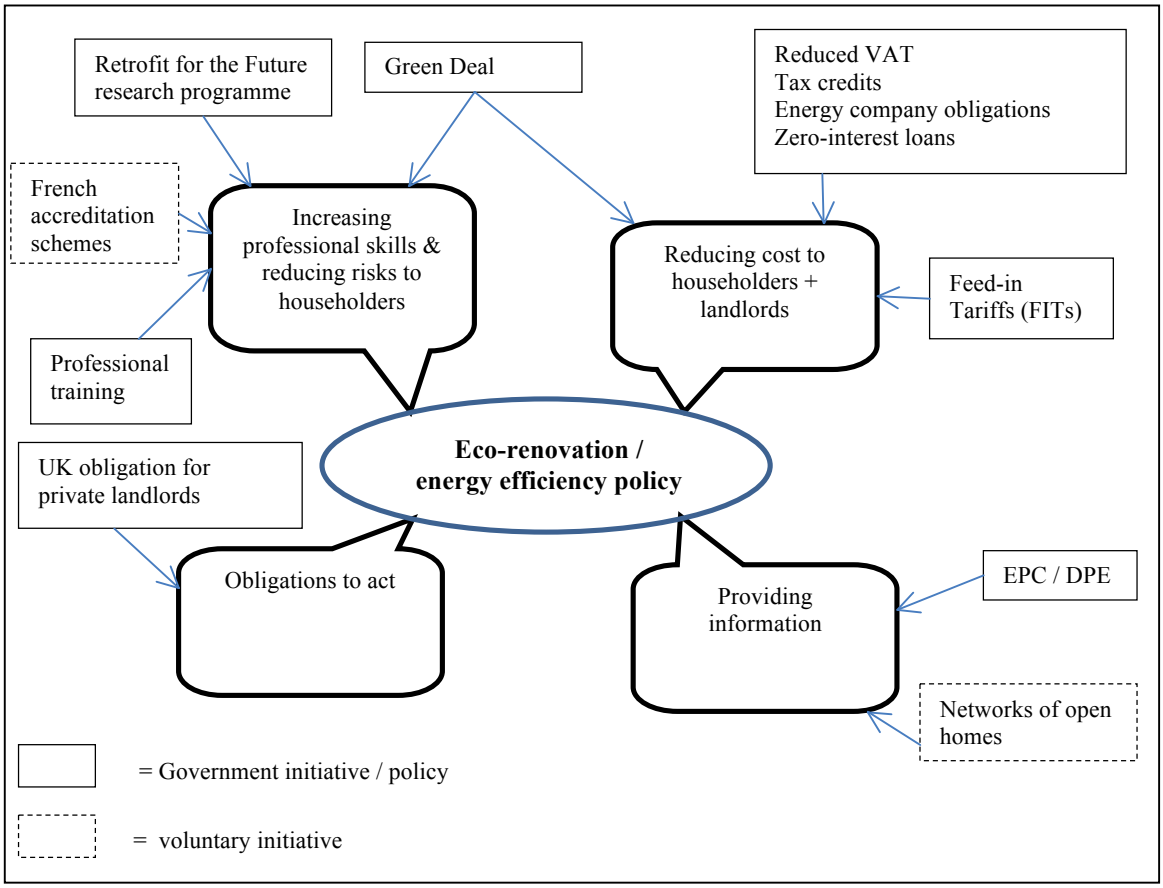

Figure 2. Summary of renovation policy approaches, and examples using that approach in France and the UK.

holds per year. So a key question is whether they could be scaled-up to reach orders of magnitude more households. Other innovations, not described in further detail here, include a French firm which has developed a 'room in a day' fast, co-ordinated eco-renovation service, firms which are using the zero interest loans in France to persuade clients to undertake more ambitious renovations, and a UK social housing provider developing a very effective, problem-solving renovation workforce.

Company offering guaranteed performance contracts (France)

One innovative business model in France is being created by a new company. Using a co-operative governance structure it plans to offer guaranteed performance contracts to clients for its refurbishment services. This idea is still very much under development. The key idea is that a guarantee of energy savings, provided the householder does not indulge in more energy-intensive practices than pre-renovation, will offer much greater certainty to householders, transfer technical risk to the professionals and encourage eco-renovation activity. In some ways it is trying to bring a model which is used in the commercial sector (energy performance contracting), into the residential sector. There are many challenges around designing contracts with householders, which protect both the householders and the company which does the renovation work. Once a workable system has been developed, the founders see this idea as being eminently scalable.

Consultancy/project management for eco-renovation (UK)

Two firms offering new routes in to eco-renovation are briefly described. Parity Projects is a company which offers a number of services to home owners and social housing landlords on how to cost-effectively retrofit their homes (www.parityathome.com). It provides 'Home Energy Masterplans' which, based on detailed modelling of homes and understanding of how the owners live, gives very detailed advice on many retrofit options and combinations of options. These include much more analysis and advice than the standard Home Energy Reports which are provided at point of sale in the UK. It also trains installers, offers specification, project management and other services, is one of the most prominent firms in debates around eco-renovation issues, and has won a number of environmental awards. The firm has worked with in excess of 700 private householders and a number of social housing providers who own hundreds of thousands of properties in aggregate.

Ecospheric is a fairly new company established by an engineer with a background outside of the construction industry, based in Manchester specialising in domestic retrofit (www.ecospheric.co.uk). Their focus is on providing technologically advanced energy efficient and renewables installations to deliver healthy, comfortable living environments. They undertake tens of projects per year, with clients who are mainly home owners with large homes of solid wall construction, 100+ years old. The company aims to offer a bespoke service for advice on renovation, which is knowledge-based. Ecospheric is acting a

project designer and an 'integrator' between all the different building trades required to deliver high quality eco-renovation. On interviewing the founder, he suggested that his business model could not be expanded to renovate all UK homes. It is too knowledge-intensive and too costly. (A view not shared by the interviewee from Parity Projects.) However, he believes it is most likely to be the most effective approach for the segment of homes he is dealing with, which require considerable intervention and whose owners can afford the work required.

Social enterprise, providing information and inspiration (UK)

Bristol Green Doors (BGD) is a social enterprise which has a number of aims, including: to present good practice of domestic green refurbishment; to make retrofitting more mainstream; to develop the retrofitting supply chain and the green economy; and, to pilot an effective project other cities can use. Based, as the name suggests, in the city of Bristol (SW England), its main activity is running annual 'Green Doors' events where householders who have undertaken eco-renovation work, open their homes to members of the public. The event in 2012 attracted nearly 2000 people (www.bristolgreendoors.org) and their impact has been evaluated by independent researchers (Cole, 2011). In addition, BGD has run more specialist seminars, some of which are targeted at building professionals, and has managed a project on installing external solid wall insulation to a terrace (row) of houses.

While BGD is not unique, nor the first locally based organisation to undertake this type of work (Hamilton and Killip, 2009) it is an extremely good example of a social enterprise making use of very limited resources to provide relevant information about eco-renovation to the public. Talking to one of the founders revealed just how difficult it has been to secure the minimal funding needed to keep the organisation running. The organisation does not wish to expand its geographical scope. However, it is clearly a scalable activity in the sense that the same activity can be carried out in many other locations, indeed BGD has been involved in giving advice to other nascent local organisations who wish to begin similar activities.

NEW WAYS OF APPROACHING POLICY

This paper has identified the lack of a UK or French roadmap with a strategy on getting a fully eco-renovated housing stock by 2050. In terms of a policy framework to develop a roadmap, probably the most fully developed at the moment would be the market transformation approach, which has been proposed by a number of authors (e.g. Boardman, 2012, Fawcett and Boardman, 2009). The market transformation approach, having been developed for appliances, may not be perfectly suited to housing which is very different, and doubts about this approach have been debated (Killip, 2011). This approach is not further developed here, instead a new way of thinking about whole house eco-renovation which has been developed in the Building Expertise project is summarised below.

Over time eco-renovation

Presently, the dominant model of eco-renovation assumes a one-off renovation which substantially reduces energy use and carbon emissions at a single point in time. An alternative model is of work which is carried out over a longer time, piece-by-piece, as the opportunities arise, with the aim of achieving high levels of energy and carbon savings. As part of the Building Expertise project, an 'over time' model of eco-renovation has been explored and developed (Fawcett, 2013; Fawcett and Mayne, 2012). By elongating the time dimension of eco-renovation, the profile of disruption and cost to householders is spread out over time. As well as changing the householder experience, the time dimension could have effects on how the process is managed and the professionals involved, and the potential for carbon savings.

The preliminary evidence suggests that over time eco-renovation may be an attractive option to home owners, and that it could deliver 60 % carbon savings, and therefore be an important approach to securing the necessary savings from the residential sector. In order to include over time eco-renovation in the general understanding of eco-renovation, a means of acknowledging that a property is in the process of eco-renovation, via measures of completeness or progress towards a target is needed. Completeness could be measured either against a renovation masterplan for the property, or a universal standard, such as x % carbon emissions/energy use reductions or x CO_2/m^2/year or x kWh/m^2/year, giving rise to assessments such as 'this home has achieved x % of its eco-renovation potential'. In addition, a structure which supported over time eco-renovation would signpost opportunities for adding eco-renovation to non-eco-renovation works.

The over time model has two important consequences for professionals: firstly, it requires an integration of different people's renovation activities at different times, which suggests a log-book approach and/or a widespread ability among industry actors to 'read' previous interventions and make complementary improvements (or fix things that are broken/wrongly done/not compatible with current aims). Secondly, the ability of the industry to do this type of work may/should improve over time, so today's acceptable standard may not be sufficient in 10 years. Somehow the goals have to allow for learning and innovation.

The model of over time eco-renovation includes recognising the importance of timing, and making the most of trigger points and fortuitous opportunities to improve energy efficiency. However, it also includes the idea that the passage of time itself can be important in the process of eco-renovation. Time passing allows people to recover from the impact of disruption of earlier works, build up savings to afford future works, and to enjoy the benefits of efficiency/renewable measures already installed, and perhaps thereby to increase their ambition to further improve their homes. The over time approach is likely to increase accessibility and reach of eco-renovation by spreading costs over time and aligning eco-renovation with normal repairs/upgrades. While many detailed research questions remain, preliminary analysis has shown that over time eco-renovation is a promising idea, worthy of further exploration.

Discussion

The starting point for this paper was a discussion of different definitions of eco-renovation. The three definitions chosen differed not only in their level of technical ambition, but also in the metrics which they were using and the sorts of measures which could be included when delivering the targets. This illustrates the difficulties which can be experienced when researching and writing about eco-renovation: different people

and organisations use a range of different words (renovation/retrofit/refurbishment), targets & metrics (in terms of primary energy, delivered energy, carbon) and therefore range of measures (energy efficiency and/or fuel switching and/or renewable energy and/or behaviour change) which can deliver those targets. Policies, ideas and initiatives may appear to be addressing the same problem, but closer analysis suggests they are not. In addition, it is difficult to draw a clear boundary between policy which delivers energy efficiency, and that which may be said to be addressing a (wider) eco-renovation agenda (as illustrated in Figure 1). It would be very helpful if more standardised language could be developed so that there are agreed meanings to phrases like 'eco-renovation' or 'deep renovation', but given the different agendas at work, this may not be possible.

This diversity of views was reflected in different policy aims in the UK and France. Although both countries have carbon reduction targets, in the UK this seems to be much more decisive in the way housing renovation policy is framed than in France, where energy reduction is the focus. In practical terms, this may not be very important – in that both countries are pursuing similar strategies of reducing the cost of energy efficiency measures/eco-renovation to householders, France in a more vigorous way than the UK. However, evidence from British people who have extensively eco-renovated their homes suggests that their primary motivation is concern about climate change. To the extent that this group is important in demonstrating the feasibility of whole house eco-renovation, creating an early market, and informing and inspiring the wider public, then failing to frame eco-renovation as an important part of efforts to limit climate change could be a mistake. Conversely, it could be argued that the UK takes too narrow a focus on carbon, while the Grenelle approach takes account of much broader sustainability issues – a viewpoint worth exploring in future work.

While the complexities of national differences limits what comparative studies can deliver, comparing the UK and France has proved interesting and useful. Preliminary analysis suggests that alignment of eco-renovation with employment policy in France and with social & fuel poverty policy in the UK has led to funding from general taxation/energy bills being distributed in different ways. In France individual households can get more generous financial assistance with eco-renovation, whereas in the UK there has always been concern that funds are not redistributed away from the least well-off, and large incentive payments to wealthier individuals are unlikely to be socially acceptable. In the longer term, given the high cost of comprehensive eco-renovation, and the large number of properties to be treated, it is unlikely either government can subsidise its way meeting their energy and carbon reduction goals. Policy emphasis will need to change to other 'barriers' preventing people undertake eco-renovation, and provide information, motivation, confidence in professionals and so on.

Examples from business and social enterprise innovation show some of the ways ahead. The business examples showed the development of specialist services for better-off households who already have the intention to undertake some eco-renovation. The scale to which this sort of business could grow would be limited by the proportion of the market which fits that description, and the skills available in the industry to deliver these specialised services. The second potential limit could certainly be alleviated by government policy and funding on training. Social enterprise initiatives, such as Bristol Green Doors, can play a very important part in overcoming some of the non-financial impediments to action on eco-renovation. By allowing people to see real life examples of eco-renovation, and talk to the people who did them, they can help increase the knowledge and motivation people have to eco-renovate and confidence in building trades. There is proven interest in this activity in the UK, with several local schemes and one national network (Superhomes – www.superhomes.org.uk). Providing modest funding for this sort of scheme could be part of government policy. Encouraging business and social enterprises to develop and test new approaches, is likely to prove an important part of creating a successful strategy to deliver 2050 targets – because it is certain that we – the policy community – do not have all the answers at present.

How future policy should develop will depend on the scale and speed of changes the government plans. A policy which aims for all households to undergo ambitious whole-house eco-renovation (60–90 % savings) will be different to one which aims to achieve a lower minimum standard for all housing, and perhaps makes more savings via fuel switching or de-carbonising the energy supply. A policy which rewards comprehensive eco-renovation carried out at one point in time will differ from that supporting an over time approach. Designing an approach which achieves ambitious standards which can be achieved over time is a new challenge, and a lot of work would be required on supportive policy instruments and institutions. What is possible in different countries will depend on many factors, including how energy efficiency and eco-renovation policy intersects with other key policy concerns around employment, fuel poverty and social justice.

Conclusions

The aim of this paper was to identify the policy gaps regarding eco-renovation in the UK and France, and to highlight some promising ideas which could successfully fill those gaps. Many policy gaps have been identified. In fact, it is not clear that the UK and France do have eco-renovation policies as such, there are policies which promote packages of energy efficiency measures, but little in the way of a strategic approach which would lead to a sufficiently low energy and low carbon housing stock by 2050. Much more thinking, learning from innovators and from experience in other countries is needed.

There are hopeful signs. Social enterprises and businesses in both countries are trying out new approaches. They are aware of the need to replicate what they are doing at much larger scale – and governments need to consider if they can assist in that process. Many of the business innovations are targeted at higher income householders who are already interested in renovation. This is clearly a good place to start –if this sector of the population can be persuaded to eco-renovate in much larger numbers, and achieve ambitious reduction targets, it could be the beginning of the wider social change needed. Social enterprises can reach a broader range of people, and by knowing local conditions can respond to the audiences they serve. New policy ideas, such as eco-renovation carried out over time, could broaden the appeal of renovation and engage more households in this process. Nevertheless, comprehensive-

ly eco-renovating the housing stock remains a huge and hugely difficult task. The Building Expertise project aims to contribute by providing analysis and case study examples from the France and the UK, but much more remains to be done before we can claim to know how to get from where we are now, to where we need to be.

References

ADEME, 2011. Batiment Edition 2011: Chiffres cles. Agence de l'Environnement et de la Maitrise de l'Energie, Centre de Sophia Antipolis.

Beillan, V., Battaglini, E., Goater, A., Huber, A., Mayer, I., Trotignon, R., 2011. Barriers and drivers to energy efficient renovation in the residential sector: Empirical findings from five European countries, European Council for an Energy Efficient Economy, Summer Study, Hyeres, France, pp. 1083–1093.

Bertoldi, P., Rezessy, S., Lees, E., Baudry, P., Jeandel, A., Labanca, N., 2010. Energy supplier obligations and white certificate schemes: Comparative analysis of experiences in the European Union. Energy Policy 38, 1455–1469.

Boardman, B., 1991. Fuel poverty: from cold homes to affordable warmth. Belhaven Press, London.

Boardman, B., 2012. Achieving zero: Delivering future-friendly buildings. Environmental Change Institute, University of Oxford, Oxford.

Boulhol, H., 2011. Making the French housing market work better: OECD Economics Department Working Papers, No 861. OECD, On the web: http://dx.doi.org/10.1787/5kgcd9w73qvf-en.

Charlier, D., Risch, A., 2012. Evaluation of the impact of environmental public policy measures on energy consumption and greenhouse gas emissions in the French residential sector. Energy Policy 46, 170–184.

Cole, M., 2011. The economic impact of Bristol Green Doors: Interim Report. University of Bristol, Bristol.

Consumer Focus, 2012. What's in it for me? Using the benefits of energy efficiency to overcome the barriers. Consumer Focus, London.

DECC, 2012a. The energy efficiency strategy: The energy efficiency opportunity in the UK. Department of Energy and Climate Change, London.

DECC, 2012b. Final stage impact assessment for the Green Deal and Energy Company Obligation. Department for Energy and Climate Change, Published on the web: http://www.decc.gov.uk/assets/decc/11/consultation/green-deal/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf [accessed January 2013].

ECEEE, 2011. Steering through the maze # 4: Capturing the collective knowledge base on building retrofit. European Council for an Energy Efficient Economy Secretariat, Stockholm.

Egger, C., 2012. Progress in energy efficiency policies in the EU Member States – the experts perspective: Findings from the Energy Efficiency Watch project. O. O. Energiesparverband, Linz, Austria.

Enerdata, 2011. Quantitative evaluation of explanatory factors of the lower energy efficiency performance of France for space heating compared to European benchmarks: Study carried out by Enerdata for ADEME. ADEME, Paris.

EST, 2010a. Sustainable refurbishment. Energy Saving Trust, London.

EST, 2010b. At home with energy: A selection of insights into domestic energy use in Scotland. Energy Saving Trust, Edinburgh.

Eurostat, 2012. Housing statistics. Eurostat, Published on the web: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Housing_statistics#Further_Eurostat_information [accessed December 2012].

Fawcett, T., 2011. Home time: an exploration of the time dimensions of the eco-renovations of housing, Energy and People: Futures, complexity and challenges, 20–21 September 2011, Oxford.

Fawcett, T., 2013. Changing times: A new option for large-scale housing eco-renovation. Building Research and Information (under review).

Fawcett, T., Boardman, B., 2009. Housing market transformation. Proceedings of European Council for an Energy Efficient Economy. Summer Study 2009, La Colle sur Loup, France.

Fawcett, T., Mayne, R., 2012. Exploring an 'over time' model of eco-renovation., Retrofit 2012, Salford, Manchester.

Hamilton, J., Killip, G., 2009. Demonstration, inspiration … replication? Assessing the impact and limits of social learning from Eco-homes Open Days in the UK, Proceedings of European Council for an Energy Efficient Economy. Summer Study 2009, La Colle sur Loup, France.

Harvey, F., 2012. Coalition faces backbench rebellion on energy bill, The Guardian, London. 18 December 2012.

IEA, 2012. CO2 emissions from fuel combustion: Highlights (2012 edition). International Energy Agency, Paris.

INSEE, 2012. Évolution de la population jusqu'en 2012. Institut national de la statistique et des etudes economiques, Published on the web: http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATnon02145.

IPPR, 2010. IPPR Green jobs summit 2010, . Institute for Public Policy Research, Published on the web: http://www.ippr.org.uk/uploadedFiles/events/2010/Green%20jobs%20summit%20-%20summary%20note.pdf [accessed January 2013].

Killip, G., 2011. Can market transformation approaches apply to service markets? An investigation of innovation, learning, risk and reward in the case of low-carbon housing refurbishment in the UK, ECEEE Summer Study 2011, Hyeres, France.

Killip, G., Fawcett, T., Janda, K., 2013. Builing Expertise: industry responses to the low-energy housing retrofit agenda in the UK and France, Proceedings of ECEEE 2013 Summer Study, Belambra Les Criques, France.

Mallaband, B., Haines,V., & Mitchell,V., 2012. Barriers to domestic retrofit – learning from past home improvement experiences. Retrofit 2012, Salford, Manchester.

MEDDTL, 2010. Grenelle II law. Ministry of Ecology, Sustainable Development,Transport and Housing,, On the web: http://www.developpement-durable.gouv.fr/IMG/pdf/Grenelle_Loi-2_GB_.pdf.

MURE, 2012. Energy efficiency profile: France, Published on the web: http://www.odyssee-indicators.org/publications/country_profiles_PDF/fra.pdf [accessed December 2012].

Nosperger, S., Killip, G., Janda, K., 2011. Building expertise: A system of professions approach to low-carbon refurbishment in the UK and France., Proceedings of ECEEE 2011 Summer Study, Belambra Presqu'ile de Giens, France.

Novikova, A., Vieider, F., Neuhoff, K., & Amecke, H. (2011). Drivers of Thermal Retrofit Decisions – A Survey of German Single- and Two-Family Houses CPI Report. Climate Policy. Berlin.

ONS, 2011. Population estimates for UK, England and Wales, Scotland and Northern Ireland, population estimates timeseries 1971 to current year. Office for National Statistics, Published on the web: http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--england-and-wales--scotland-and-northern-ireland/population-estimates-timeseries-1971-to-current-year/index.html.

ONS, 2012. Families and households, 2011. Office for National Statistics, Published on the web: http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-248983.

Palmer, J., Cooper, I., 2011. Great Britain's housing energy fact file. Department of Energy and Climate Change, London.

Rosenow, J., Eyre, N., 2012. The Green Deal and the Energy Company Obligation – will it work?, BIEE Academic Conference - European energy in a challenging world: the impact of emerging markets, St John's College, Oxford.

SOWATT, Enerdata, 2011. French higher domestic specific electricity consumption compared to Germany : Explanatory factors assessment study. ADEME, Paris.

UKERC, 2009. Energy 2050: Making the transition to a secure and low-carbon energy system: synthesis report. UK Energy Research Centre, London.

Watson, K., 2011. Eco-homers: Who are they and why do they retrofit? Unpublished MSc Thesis. University of East London & CAT, London.

Acknowledgements

We would like to thank the many interviewees who generously shared their knowledge and experience with us. Thanks also to our research partners in EdF R&D, in particular Véronique Beillan and Stanislas Nösperger. This work is jointly supported by EdF and the Research Councils' UK Energy Programme under the People, Energy, and Buildings Programme.