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The value of retrofitting carbon-saving measures into fuel poor social housing

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ABSTRACT

With current fuel poverty and carbon-saving policies continuing to miss their targets in the UK, the synergy between the two problems is investigated to highlight an approach that could be mutually beneficial. Focussing on the 550,000 fuel poor socially housed dwellings in the UK, costs of between £3.9 and £17.5 bn are estimated as the required capital investment for achieving deep-cut carbon savings (defined as at least 50%) across this section of the housing stock, with a potential total annual carbon saving of 1.7 $MtCO_2$. It is assumed that such costs would be largely (or totally) state-funded, though additional private investment could clearly increase the possible carbon savings across this section of the stock. The use of these socially housed fuel poor dwellings as low-carbon exemplars is discussed, and benefits for the private housing sector are postulated. The study also focuses on the problem of installing non-cost effective measures, i.e. technologies that would not currently be encouraged by existing subsidy schemes, but which might be necessary for achieving large carbon-saving targets.

1. Introduction

In the UK, the housing stock is often described as inefficient and requiring improvement. There are two main symptoms of this problem: fuel poverty and domestic sector carbon emissions. Fuel poverty in the UK, a circumstance where a household is spending more than 10% of their income on energy bills, currently stands at 3–4 million households (DEFRA, 2008). It is highly sensitive to domestic energy tariff variations, with a 1% rise in fuel price likely to result in another 40,000 households entering fuel poverty (House of Commons, 2009). The current approach for dealing with this problem relies on providing winter payments for energy bills for vulnerable households.

Domestic buildings in the UK account for 27% (DEFRA, 2006) of the carbon emissions of the country. With new-build homes only contributing an extra 1% (DCLG, 2007a) to the stock every year, the need to retrofit existing homes on a massive scale is clear. This paper aims to look at whether this coincidence of stimuli for reducing fuel poverty and carbon emissions can be exploited to provide a first step to retrofitting the domestic housing stock with deep-cut carbon saving measures.

There are several barriers to reducing carbon emissions of the existing domestic stock. A key problem is that of capital cost, with targets of 50% carbon savings and higher unlikely to be met through measures with short-duration payback periods (Tarbase, 2009).

This study looks at how possible approaches concerned with fuel poverty and carbon emissions might overlap, and how social housing projects can be used as an initial litmus tests for such schemes. One major obstacle to the implementation of retrofit measures in existing buildings is the supply-chain or, more generally, getting a range of different technologies installed into a large section of the housing stock. With social housing, examples do exist where organisations such as housing associations have been active in encouraging such measures. With the fuel poor, there is the added incentive for the occupier that energy bills could be significantly reduced and/or the building can reach an improved level of thermal comfort. This would suggest that fuel poor homes in the social housing sector might be a suitable area to concentrate on when attempting to begin a mass-retrofit scheme across the UK.

The aim is therefore not to look at modest carbon savings per house over the entire building stock, but rather ambitious carbon savings across a specific section of the stock, namely fuel poor social housing. The subsequent effect on the housing stock at large will also be discussed.

2. The existing domestic stock

The UK domestic stock is non-homogeneous and, therefore, different refurbishment measures are required depending on these different building types. Fig. 1 shows a breakdown of the English housing stock by building type (though a UK-wide dataset

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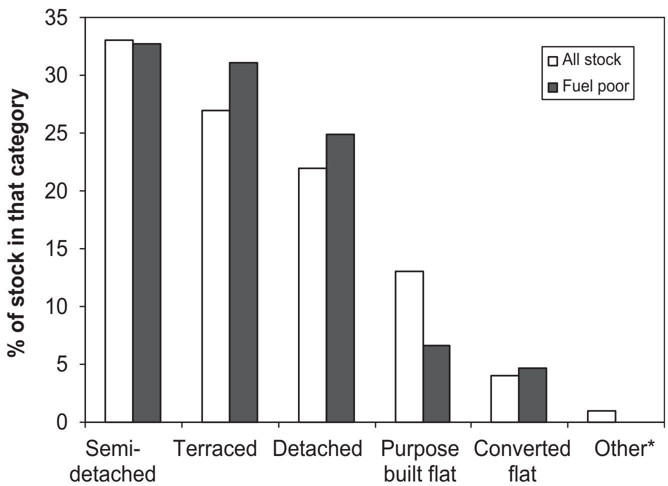

Fig. 1. Domestic stock categories for all English properties (DCLG, 2008) and UK fuel poor (DBERR, 2005).

would be similar as 83%, or over 21 million, of UK houses are in England).

Clearly, the stock can be further disaggregated into other categories such as construction type, location and occupancy profile, all of which can have a significant effect on expected energy use of the dwelling. Likewise, the definition of the building will change the retrofit approach to the building. A cavity-wall insulation measure, for example, is extremely effective for a house with a typical cavity-wall construction. A similar building with a timber frame structure will not be able to use the same insulation measure, due to the need to retain an air gap in front of the timber (to prevent degradation due to dampness). Such a building might require external or internal insulation measures instead, which can be in the region of ten times more expensive than a cavity-wall measure (OPSI, 2008). Solid wall buildings will be subject to the same cost barriers. This problem is particularly relevant when investigating the Carbon Emission Reduction Target (CERT) scheme in Scotland (the largest available funding mechanism for energy-saving refurbishment in the UK), where a large proportion of houses are timber frame or solid walled. Figures accounting for the total number of dwellings that are unsuitable for cavity-wall insulation are difficult to estimate; although it is known that 70% of dwellings in England have cavity walls (DCLG, 2007b) and 74% in Scotland (Scottish Government, 2007), the percentage of these that are timber-walled and social housing is difficult to cross-reference. As discussed elsewhere (WWF-UK, 2008a), this is likely to be more of a problem in Scotland than the rest of the UK.

While, subtracting grant assistance, cavity-wall insulation can be installed at a cost of several hundreds of pounds to the occupier (the rest being paid by CERT), a building where only internal or external wall insulation is possible would require the householder to spend in the region of several thousands of pounds (OPSI, 2008). Looking at CERT UK-wide, the current target for annual CO_2 savings, of 4.2 $MtCO_2$, is just 2.7% of the total domestic stock emissions, assuming that the total stock emissions are 152 $MtCO_2$ (Shorrock and Utley, 2003) [N.B. The CERT target of 154 $MtCO_2$ that is sometimes quoted refers to lifetime, not annual, CO_2 savings. This appears to suggest that the average lifetime of the refurbishments exceeds three decades, which itself appears questionable]. The figure of 4.2 $MtCO_2$ also assumes that the grant scheme is sufficient to encourage additional private investment from the householder, as the fund can only be used for part of the capital cost (generally less than 50%). It is therefore suggested that, while the CERT scheme is useful in providing financial assistance for measures such as roof insulation and cavity-wall insulation in particular (i.e. making cost effective measures even more cost effective), it is not designed to achieve deep-cut carbon saving targets (e.g. 50% reductions and above) throughout the UK housing stock. Such targets require an initial capital purchase that is far in excess of most individuals' willingness to pay (Peacock et al., 2009). This becomes even more problematic when lower income households are investigated.

3. Fuel poverty

Fuel poverty figures are subject to relatively high levels of uncertainty, largely due to variations in energy tariffs but also due to different definitions between sources. One UK government report estimates the number of fuel poor households at 3.5 million in the UK in 2006 (DEFRA, 2008). Other sources (Ravetz, 2008) provide estimates that are higher (in the region of 4 million) than this figure, and current (2008 and 2009) estimates are unavailable at time of writing, due to the time it takes to collate such information. It will be assumed for the following calculations that there are in the region of 3.5 million fuel poor households in the UK.

Fig. 2 shows the change in fuel poverty statistics over recent years, with predictions used for fuel poor numbers after 2006 (DEFRA, 2008). The causes for these variations can be categorised into four areas: winter temperature, energy tariffs, subsidies (such as cold weather payments) and average income of the households. Building thermal performance is also clearly a factor in the cause of fuel poverty but, in Fig. 2, would have a negligible effect on the variation (as, with a relatively immature low-carbon retrofit industry and annual new-build additions being in the region of 1% of the total stock, the overall efficiency of the building stock would not be dramatically changed over this period).

Also shown in Fig. 2 is the Retail Price Index (RPI) for fuel and light since 1996, a good indicator of the real cost of energy used in the home (also GDP corrected (DBERR, 2008)). This shows a clear correlation for much of the period between 1996 and 2008, with the introduction of Warm Front payments (and other subsidies) in the late 1990s causing the fuel poor to drop at a greater rate than the RPI up to 2001.

With reference to what building types might be more susceptible to fuel poverty, Fig. 1 indicates a slightly higher percentage of fuel poor households in detached and terraced homes than is seen in the stock at large. This could be due to detached homes having more external walls (and so are more sensitive to poor thermal performance) and terraced homes being less straightforward to retrofit and improve. However, Fig. 1 does

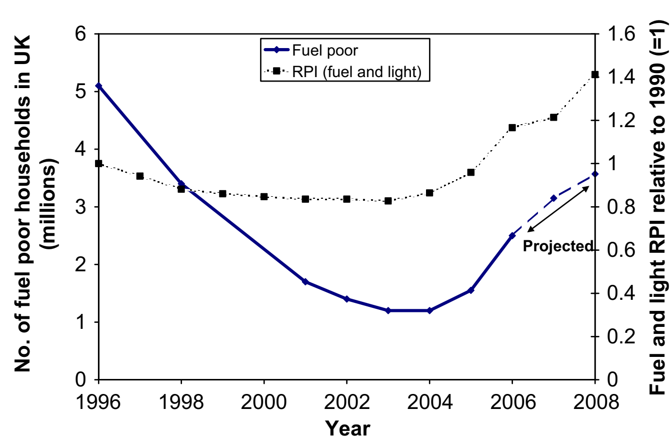

Fig. 2. UK fuel poverty and RPI since 1996.