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Unseen influence—The role of low carbon retrofit advisers and installers in the adoption and use of domestic energy technology

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HIGHLIGHTS

- Five UK schemes to promote domestic energy technology are examined.
- Advisers and installers influence the impact of energy technology.
- Micro-enterprises dominate low carbon retrofit.
- Low carbon retrofit installers are beyond the reach of current policy.
- A framework for investigating installer competence is proposed.

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ABSTRACT

Reducing climate changing emissions associated with residential property continues to be a significant challenge. Five case studies of different domestic energy technology schemes in England highlight the influence of advisers and installers in householders' decisions to adopt low carbon technologies. Many of these advisers and installers are micro-enterprises working in connected groups in particular geographic areas. Such micro-enterprises form a large part of the construction sector, but despite the number of enterprises and the potential impact of changes in the behaviour of the sole traders and small firms, there appears to be little policy that specifically targets this group.

Data from these case studies is presented and organised into a typological framework, in order to illustrate the range of ways in which the impact of advisers and installers can be modified. Two of the six factors in the typological framework relate to the motivation of installers themselves and how their work is perceived by their clients. By examining these factors in particular, this paper makes a novel contribution to understanding the factors that influence the take up and use of domestic energy technologies, leading to the possibility of new policy options or interventions.

1. Introduction

In the ongoing challenge to mitigate climate change, tackling carbon emissions associated with buildings remains important. While new buildings can be designed and constructed to ensure lower levels of energy demand and associated emissions, existing buildings must undergo technological retrofit. The ideal opportunity for retrofit is at a point where there is a change in the building's function, a change of occupant or a change of lifestyle or routine (Schäfer et al., 2012). In developed countries, where rates of new build are low compared to the stock of existing buildings, retrofitting buildings is a major element of achieving carbon reduction targets. In the UK, it is estimated that approximately 75–80% of the UK's 2050 building stock already exists (SDC, 2006). Within the total building stock, domestic (homes) and non-domestic properties demand different interventions. UK homes accounted for 25% of UK emissions and 40% of energy use in 2009 (DECC, 2011), so focussing on residential property alone could still offer a significant contribution to meeting carbon reduction targets.

This paper arises from research focussing on how technology can reduce domestic emissions when part of a retrofit project. There are three ways in which domestic technology might make a contribution: curtailing energy use, improving energy efficiency (Gardner and Stern, 2002) or increasing microgeneration. Energy efficiency can be improved by deploying technologies, such as insulation, which reduce energy losses, or by improving energy

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use efficiency directly, for example through the adoption of energy efficient lighting and appliances. On the domestic scale, renewable microgeneration technologies that might make a contribution (if correctly installed) include solar thermal systems, heat pumps or biomass boilers for heat, and solar photovoltaic (PV) cells, wind turbines and micro-hydro turbines for electricity (Bergman and Jardine, 2009). There may be additional indirect carbon reductions from technology installation; it has been suggested that households that have microgeneration technologies installed also make behavioural changes to reduce demand (Dobbyn and Thomas, 2005).

Modelling suggests that up to 40 $MtCO_2e$ could be removed from UK residential emissions by 2020 if energy efficiency measures and lifestyle changes were implemented, with a further 60 $MtCO_2e$ reduction possible via domestic renewable microgeneration, although this is more expensive (CCC, 2008). The CCC's realistic forecasts of what could be achieved by 2020 are 9–18 $MtCO_2e$ from energy efficiency and 10 $MtCO_2e$ from microgeneration. In the UK, policy packages such as the Green Deal and the Energy Companies Obligation are fundamental to achieving low carbon retrofit. Green Deal is a scheme which allows private householders to repay the costs of energy efficiency improvements through their energy bills rather than needing up front capital payments. The Energy Companies Obligation complements the Green Deal by placing a legal requirement on energy suppliers to implement energy efficiency measures, particularly for more vulnerable groups of energy users.

Energy technology retrofit clearly has potential to deliver significant emission reductions, but in practice, the success of retrofitting existing building stock to low carbon standards is dependent on social, cultural and economic change as much as technical innovation (Ravetz, 2008). Here, we investigate the role of a largely overlooked change agent in this broadly conceived retrofit process, the energy technology installers and advisers. We explore the interaction of these agents with householders in an effort to better understand their role and influence in the domestic energy retrofit process. We begin by briefly reviewing the factors that affect uptake and use of domestic energy technologies, before moving to the main focus of this paper, the influence of installers and advisers. We explore the role and impact of the adviser and installer through analysis of primary data from five English case studies. We conclude that their role is significant but that some of the characteristics of a large proportion of the advisers and installers mean that they are beyond the reach of current policy interventions. A framework for understanding individual adviser/installer attributes and competencies is developed, which we suggest can help to identify how policy and practice might reach these key individuals and unlock their potential to contribute to, and accelerate, the essential low carbon retrofit of the domestic sector.

2. The role of intermediaries in domestic energy technology and use

Before the explicit consideration of the role of advisers and installers in energy technology adoption, it is useful to review, briefly, the factors that affect adoption and use of energy technologies in the home as this helps to understand the context in which these key intermediaries operate. The key factors important in energy technology adoption include the technology, its users (in our case, householders), and characteristics of the place where the home is located.

A first set of issues relates to the characteristics of the technology itself. Rogers (2003) suggests that around half of the variation in the rate of adoption of a new innovation can be ascribed to five characteristics of the innovation itself: the relative advantage it provides to the user, its compatibility with existing systems, its observability, trialability and perceived complexity. In the UK, the diffusion and impact of energy technologies (including cavity wall insulation, solar water heating, photovoltaic (PV), compact fluorescent light bulbs, central heating controls and condensing boilers) has been researched in depth, with a view to informing energy technology design and closing an observed gap between intended and actual impact (Caird et al., 2008; Roy et al., 2007). The research examined the motivations of, and feedback from, non-adopters (who have not considered adopting low carbon technologies), rejecters (who have considered adopting but decided against it), as well as actual adopters. This framework adapted the five technology attributes central to innovation diffusion as suggested by Rogers (2003), and proposed four related innovation attributes: price, usefulness, interconnectedness (the degree to which a technology is dependent upon, or closely linked to, a range of other technologies or services), and symbolism (the meaning the technology has for the user beyond its design function). The importance of these factors varied between technologies. Examining the diffusion of these energy efficiency investments amongst UK households, the desire to save energy, save money and have a warmer home were the three main motivations for adoption of loft insulation, heating system controllers, condensing boilers and energy efficient lighting. Expense, and the (perceived) difficulty of installation (of the whole process e.g. clearing the loft as well as laying down insulation) were significant barriers to adoption and a range of product design improvements were suggested that would help to overcome such barriers (Caird and Roy, 2007, 2008). Other analysis has shown that energy costs and technology prices matter in the decision to adopt a technology, but finance alone is not enough to achieve change without the influence of other factors (Jaffe and Stavins, 1994). Price is also not an absolute barrier but a relative one, working in combination with household income.

A second set of issues relates to the characteristics of the users of the technology. While the adoption of a domestic energy technology is a necessary stage in achieving reductions in resource use, it is the use of that technology that leads to its impact. This leads to recognition that, in addition to the characteristics of the technology itself, the user's attributes will also affect technology adoption and how it is used. Such attributes include the household's attitudes towards the environment (e.g. Fishbein and Ajzen, 1975; Mirosa et al., 2013), their values (Stern, 2000), perceived behavioural control (Ajzen, 1991) and habits (Marechal, 2010; Shove, 2009). These individual factors interact with the household's socio-economic conditions. For example, early adopters of microgeneration in the UK were found to be older householders (with more available capital) in larger, detached, rural locations (Roy et al., 2008).

The third set of characteristics that have been found to influence technology adoption and use relates to the place where the technology is installed, with the location of a property affecting the feasibility of a specific technology. For example, lower latitudes have more incident solar radiation, enhancing the performance of PV cells, although studies of the adoption of PV in the USA found that incident radiation was not the only important factor, with state incentives to support technology also being important (Kwan, 2012). A south-facing roof with a particular pitch is optimum for PV; a sheltered external area assists a heat pump fan; storage is essential for biomass boilers, and so on Pester and Thorne (2011), Thorne (2011a,b). However, the more subjective characteristics of place (Tuan, 1990) rather than location also have an influence. The case studies presented below found that 'acquired attributes of place' (Lupton and Power, 2002) are particularly important in creating the context for accelerating