



Achieving growth within the UK's Domestic Energy Efficiency Retrofitting Services sector, practitioner experiences and strategies moving forward



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ABSTRACT

The adoption of the UK Green Deal policy provided an unprecedented change within the policy arena of domestic retrofit. Government financial support present within previous policy regimes was reduced and private industry was enlisted to provide finance, delivery mechanisms and management schemes for national domestic low carbon retrofit. Consequently, the **Energy Efficiency Retrofit Services (EERS) sector** needed to grow capacity and deliver retrofit at a large scale.

This research focuses on assessing the present EERS sector industry and its strategy to increase retrofit activity. This paper provides findings from on the ground interviews with UK EERS sector practitioners with relation to their experience of working with the Green Deal, and also their suggested strategies progressing forward now the Green Deal is no longer operational.

Key findings suggest that UK EERS sector practitioners were unprepared to professionally deal with the expectation of the Green Deal, in terms of business administration and also dealing with the policy itself. Moving forward an emphasis is suggested which focused on training, to enable an increase in EERS sector capabilities, and to also enable an improvement of the quality and variety of work completed. Additionally, findings detail the requirement for enhanced communication between clients and policy administrators, to increase clarity in policy implementation and stakeholder expectation.

1. Introduction

To meet UK climate change targets of 80% residential property carbon reduction by 2050 from the 1990 baseline (Boardman, 2012; Fawcett, 2014; Killip et al., 2014), the UK housing stock requires extensive retrofitting of energy saving measures (Eames et al., 2014). In the past, retrofit policy strategies have centred on 'low hanging fruit' to boost the performance of buildings, via increased loft insulation for instance (Rosenow and Eyre, 2014). The effect of this strategy is the production of an Energy Efficiency Retrofitting Services (EERS) sector landscape whereby property enhancements have scarcely scratched the surface of potential improvements (Gooding and Gul, 2015; Dowson et al., 2012; Kelly, 2009). This differential between achieved energy savings and possible energy savings has resulted in a sizeable performance gap within the UK housing sector (Barr et al., 2005; Pelenu and Cruickshank, 2012).

To increase the volume of installed retrofit measures, the UK government of early 2013 launched the loan scheme the Green Deal (GD) and also a new version of the Energy Company Obligation (ECO), obliging energy providers to fund energy efficiency improvements to

assist home owners and tenants to reduce property carbon emissions and running costs (Rosenow and Eyre, 2013). The GD was designed to be a loan scheme finance device which did not need public subsidy, but offered members of the public the opportunity to commence retrofit projects at a large scale. The policy itself was positioned at the head of the government's political strategy, with the label of 'flag-ship' being applied to the scheme. This illuminated the fact that policy makers were positioning policies which enable sustainable development, at the forefront of governance.

In particular, the government placed the GD within a raft of other measures, designed to enable energy security, and the concept of protecting consumers against the volatility of energy prices. This movement to enhance energy security is stated to be due to supply risks from severe weather, terrorist threats, technical failure, industrial strike action, domestic fuel reserve decline (DECC, 2015), along with an obligation to meet carbon emission reduction targets. The result of these factors means the GD was positioned as one method of many, targeted at creating a situation whereby energy demand is reduced via efficiency, and of this reduced demand a wider variety of energy sources are drawn upon. Therefore energy efficiency and retrofit sits within a

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wider discourse change focused on deregulation and liberalisation, enabling a variety of strategies to provide and save energy.

More specifically in the case of the GD, there is a focus on consumers, generating a dynamic market for businesses, and therefore fostering a low carbon economy, alongside the reduction of fuel poverty and carbon emissions. In placing responsibility for policy delivery in the hands of the private EERS sector, the GD shows that to an extent liberalisation and deregulation of the energy sector was intended (Pettifor et al., 2015). This freedom for businesses to prosper was resultant from the recognition that the market for energy efficiency measures could grow from £8.25bn in 2007 (DECC, 2012, p31) to a potential of £58bn in 2013.

Operational until mid-2015 (Briggs, 2014; Rosenow and Eyre, 2016), the GD aimed at permitting the opportunity to retrofit properties with energy saving measures, without the need for upfront payments, via pay as you save finance mechanisms (DECC, 2010). Repayments for the retrofit upgrades were envisioned to be generated via on bill payments post installation. The GD relied upon ‘the Golden Rule’ to ensure that the value of any energy saving generated by the improvements, was no less than the repayments for the measures (Guertler, 2012). ECO operated alongside the Green Deal in aiming to tackle carbon saving and fuel poverty simultaneously. ECO fitted in with the GD by offering measures that did not meet the Golden Rule assessment; this positioned ECO to deliver less cost effective measures (Rosenow and Eyre, 2012), which suited low income households, and those in fuel poverty (Guertler, 2012).

The Green Deal was intended to have a high level of impact, via the provision of 14 million property retrofit schemes by 2020 (DECC, 2011). However, in practice the policy significantly failed in achieving any notable result level. In actuality approximately 6000 properties per year received a scheme of retrofit works under the Green Deal, meaning about 14,000 properties were retrofitted during the policy's operation period (January 13–March 16) (DECC, 2016). Plus, in comparison to predecessor policies, the Green Deal resulted in substantially lower carbon savings. Per year, the predecessor policies of the Carbon Emissions Reduction Target (CERT) and the Community Energy Savings Programme (CESP) delivered approximately 68 MtCO₂ in savings over the lifetime of measures (DECC, 2010), compared to the GD's 0.4 MtCO₂ of savings (NAO, 2016; Rosenow and Eyre, 2016).

During the operational period of the Green Deal, a high reliance upon the EERS sector was present, which has continued since its demise. This reliance is due to a need to promote retrofit whilst limiting demands upon the public purse. The importance of private industry increasing retrofit activity is high, as an estimated half a million retrofits will need to be realised yearly with minimal government support, to reach 2050 carbon reduction targets (Killip, 2008a, 2008b). To facilitate this rate of change, the EERS sector therefore needs to embrace an adaptive approach towards policy, enabling large scale modifications to supply chain strategies (Gooding and Gul, 2015; Lowery, 2012; Energy Saving Trust, 2010).

The challenge to change the level of retrofit activity however, has been stated as too great for the EERS sector to tackle (Genovese et al., 2013; Gooding and Gul, 2015; Koh et al., 2012). Reasoning for this is that the sector has been classified as a subsector of the traditional construction industry (Genovese et al., 2013). This status means that in effect the EERS sector has been considered fragmented and embryonic (Goldman et al., 2010), with businesses being characterised as small in size and restricted in geographic coverage. Therefore, for a retrofit policy to succeed, business capability needs to be taken into account (Genovese et al., 2013; Killip, 2011).

This paper firstly outlines the key characteristics of the EERS sector, along with challenges facing practitioners. Secondly, this paper introduces the methodological approach utilised here, followed by an identification of key themes emergent from interviews with EERS sector practitioners. The themes are in particular; the ways in which the EERS sector has responded to producing retrofit at scale, and areas

where policy and the EERS sector need to realign expectations to increase retrofit implementation. Finally a discussion section details the findings from data collection, and possible resultant lessons to be learnt. Due to the source of data being from on the ground EERS sector practitioners, a focus is made on emphasising strategies for practitioners and policy to best interact and boost retrofit activity.

2. The EERS sector

High levels of heterogeneity within the construction industry, mean characterising and grouping differing areas of the industry is not a simple task. When considering energy efficient retrofit for instance, the businesses and individuals operating within the sector are not necessarily separate to more mainstream construction activities. The level of variability and flexibility needed to provide retrofit measures, means many EERS sector members are involved in conventional construction as well as energy efficiency practices (Dunphy et al., 2013; Genovese et al., 2013).

Activities within the sector include the design and construction of properties and refurbishment schemes, the implementation of low carbon materials and technologies, the maintenance of energy efficient measures and also the facilitating of behavioural change. Stakeholders undertaking these processes include individuals in both the public and private sectors; include government organisations, construction companies, contractors, engineers, architects, designers, suppliers etc. As stated, due to the lack of clarity in generating boundaries to the sector, being recognised as a sub-sector of the general traditional construction industry has limited research into the industry (Genovese et al., 2013; Goldman et al., 2010).

Previous studies show (Goldman et al., 2010; DTZ, 2009) that the majority of companies functioning within the sector are small to medium sized (SMEs), with 10 or fewer employees. This trend of smaller operation is also present within the general building improvement and maintenance industry (Killip, 2008a, 2008b), influencing the fact that retrofit projects are mainly conducted on an individual basis. This type of operation discourages larger businesses from sector involvement, due to economies of scale being difficult to produce, with heterogeneous projects requiring substantial management and organisation costs (Mundaca, 2007). Low large-scale business investment may also be driven by a lack of government funded initiatives growing demand, initiatives which could be transformative in advancing EERS sector performance (Killip, 2013). High levels of sector fragmentation and dispersal may also limit larger business involvement (Genovese et al., 2013). Existing strategies to address this fragmentation include cooperative style groups of SME retrofit businesses; cases include RetrofitWorks based in South East England, and the national group of independent businesses named SNUG (Fawcett et al., 2014a, 2014b). These demonstrate the supply chain acknowledges that modifications to business formation to enable increased retrofit levels are required.

What is evident therefore is that market forces are producing advances within the operating styles of the EERS sector, but assistance from government policies is still required to meet carbon reduction targets. It is considered that the innovation within the EERS sector and wider ‘Green Economy,’ is occurring at an insufficient rate to produce retrofit at scale (Stewart, 2015). Therefore the role of policy is required more than ever, to incentivise and to enable a transition to produce a low carbon society (Dowson et al., 2012). This in turn means that innovations within the EERS sector need to encourage purposive action to influence both businesses and consumers (Stewart, 2015). This required progress of the EERS sector, to some commentators may seem uncharacteristic for an industry emergent from the construction sector traditionally labelled as conservative (Keegan and Turner, 2002). However, the sector has displayed innovation, with progression occurring within the areas of design and consultancy (Fawcett et al., 2014a, 2014b; Winch, 2003), along with construction project based innovation taking place when temporary groups of practitioners come

together (Harris and Halkett, 2007). Furthermore, high levels of expertise and management skills within the sector (Janda et al., 2014) enable quality completion of high specification projects. Plus there has been progress in terms of creating training programmes to produce Retrofit Coordinators for example (Courses led by the Centre of Refurbishment Excellence (CoRE)), however the level of impact is still minimal (~100 graduates), with the centre ceasing to trade in 2015 (Corrigan, 2015).

The lack of impact of the Green Deal shows recent policy is not providing advantageous operating conditions for businesses, even though there is evidence that past schemes can be successful. Furthermore, since the Green Deal's decline, a replacement policy has yet to emerge, further highlighting the need for action. This increase in retrofit action is required within dedicated retrofit businesses and companies which have emerged from the blueprint of traditional building and maintenance models (Killip, 2008a, 2008b). These organisations have the potential to provide significant retrofit increases, even if it is in a piecemeal manner (Fawcett et al., 2014a, 2014b). Furthermore, this emergence of the sector from more mainstream activities means that there is a need for the development of the human resource within the sector.

3. Research approach and lessons to be learnt from EERS sector practitioners

The UK EERS sector can be characterised as a problem solving industry, both within day to day operation and in profit production strategies of business. Therefore, during the course of the Green Deal's operation, EERS sector members were enlisted with the role of producing business models capable of delivering the incentive loan scheme in a profitable manner. In order to understand the success of these models, how operationally these individuals continued to trade under the scheme, and which strategies were most effective, it is necessary to gauge views of the members of the EERS community. To undertake this qualitative study the approach adopted is of semi-structured interviews to allow access to matters which were rarely publicly discussed, or which were not discussed very honestly in a public context (Bryman, 1988). These interviews confirm what is already known and can provide reliable and comparable qualitative data.

Due to the fact this research is investigative in nature; any claim of being comprehensive is not made (Baker et al., 2012). Instead the research focuses on forming an understanding of the way in which policy has impacted the EERS sector and what commercial responses resulted.

4. On the ground practitioner sample group

In assessing interactions between EERS sector practitioners and the GD, along with resultant suggestions for policy improvements, this research aims at evaluating the nature of practitioner experience. Focusing on practitioners with experiential knowledge of the policy landscape has been chosen as the sample group, for the following reasons:

- Practitioner research in this case, aims to position itself to formalise construction professional's viewpoints, and also provide data which is grounded within field experience (Azhar, 2007).
- Concepts and theories of change can be developed within specific environments, characterised by situational problem solving (Baskerville, 1999).
- The production of reliable research results can occur, due to the data being grounded within practical action, focusing in on solving a real situational problem (Naoum, 2001).

The sample group selected for this study is not limited geographi-

cally and therefore the research looks to offer an insight into EERS sector operation conditions across a wide ranging area. Although participants were based in the main in the north west of England and the central belt of Scotland, individual's experiential knowledge of differing areas around the UK was high, with multiple respondents operating nationally. The differing extents of operational area therefore provides a key insight into the varying roles EERS sector respondents complete, and the types of supply and implementation networks they operate within. The investigative nature of the research is also reflected in the snowball sampling method utilised. To commence sampling, initial existing researcher contacts within the EERS sector were utilised, to generate a base of interviewees who were known to have extensive sector experience. From this standpoint, the sample group is not selected from the population, but instead the population is determined by examining a phenomenon where it is discovered to exist (Chenitz and Swanson, 1986). Once a base of data was produced, preliminary coding of interview transcripts occurred, subsequently enabling theoretical sampling to take place to form the group interviews. In combining these two sequential sampling techniques, a broad category identified in snowball stages can be examined in more detail to 'elaborate on its various manifestations' (Teddlie and Yu, 2007, p83). This targeted of investigation ensured further participants could provide illumination of themes which were emergent (Draucker et al., 2007). This use of grounded theory purposive sampling provides an in depth strategy to evaluate relationship themes between the EERS sector and policy (Coyne, 1997).

5. Data collection

Twenty three telephone semi-structured interviews (lasting between half an hour to an hour) (Table 1) and six UK based group interviews (Table 2) were carried out within the premises of differing businesses and organisations. These were conducted by an experienced interviewer over a period of 6 months, with differing participants taking part in the individual and group sessions. This provided an opportunity for new individuals to assess the themes emergent from within the individual interviews, to not only act as a method of triangulation to assess the validity of a theme, but to also build upon some concept to produce well rounded policy suggestions.

The number of interviews was considered adequate as it enables the detailed immersion in the field, to establish fruitful relationships with respondents to address the research area in depth. Therefore from this, a smaller sample facilitates an in-depth inquiry into a theme, and explores the various connotations of a concept (Crouch and McKenzie, 2006). In addition, the final number of interviews was resultant due to an initial sample size of 20 being selected. This minimum number of interviews was determined via considering previous investigations into the EERS sector (Galvin, and Sunikka-Blank, 2014; Walker et al., 2014; Fawcett et al., 2014a, 2014b), and follows the concept of the 'wisdom of the elders' (Galvin, 2015), or the notion of informing sample sizes via prior research evidence. This initial sample then was followed by three interviews, which acted as a stopping criterion to ensure that saturation has actually been met (Francis et al., 2010). These 23 interviews produced theoretical saturation of issues, concepts which were then

Table 1
Breakdown of semi-structured interview research participants and roles.

Profession	Frequency
Retrofit training provider	3
Property assessor and advisor	1
Green Deal installer	5
Green Deal provider	1
Government official	2
Retrofit supply chain manager	5
Retrofit material supplier	6

Table 2
Details of group interviews undertaken.

Group interview business area	Participant number	Participant professions
Retrofit material supplier	3	Business development officer Architectural technologist Retrofit advisor
Retrofit material supplier	4	Retrofit specification advisor x2 Supply chain advisor x2 Property assessor x2
Property assessor	3	Green Deal advisor
Large scale landlord	4	Planned maintenance officer x3 Policy funding specialist
Retrofit installers	4	Insulation installation specialist Membrane and airflow management specialist General refurbishment contractor x2
Local authority	2	Retrofit funding advisor x2

taken to theoretically sampled group interviews for further discussion (Baker et al., 2012). This development of a theme then leads on to producing suggestions of how policy could be altered in the future to enable increased retrofit activity.

The breakdown of participant roles and numbers is detail within Table 1.

These group sessions had between 2 and 4 participants within them. The sessions were determined as exploratory in nature, due to the requirement of on the ground suggestions as to the future of the sector and policy. These policies are considered important to ensure future high volumes of retrofit projects to meet targets, and also to future proof buildings to ensure performance is deemed satisfactory by today's and tomorrow's standards.

Therefore to achieve insight into future sector strategies and policies, group respondents were permitted the opportunity to discuss freely their thoughts and via discussion define in greater depth, their reasoning's. The fact that the individuals shared experiences, from operating in the EERS sector, meant that a more nondirective interviewer approach was adopted. This informal, unstructured method permitted the group the opportunity to interpret each other's responses and carry out a discussion from the groups combined opinions. However to enable coverage of the themes, the sessions covered three major sections; the groups existing experiences, their opinions of EERS sector related policies, and their views of the sector and policy into the future.

Data collection sessions produced details of commercial business responses, to the challenge of developing within the sector. Along with opinions of the suitability of the policy landscape, and ways in which progress could be made on both sides of the policy/practitioner line. The following areas of query were utilised within the data collection, to attempt to produce in-depth information on commercial responses to the retrofit challenge (table 3). These areas of inquiry were selected from an extensive literature review of known barriers and drivers to retrofit uptake (Gooding and Gul, 2015).

6. Results

As linked to the questioning routes, the results from the individual and group interviews are presented in terms of; strategies for EERS sector growth, areas for improvements, and suggested improvements emergent from participant statements of future strategies. Within each of these areas, key themes generated by the data are discussed with reference to the broader contexts of policy design and the supply chain.

Table 3
Energy Efficiency Retrofitting services sector practitioner data collection question areas.

Characteristics of the EERS sector.	Characteristics of business related to;
	<ul style="list-style-type: none"> – Income generation streams. – Industry growth and profit levels. – Supply of properties. – Innovations. – Formation of practitioner networks. – Levels of competition. – Differing types of businesses involved in the delivery chain.
Changes in industry	EERS sector changes over time, related to; <ul style="list-style-type: none"> – Rate of change and perceived reasons. – Negative or positive impact of changes.
Market conditions and policy	Level of EERS sector success, related to; <ul style="list-style-type: none"> – Perceived levels of retrofit activity. – Viability of present strategy into the future. – Main barriers to growth into the future.
Suggested improvements	<ul style="list-style-type: none"> – If changes to policy are required, what needs to be addressed and for what reasons? – What areas of policy in particular in your opinion need attention to increase retrofit activity? – With regards to the UK housing stock as a whole, what area in particular needs prioritising as an area for improvement, and how would you go about implementing that improvement?

6.1. EERS sector strategies for growth

The following areas are themes raised within data gathering sessions, detailing the different areas in which practitioners have focused efforts to enable growth.

6.1.1. Profit generation methods

Business strategies for profit generation were very divergent among respondents, and covered areas from installer, to consultant, to government supply chain advisor. In the main, adaptability towards the requirements of end users, and possible income generation routes was considered to be valuable to produce a financially stable industry. This ability, was considered to be prevalent within some sampled businesses, including newer businesses entering the sector and those attempting to progress and generate more trade. This strategy to take advantage of different profit centres was considered important to adapt to the requirements of the market and policy. Moreover, due to SMEs comprising much of the EERS sector, fragmentation of supply means companies need to be able to tackle differing types of projects, across a large geographical area. Additionally, recognised within 100% of the interviews was the need to step away from boom and bust strategies in relation to differing policy schemes and incentives, to enable sustained growth. The main rationale for this was stated as the need to add value to projects and produce differing types of income, instead of purely loft insulation installation for instance. Therefore, due to the low level of GD impact, and the policy's short term, the scheme was stated as having a negative impact on the sector, with businesses not given enough time to establish, an issue which limits larger scale investment.

This desire of EERS sector practitioners to produce financially stable businesses has produced an industry whereby interaction with the Green Deal was carried out with caution. This caution was continually stated as important due to the rate at which changes to the policy landscape can cause unanticipated impacts upon market conditions. It was considered that these changes can impact business reputations, harming the possibility for the creation of further business. This was expressed by one respondent as:

'We have had to keep particular close eyes on the changes in the policy, and the changes in the way funding is made available to differing projects.' (Green Deal training advisor).

In addition, 60% of respondents stated that a business strategy to purely take advantage of policy was not only unwise due to the level of

exposure to unexpected changes, but also because it was thought to show a lack of success in non-policy implementation work. Therefore, a purely policy strategy businesses was considered to be not producing a high level of continuing business from word of mouth recommendations and also in house marketing. As one respondent stated:

'I think that there are plenty of companies who have completely just tied themselves to the grant and are simply going under.' (Retrofit consultant).

Linked in with this concept of ensuring a business's reputation, is the need for high quality levels within provided products and services, which entails good customer service, energy performance of installed goods, after care, and general business outlook. The motivation to achieve high levels of quality is to ensure word of mouth marketing occurs promoting business services, and to also increase profit margins via the provision of efficient operational processes. This motivation to provide quality was stated as going unrealised within the Green Deal by the majority of respondents. Furthermore, due to the fragmented nature of the EERS sector, and the prevalence of SMEs, successful companies were stated as having to work on a variety of differing project types, with subcontractors, to enable project completion. This high level of divergence between different projects means that sector businesses need to be adaptable to different projects. This is explained by the quote below where one participant said:

'What I would say is that you have to be adaptive in this industry because every person is looking for something slightly different from the last and therefore you do have to be aware of how your offering can help different people.' (Retrofit management trainer).

Connected with the point above of focusing on quality, is the fact that it can be sometimes difficult to encourage a client to spend higher levels of finance on achieving a greater level of quality. It was stated by 60% of respondents that the overwhelming way in which a business is run is to ensure that the financial bottom line is healthy, (the remaining 40% agreed with this sentiment, but also stated an importance of ongoing trade and sustainable levels of business dictated how a business is run). This financial priority is sometimes conflicting with end users who require high levels so service and quality at a minimum cost, as described by the quotes below:

'People want to save money more than anything on their property and tradespeople want to make money, so there is a bad dynamic between the two parties.' (UK material supplier).

'Part of the business model is to provide a rewarding retrofit for the end user in terms of finance, warmth, and carbon savings, whilst the other side of the model is to generate as much profit as possible. These two sides in my opinion cannot work seamlessly side by side.' (Supply chain policy advisor).

From this it can be seen that advanced performance projects completed to a high specification of products, materials and installation standards, is something that is seen as detached from a low cost project. This divergence is supported by the fact that respondents considered customers reluctant to commit high levels of finance to retrofit schemes. This was considered an issue as interviewees considered end users unaware of the need to prioritise energy efficiency above other expenses, such as luxury home fittings and appliances. Resultant from this is a need for alterations in the way citizens consider energy efficiency retrofit as a priority when thinking about domestic improvements. This end user awareness increase was something the GD strived for, in requesting businesses to advance end user communications. However, the results from the GD show the policy miscalculated consumer's home improvement purchasing habits and appetites for debt. Linking all of these issues of policy failings is the lack of communication between parties, and the lack of interaction between policymakers and EERS sector individuals. This limited the implementation of adequate communication channels for large scale

end user demand increases, as detailed by the following quote:

'The ball has been placed in the court of private businesses and policy makers have just said that they need to get on with it or the trade will not be there, so it seems to me that there needs to be much more communication between the different parties to make it successful.' (Retrofit training manager).

6.1.2. Working above policy expectations and targets

Continuing with the move away from purely financial factors governing projects, is the consideration that in the main businesses try to stop simply working to policy defined minimum performance levels. Thereby only attempting to produce projects which meet today's policy targets. It was stated this lack of high standard project prevalence is due to the lack of consumer requests for higher quality, and the ability of SMEs to promote themselves in a manner which generates quality project completion contracts. At the moment it was suggested EERS sector is characterised by businesses which carry out one specific operation, loft insulation for example, and attempt to carry this out to the highest time and resource efficiency. In turn it is considered that the GD did not attempt to form a sector differing from this format. The issue with this is that the sort of installation and services which can be provided on such a large scale, are in the main low hanging fruit improvements. If businesses are to start looking towards deeper retrofits, a move away from one area of operation to more problem solving comprehensive retrofit improvement schemes is required. This move towards deeper retrofit schemes was stated to only succeed if projects can be completed in a time and resource efficient manner, to maximise business's financial profit and end user appeal, as indicated by this statement;

'We aim to help enable businesses to make as maximum profits as possible, by ensuring their operation is as streamlined and efficient as possible' (EERS sector business consultant).

This attitude towards forming a business which operates at a high level above the minimum requirements, was something stated as important, but which was not resultant from the GD, as suggested here;

'I think that within reputable circles the concept of working with the Green Deal of ECO is a bit frowned upon. If you are interested in just money and quick cash then I suppose that is true, because with a focus on cash the concept of quality and customer service is put on a back burner' (Retrofit best practice advisor).

Therefore, moving forward increased focus needs to be placed upon forming businesses which have the acumen for dealing with policy and also to produce a business which performs to a very high level of operational efficiency.

This leads onto a second point, regarding the need to work above the minimum policy requirements. It is suggested that the majority of EERS sector businesses are not tackling projects with a high degree of building physics knowledge or awareness. All respondents suggested that there is a need for both the industry and policy makers to look past the 'crude' building regulation way of operating to a more intricate way of looking at projects specifically, and how the physics of an actual building work. It was suggested that levels of training and practitioner ability to produce installation schemes ensuring building air and moisture flow optimisation, are not present, as suggested by this statement;

'We do need to increase the minimum standard by which people can enter the industry, because what you get are labourers with limited qualifications throwing up houses with little care for the actual physics of how it works.' (Building product advisor).

Practitioners within the UK retrofit policy implementation sector stated that the commercial choice to operate above regulations, to best optimise a property, was not present. This concept was also repeatedly

brought up with regards to the Standard Assessment Procedure (SAP), used within property energy performance calculation. It was considered that this assessment method does not have enough detail to best understand a property from a building physics perspective, and it also does not have enough room within it, to offer up differing client options to best deal with property energy inefficiencies. Plus, assessments as to the performance of installed measures prior to project completion, were also considered inadequate within the UK. Intermediate checks to retrofit works, carried out during installation of products and materials were considered insufficient in frequency. Meaning in some cases amendments had to be carried out after work had been completed, incurring expensive costs to both EERS sector practitioners and end users. This was considered of particular note when considering the desired levels of airtightness required for a building, post retrofit. If upon completion the property did not achieve the level of air transmission needed, the subsequent modifications to the building were considered an avoidable expense if additional checks occurred during works.

The effect of this is that there needs to be increased understanding of how to improve properties on a case by case basis, whereby improvements meet the standards of today and the future.

7. Areas for improvement

Carrying forward the areas in which the UK EERS sectors is operating, the following are specific points which are considered and stated by respondents as areas for improvement to enable greater retrofit levels.

7.1. Streamlined implementation

To enable an increase in retrofit levels, one view held by UK practitioners is to move away from the fragmented nature of the sector, which loses customers via limited proactive client engagement, and subcontractor reliance. This concept is highlighted by this statement:

'To increase capacity quickly requires the assistance of subcontractors. The issue with this however, is that there are quality issues, liability issues, and a more complex interaction between client and installer. Plus, what subcontracting shows is that businesses are only acting in a reactive manner to enquiries and contracts.' (Government retrofit advisor).

One thought process stated by the majority of participants would be to advance retrofit delivery supervision, to manage the differing parties involved and create a central point of contact. This strategy would mean the negative sector fragmentation factor could be minimized, by creating a central administration point, similar to the role an architect performs, but with specific training and knowledge of the needs of a retrofit project (Janda et al., 2014). This concept details the important role of 'middle actors' to draw together policy and projects, to ensure high levels of professionalism. This in turn, would limit the involvement required from end users, which could make the prospect of retrofit more attractive to some clients. Furthermore, it would ensure quality retrofit installation practitioners can be brought in at the correct time, to streamline project completion, minimise timescales, and enhance end user appeal, as detailed here;

'In the case of retrofit a project manager, who can lead the scheduling and management of a project but also make sure that policies are upheld and that the quality of the work being completed is to the highest possible standard, would be useful. That way, there would be an increasing of the level of professionalism within the industry in general and make a more attractive and certain investment for end users.' (Retrofit materials supplier).

7.2. Training provision

This level of customer service was also highlighted by all participants as an area for improvement, from the perspective of tradesperson training, and in particular, apprentices. It was suggested that with increased training and higher standards in general, other trades and project managers would be willing to take qualified practitioners onto a project. This need for improved training was discussed in terms of enabling quality and industry progression and is demonstrated by the following quote:

'What needs to happen is the bringing forward of all practitioners up to a high level whereby every contact an end user has with a retrofit industry individual is one of professionalism and knowledgeability.' (Retrofit training provider).

Additionally, it was indicated that without practitioner proof of skill and accreditation, networks of EERS sector members are unlikely to form, as practitioners are reluctant to work with others who are unproven or unaccredited. Consequently, there needs to be added training within the retrofit supply chain at all levels, to increase base line knowledge of relevant policies, emergent techniques and technologies. In turn, this boost in training provision is deemed to be best delivered via a combination of time served methods on live project and formal training schemes to ensure accreditations are accurately awarded. This concept is indicated by the following interview excerpt;

'There needs to be more of a time served type system whereby established businesses take on apprentices who then can only trade once they have met a certain level of accreditation, skill and experience, therefore they do not just go after money and cut corners, but provide a quality service.' (Retrofit materials supplier).

This was considered as a key way to enable greater levels of problem solving on site, along with an increase in the rate at which energy saving innovations are emerging. From that point of view, there needs to be policies in place which offer an overarching look at the retrofit sector, which discourages carbon intensive practices at all steps of a retrofit scheme of works.

7.3. Innovation emergence

The fostering of EERS sector networks which work towards common goals was also deemed important when considering bringing innovations forward. Participants stated that in the main, retrofit products and innovations are brought forward by smaller businesses and innovators. This is consistent with existing literature detailing the concept that larger businesses prioritise market position maintenance, above radical innovation practices and entrepreneurialism (Chandy and Tellis, 2000; Janda and Killip, 2013). These smaller outfits bringing forward new materials and technologies are limited in their financial and human resources along with geographic coverage, when compared to national suppliers, and consequently the frequency of innovations reaching the market is slower. Within the UK therefore, it was stated that supply chain needs to be much more resourceful with the way a business operates, and SMEs need to utilise a network of outlets and installers to gain a competitive advantage over larger companies. This is typified by the quote below:

'In the UK overall innovations are brought forward in dribs and drabs, someone grabs hold of something and tries to push it out in their own way, if that is one of the big boys then that can be quite successful in getting the geographic coverage, but if it is a smaller operation then it can be a slow process.' (German building product importer).

Alongside increased level of resourcefulness aiding innovation development, government incentives for research and development of new products or services was also called for. This strategy was deemed

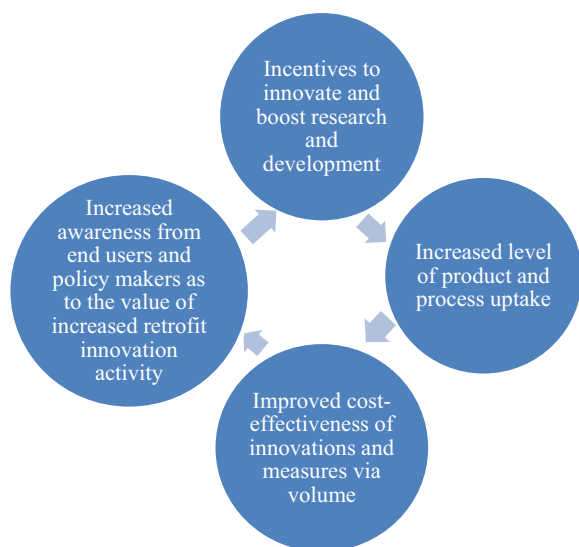


Fig. 1. Stated multiple benefits of incentivizing innovation development.

important to produce cyclical increased in innovation adoption as detail by Fig. 1:

7.4. End user relations

EERS sector customer service enhancement, to permit retrofit at scale is also an area stated where progress is needed. As discussed above, due to many EERS sector businesses being small in nature and limited in resources there is a need for innovative methods to maximise the impact of the business, in terms of economic growth, project carbon reductions and customer service. Respondents stated that at present UK promotion of high quality energy efficient goods is minimal, due to the small numbers of end users forming the potential market. If there was a changes in the level of marketing, and an increase in the size of the target marketplace, an increase in overall societal awareness would result;

'In the UK we actually do very little marketing work, because overall we have found that house builders in general are simply working to price and to the minimum standard they can get away with, meaning most trade comes from those individuals searching us out.' (Passive standard material supplier).

Accordingly an area for improvement would be a move to incorporate retrofit works with more mainstream activities such as kitchen and bathrooms upgrades. This concept was linked to the greater involvement of supply chain actors encouraging end users to adopt high energy efficient strategies of retrofit, aiding carbon savings. This may lead to increased retrofit volume, as the bundling of retrofit with other construction activities could result. Respondents stated that from the industry's perspective a striving to work with government assistance is needed, in a way which could enable more effective working between trades and traditional construction. This acknowledgment is highlighted by this here;

'Trying to attract standard contractors into this sector, even though there is a lot of money to go at is very hard, we are presently trying to get someone to do some carpentry work but simply cannot get them on board. We are crying out for builders to do bits and pieces, but it is not a big job so few are interested.' (Retrofit best practice campaigner).

8. Suggestions for policy changes

Utilising the results from the manner in which the EERS sector has responded to the challenge of producing retrofit at scale, the following points were suggested as ways in which policies could be improved.

8.1. Flexibility in finance provision

The first suggested area for policy alteration is that of the way in which finance is provided and made available to end users to implement retrofit schemes. UK participants agreed that there is a need for clients to have flexibility when it comes to how they should use finance. Thereby permitting flexibility and the possibility of tailoring based upon the characteristics of the property. Presently, within the UK the ability to supply finance to differing types of customer is considered to be lacking, as indicated by the following statement;

'Only with increased certainty and better finance deals available do I consider that retrofit at scale could exist with the present system.' (National retrofit best practice coordinator).

It was stated by participants, that with a change in finance provision, an initial boosting of EERS sector activity could result, along with an up surging of retrofit activity, enabling the commencement of growth and economies of scale. With this increased competition it was also considered that non-geographically specific employment growth could result;

'There needs to be a quest to have an intelligent input of money, in key places where it will have the most impact, not just in a monetary way, but wider than that, in a long term skill, jobs, innovation, technology kind of way too.' (UK Retrofit advisor).

Overall, every respondents considered that the fact policy had been to an extent uncertain under the GD, meant that to enable an increased level of investment, a much more long term view of operating is required.

This longer term strategy was stated as being preferred for the following reasons (Fig. 2):

8.2. Policy moving with sector capabilities

The second suggested area for alterations in policy is to increase the level of ability to adopt innovations, enabling the possible inclusion of products in specifications. This focus results from the stated need for a greater ability to tackle the complexities of building physics, therefore adopting regulations and policies which are not simply broad brush, but tailored to properties. For instance there was a stated confusion from participants as to why projects were measured on the success of installed renewable technologies, instead of being focused on building envelope improvements. It was considered that a material focus is an effective way to make best use of renewables, instead of the risk of renewables simply mitigating against an inefficient property, as highlighted here:

'In the UK, the focus is dilute, looking at materials, renewables and transport for instance. If there is more attention given to renewables, than for the envelope, it simply drives the renewables up and not the building materials. If my renewables don't work, I still have an inefficient building, whereas if my house is efficient, renewable don't matter as much.' (Materials importer).

8.3. Training routes

The third area suggested for policy improvement is the need to address the level of training and resultant accreditation which practitioners can obtain. Participants stated that a move to an apprenticeships style method of gaining expertise, mixed with formal training

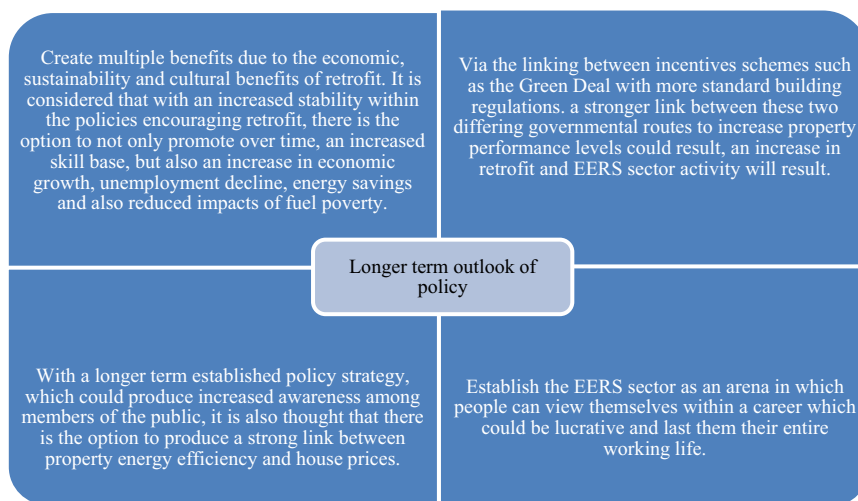


Fig. 2. Advantages of operating a longer term outlook for policy.

programmes, would enable the sector to implement a high standard of quality and service. This mixture of methods is also supported by existing literature, advocating varying strategies, including onsite training, formal degrees, short course accreditation schemes and web based learning (Goldman et al., 2010). In addition to the level of quality higher training offers, it was considered that increased experience would go hand in hand with increased problem solving, expertise utilisation and multiskilling (Jagger et al., 2013). This ability to increase onsite skills could also mean enhanced project timescale management, due to specialist trades not being brought in. It was stated by multiple contributors that this trend for UK EERS sector practitioners to focus on one particular aspect of retrofit, had caused a delaying in the rate of progress within the sector. Therefore an accredited and in depth training programme for retrofit, which is in turn widely accepted, is considered as an important move within the UK. Here is an example of such a statement:

I think that you can achieve a way of working where people are highly skilled and can turn their hands to different tasks and bring on innovations faster than if they were just installing insulation all day. (Retrofit cooperative coordinator).

This sentiment is also important for more general retrofit business management skills also:

I think there needs to be an increased level of training in all areas related to retrofit delivery. I say this in particular note to marketing and lead generation, as I think in the past all the door knocking that has gone on has detracted from the reputation of the industry as a whole. I think for a successful industry to emerge, professionalism is required throughout with highly trained delivery and business teams providing a level of service which has not been seen before. (Government retrofit supply chain consultant).

Connected with this above point regarding higher qualifications to tackle complex projects, is the suggestion from participants that qualified project managers should organise projects efficiently from conception to completion. The uses of architects or upskilled tradespeople were suggested as two ways in which to increase project management skills;

There needs to be some sort of really tight management on site, say a project manager or architect of some sort, that way price and time minimization can be improved. (Retrofit supply chain manager).

Whether it is an architect or project manager presiding over a retrofit project, there is a need to generate and increase a large number

of individuals, or middle actors (Janda et al., 2014). These professionals need to be qualified to provide a skilled administration of retrofit projects. Furthermore it is considered a valuable way to bring forward end users who are unsure about commencing a retrofit project due to a lack of clarity as to which party within the sector can best assist. This sentiment is highlighted by this quote:

'We need to be working in a system which permits practitioners to really put their skills to work, and therefore I do think that a high level of discretion is needed for tradespeople to make their own choices on site as to the best route of action for a property. So I suppose that must mean that people may need higher levels of training to permit the study of building physics and such like so on site problem solving can be completed efficiently.' (Retrofit best practice campaigner).

Moreover, this training of individuals to manage projects could bring together networks of practitioners, which could have the potential for process efficiency and profit margin increases along with delivery streamlining. These three steps of results emergent from this research are shown here in Fig. 3:

9. Policy implications and conclusions

From this research one may conclude that UK practitioners are aware of the areas in which the sector needs to develop and advance, along with the goals of increased efficiency and professionalism acknowledge as concepts to be worked towards. It is also viewed by contributors that this method of working should exist within a policy arena whereby regulations push forward the performance of the sector, due to increased numbers of properties available for retrofit. This change in sector performance in turn has been suggested to focus upon how practitioners interact with the building physics of a project, ensuring the health of the property and occupants.

Moreover, findings suggest without public awareness changes, a sector capable of delivering higher cost projects, will struggle to gain increased business levels. Consequently, companies need to focus on how they are being perceived by clients and how they professionally position their services and products in front of end users. A key area for development suggested is training, an increase in which could permit heightened customer service, therefore increasing client trust and property performance levels.

From a financing perspective, government assistance to enable EERS sector growth is still viewed as necessary. The consensus is that finance needs to be widely available and flexible to permit the treatment of differing housing types in a quality centric, reliable

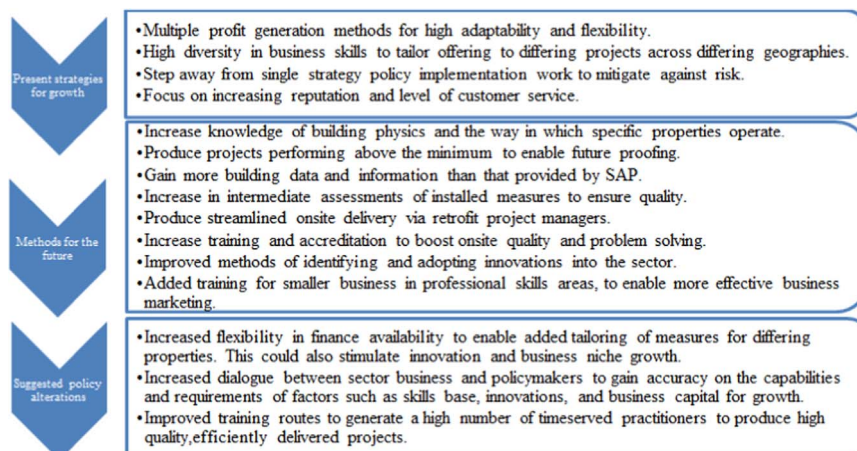


Fig. 3. EERS sector present strategies for growth, method for the future, and suggestions for policy alterations.

manner. Furthermore, finance or incentives need to be available to EERS sector businesses to allow increased training levels as suggested above, or fast tracking of innovations.

Although the GD has been deemed a failure, in terms of, estimated end users appetite for debt (Fawcett, 2014), producing large scale retrofit activity and increased end user engagement (Pettifor et al., 2015), as seen here it can be deemed a learning process for implementation businesses (Mallaburn and Eyre, 2014). However, the GD has left the EERS sector with a lot of work to do, to produce a sector aware of areas in need of change and be capable of retrofit at scale.

Key areas for alteration to enable this increase in retrofit activity:

- Improved training for onsite trades to limit subcontractor involvement and increase problem solving.
- Increased business skills training to aid the development of professional EERS sector business, with successful client acquisition and fulfilment methods.
- Boost in finance flexibility for end users to enable tailored schemes of measures and the inclusions of new innovations.
- Increased level of dialogue between policy makers and private businesses to ensure expectations are in line with reality.
- Establishment of a large number of onsite project managers to enable streamlined delivery of project on site.
- Inclusion of energy efficient measure within standard property improvements such as kitchen and bathroom refits.

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