Understanding the effectiveness of the Green Deal and the Energy Company Obligation: a study of policy impact on the retrofit supply chain

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Keywords

retrofit, building stock, energy efficiency policy, Green Deal, supply chain

Abstract

Within the UK retrofit policy landscape, government involvement in financing, managing and implementing policy has been scaled back. This process has resulted in a private industry lead policy mechanism, the Green Deal (GD). In relying on private actors to produce energy efficient retrofit at scale under the GD, policymakers are anticipating high levels of innovation, inter-business collaboration, customer service and investment. Since the GD's commencement in early 2013 however, substantial levels of activity have yet to materialise. Understanding why there is a mismatch between policy expectancy and the level of actual activity is the focus of this paper. Differing types of impact generated by the GD upon the supply chain are investigated, and the rate at which barriers to growth are being removed is examined.

To capture the interactions between this new policy landscape and the supply chain, interviews with key commercial stakeholders, running businesses regularly interacting with policy are utilised. These businesses provide retrofit measures under the title of GD assessor or installer, and function in the main, to profit from implementing the policy aims, at ground level. Focussing on the assessment of policy performance, the exact impacts of differing mechanisms upon businesses can be determined. Through this pinpointing of influential factors affecting the performance of policy, findings aid the understanding of what barriers are hindering businesses presently, and to what extent they could be reduced into the future. These results contribute to ongoing policy learning from ground level sources, with insight into the effectiveness of policy upon the financial, operational and growth characteristics of businesses.

Introduction

The UK's residential housing stock must be altered at a large scale to be brought in line with climate change targets. Within the UK, domestic properties consume more energy than any other factor within Britain's society and in turn emit the largest amount of CO₂ (Boardman, 2007; Osmani and O'Reilly, 2009). This low performing building stock has been in the past, subject to retrofitting from schemes promoting insulation or heating system improvements. This focus on 'easy wins' or 'low hanging fruit' however has meant improvements have only scratched the surface of the levels or retrofit which could be possible. To accelerate the pace and depth at which the issue of transforming the UK housing stock is taking place, the UK government has implemented the Green Deal (GD) and reformed Energy Company Obligation policy schemes, to enable homeowners, tenants and businesses to generate energy savings via energy efficiency retrofitting improvements, without the need for any upfront finance (Rosenow and Eyre, 2013). The success of this private industry implemented policy mechanism is of high importance due to the factor that it is estimated that half a million property low carbon retrofits will need to be delivered each year to meet the 2050 carbon reduction targets, without significant government assistance (Killip, 2008). It is evident therefore that to enable this rate of change, large scale modifications are required in both the ways in which the retrofit supply chain operates, and also the products and services offered (EST, 2010; Lowery, 2012).

In the UK however, the business sector enlisted with tackling this retrofit challenge, the Energy Efficiency Retrofitting Services (EERS) sector has in the past been considered as a subsector of the more general construction industry (Genovese et al., 2013). The implication of this subsector status is that the retrofit supply chain can be considered as fragmented and embryonic (Goldman et al, 2010). Furthermore, within the UK, businesses trading specifically to tackle energy efficient retrofit tasks are in the main, small in size and limited in their geographic coverage. Therefore, for a policy such as the GD to operate successfully, the business types and plans of these differing small companies needs to be taken into account, and the scheme needs to develop a commercial landscape promoting large-scale growth of small to medium sized enterprises (SMEs) (Genovese et al., 2013; Killip, 2011).

This paper details initial findings of a larger research project exploring the ways in which; the GD and ECO is interacting with EERS sector professionals, what policy expectations are presently, along with what ways the policy/practitioner relationship can be improved to increase the level of retrofit taking place. Firstly the key policies interacting with the EERS sector within the UK are outlined and the ways in which businesses are responding to these policy landscapes. Secondly, this paper introduces the projects approach in general and also background literature regarding concepts impacting a business/ policy relationship. This is then followed by an identification of key themes emergent from interviews with EERS sector practitioners, as to where the UK retrofit policy landscape is succeeding in promoting retrofit at volume, and areas in need of alteration or improvement. Finally a discussion section details the findings related to the existing literature and how the policy could be implemented to improve the retrofit industry and ways in which strategies could be introduced to enable an increase in EERS sector growth.

Policy background

PREVIOUS POLICIES

The GD has emerged from a policy landscape with foundations far different to its own, foundations which are characterised by government assistance. To generate a context in which the GD and ECO are now operating, the previous policies of CERT and CESP will be discussed.

Operational from 2008-2012, CERT was positioned as one of the UK's primary energy efficiency policy tools. CERT placed obligations upon energy suppliers to reduce customer carbon emissions. 60 % of savings had to be achieved via insulation measures, and the remaining 40 % of carbon savings needed to focus on priority groups, such as low income or elderly households. CERT provided, within 2 years, 1.4 million cavity wall and 1.1 million loft insulation improvements, along with 30,000 solid wall insulation schemes, 200 million low energy light bulbs, and 2,000 heat pumps (DECC, 2010). CERT development grew from a technical base, emphasizing the take up of carbon saving measures. This produced a policy which was focused and achievable, with a high degree of stakeholder consultation, particularly with suppliers. In addition to the policy focus and transparency, target setting also offered clarity to the policy and contributed to its success in delivering the volume of energy efficiency measures it did.

The length of time CERT was effective for also created a supportive environment for stakeholder engagement and administration. The extended operational period meant that all participants grew to know what is required at the differing stages of a project. This familiarity fosters trust within processes and certainty can be generated within commercial agreements, overall this effect benefits the end customers as limited business expenditure on risk aversion measures, offers a saving to end users. Studies into CERT have detailed that the geographical extent of the supply chain is also key in generating innovation, alongside measure availability and prompt deployment (Energy Retail Association, 2011). These successes show that for the Green Deal and other present policies to work, lessons need to be learnt from previous schemes, with provisions to engage in a transparent way over a long period of time with the supply chain.

Working alongside CERT, CESP was a scheme funded via energy company obligations, aimed at providing funding to community groups, housing associations and local authorities to improve the energy efficiency of hard-to-treat properties. CESP emphasised a whole house approach, treating properties in a street-by-street approach (EEPH, 2008). Between the operational periods of 2009 to 2012, the scheme financed almost 100 community initiatives, resulting in the low carbon retrofitting of 90,000 properties. 81 % of these properties involved solid wall insulation, and 65 % boiler replacements. The impact of the scheme meant that in a post retrofit assessment, 75 % of participant's agreed that their property was warmer and took less time and energy to heat to comfortable levels (EEPH, 2008).

The CESP delivery model is one which focuses on creating local partnership and schemes which are locally specific and highly concentrated. This offers a method of increasing the rate of localised energy savings particularly within low income, deprived areas. The fact the CESP was designed to work locally meant that the delivery model focused primarily on the economies of scale which could be generated on large social housing estates for instance.

As with CERT, it is important to practice policy learning and view how policy and end user interaction influences policy affectivity, with the insight of previous experience. CESP, highlights the need to focus in on local retrofit schemes in addition to national mechanisms, in doing, local networks working with economies of scale could prosper. The policy landscape evaluation shall now continue to present day and the GD.

THE GREEN DEAL (GD)

Effective since late 2012/early 2013, the GD offers bill payers the opportunity to carry out low carbon retrofits on their homes, without the requirement for any upfront capital (DECC, 2010). Retrofit upgrade repayments are derived from on bill payments post installation (Ya He, 2012). The GD utilises 'the Golden Rule' to guarantee that the value of any energy savings produced by the retrofit upgrading, is no less than the repayments for the works (Guertler, 2012).

Unlike CERT and CESP, the private sector is responsible for GD delivery, management and financing (Smith, 2010). A consortium of banks, businesses, local authorities, and investors provides the finance (Dowson et al., 2012; James, 2012). Plus, during the early stages of the policy, Government funded cash back incentives are offered to early adopters, aiming to acceler-

ate the initial stages of demand and industry capacity growth (Smith, 2010). Unlike traditional loans, the repayments for the retrofit measures are attached to the property, not the bill payer. This means homeowners and tenants can save energy without taking on personal debt (DECC, 2010). In addition the Government has funded the GD Home Improvement Fund which offers users the option to apply for up to £7600 to contribute towards retrofit works. Larger grants are available through the fund to finance hard to treat properties, and those which would benefit most from retrofit measures. The first tranche of funding was opened in May 2014 and closed on the 24th July 2014, and catered for 21, 683 applications with £118m of the £120m fund. Demand for the fund was greater than expected meaning a gap was created before the second tranche came into effect in September 2014, where home improvers could make renewed bids.

The GD has placed itself to answer the three sided energy dilemma (addressing environmental degradation, energy security, and energy prices) (Dowson et al., 2012). The GD therefore emphasises private involvement in the delivery of residential low carbon retrofit, limiting the requirement for government funding and therefore supporting market confidence, prosperity and employment (Winch, 2013). This market confidence, encouraged by growth catalyst of incentive schemes protects consumers against energy price increases and reducing carbon emissions and therefore environmental degradation (Aire, 2012; Guertler, 2012). Furthermore, the development of the delivery chains is greater than during the time of CERT and CESP, due to the requirement for growth and sector prosperity without significant government input.

ENERGY COMPANY OBLIGATION (ECO)

The Energy Company Obligation (ECO) functions alongside the GD in endeavouring to tackle carbon saving and fuel poverty concurrently. ECO runs parallel to the GD by initially offering measures that do not meet the Golden Rule assessment; positioning the ECO to implement measures which are less cost effective (Rosenow and Eyre, 2012). Therefore, ECO is considered as a method to provide high cost measures to low income households, or those in fuel poverty, in a similar way as CERT (Guertler, 2012). ECO and the GD are connected via the delivery method, as the businesses providing the services will be the same companies, with the capability of bundling additional Green Deal measures on top of an ECO funded package (Rosenow et al, 2013). The impact of this reliance upon private industry, means that the UK government is fully reliant upon the private sector to provide for those in fuel poverty, and those least able to help themselves. ECO places an obligation upon an energy provider to ensure that vulnerable groups and hardto-treat properties are retrofitted. The compulsory requirement of energy suppliers to complete a target number of retrofits is positive for the EERS sector, as it offers certainty in future numbers of retrofit projects available.

POLICY IMPACT ON THE EERS SECTOR, EXISTING EVIDENCE

Due to the fact that the GD is to be financed, managed and delivered by the private sector, (with the exception of the GD Home Improvement Fund) the development and integration of the supply chain is paramount (Koh et al., 2012). To reach the UK's carbon reduction targets, 12,000 properties will need to be retrofitted per week from 2014 (Lowery, 2012). Past statistics of

the growth of the cavity wall insulation (CWI) industry (which is a key component of the GD supply chain) suggests that this may be out of reach in the short term. In 1994, 100,000 CWI installations were carried out, with CERT pushing the industry, installations grew to 550,000 in 2005 (OFGEM, 2010). This growth in scale is positive, however with the GD existing without the level of public finance support, matching previous figures seems beyond reach in the short term. In fact, even if 550,000 properties were insulated each year under the Green Deal and ECO, it would take 24 years to insulate the 13.1 million homes in need of either cavity or solid wall insulation (Lown, 2014).

The estimations within the GD and ECO impact assessment also places the EERS sector in a difficult position, as the expectation is for a very significant growth in capacity, within a short period. The assessment states that solid wall insulation (SWI) measures should increase from around 45,000 (2013), to 125,000 per year to achieve 1,000,000 by 2022 (DECC, 2012).

The ECO model is unprecedented within UK policy design, and therefore contains some initial issues. Firstly, as the scheme prioritises hard to treat properties with SWI, and CWI, meaning low hanging fruit retrofit measures have struggled to become a major part of the roster of mechanisms on offer (Eyre et al., 2009). Secondly, in focussing on high cost measures, ECO is applying a lot of pressure on businesses supplying SWI and CWI to grow in capacity at a very fast pace (Aire, 2012). Thirdly, research indicates that the proposed impact of ECO is too low to reach the Government obligation to eradicate fuel poverty by 2016. ECO is by 2023, proposed to remove 125,000-150,000 households from fuel poverty, a number which is 20-40 times too small to tackle the problem (Rosenow and Eyre, 2013). The Association for the Conservation of Energy (ACE) states that ECO may actually be in place while there is a 29 % increase in fuel poverty, due to the small impact it could have in relation to the growing problem of fuel poverty (ACE, 2012).

EXISTING LITERATURE REGARDING BARRIERS INHIBITING THE GROWTH OF THE EERS SECTOR

In attempting to grow the EERS sector and provide markets creating demand and capacity increases, government policies such as the GD and ECO are implemented. For both existing and past policy mechanisms, barriers (Table 1) have limited the degree of success these policies have experienced. This review is focussed on assessing the present UK policy landscapes from the perspectives of policy implementation practitioners and also utilising existing literature regarding these barriers, to determine areas succeeding in producing low carbon retrofit at scale and those which are not.

From these barriers it can be understood that for policy schemes to succeed in producing retrofit at scale; numerous interlinked barriers need to be brought down. At this juncture, data from official government Green Deal assessments show that these barriers to retrofit at scale could be impacting the industry at the moment, as the policy has only generated 3,961 retrofit from an operational period running from January 2013–November 2014, substantially below required levels. Furthermore, ECO has also brought results below expectation; due to a lack of impact because of an emphasis upon higher cost measures, reform was required and changes were made, permitting the installation of lower cost mechanisms under the same ECO banner. There are three main reasons for this slow

Table 1. Barriers limiting EERS sector demand and growth.

Imperfect information	If end users are restricted in their access to information which is correct and accurate in nature regarding the market, technology and how their energy use could change (Sanstad and Howarth, 1994), they may be limited in motivation to commence retrofit action. Imperfect information can be caused by several factors, including insufficient data, inaccuracy of information, and the concept that information can be expensive to obtain (Ürge-Vorsatz et al., 2007).
Credibility and trust	The perceived level of trust end users can place in industry practitioners limits the motivation of a householders to enlist a business to undertake work on a property.
Inertia	Inertia and apathy via entrenched routines and habits can mean issues of energy inefficiency could be simply ignored (Stern and Aronson, 1984).
Bounded rationality	Bounded rationality, or the fact that individuals may not always act rationally can result in cost effective energy efficiency measures to be missed (Gillingham et al., 2012). This can be caused by: human's natural irrational behaviour, complex problem solving, and multiple actor disagreement.
Principal agent problem	The principle-agent relationship is where two or more parties are looking to receive differing outcomes from a relationship, therefore creating mistrust regarding a transaction or contract. The landlord-tenant problem is an example of this as the individual using the energy is not responsible for maintenance and the properties energy efficiency (Jaffe and Stavins, 1994).
Hidden and transaction costs	DeCanio (1998), states that hidden costs, are issues hampering the growth of businesses. Hidden or transactions costs can occur in a variety of forms, from the cost of information collecting, supply chain setup, to business contract creation (Mundaca, 2007). These factors detract from profit levels achievable and therefore limit the amount of investment forthcoming. For an EERS sector capacity increase, there is a requirement for policy to offer financial conditions limiting investor risk, and providing drivers of innovation (Geller et al., 2006).
Organisational barriers	Due to the EERS sector being embryonic, there is a business need to identify niches and predict capacity requirements and future competition, along with driving innovation, and producing business structures resultant in an integrated delivery team. Without policy mechanisms to encourage this organizational business structure, a competitive sector will be difficult to create.

uptake, which include, the fact that the unprecedented nature of ECO requires time to be transformed into effective business strategies, the concept that as ECO focuses on higher cost technologies means that an increased level of customer contribution is needed, and due to these more complex expensive mechanisms the delivery chain is in turn more complex (Rosenow and Eyre, 2014). From these barriers causing limited large scale ECO uptake, the resultant effect is that ECO needs to go from being a supporting scheme to Green Deal and providing high cost measures, to one which can serve those most in need and supply lower cost insulation and non-insulation technologies.

The following section will detail the research approach utilised here, in assessing from practitioner sources what extent the GD and ECO have been successful in minimising the negative impact of these barriers to retrofit at scale (Table 1).

Research approach

The approach used here centres in on policy impacts upon the business practices of EERS sector companies, and not necessarily the impact of policy on end users, therefore taking a step away from solely focusing in on the cost effectiveness of policy, or the upfront financial barrier to end users. This stepping away permits the goal of aiming to understanding the overall impacts of policy upon actual implementation and potential to promote EERS sector growth. In selecting differing EERS sector practitioners to interview, the contribution of this research is to determine how the unprecedented nature of the GD in relying upon the private sector for implementation, has performed in relation to enabling economic growth.

This exploratory nature of the research means that there is no claim to be comprehensive, and instead focuses in on seeking to understand the differing interactions between policy and implementation businesses. The GD and sister policy ECO, are used as the central pieces of policy under consideration here. These policies are evaluated via interviews with EERS sector practitioners, the data from which is then related back to the existing literature regarding policy/business barriers. Eight telephone semi-structured interviews were carried out (lasting between 33 and 62 minutes) with business managers actively involved in the running of a company designed to implement the GD and ECO on the ground, and in turn attempt to derive a profit from this implementation. Interview participants were selected and drawn from businesses directly established to take advantage of the GD and ECO; these comprise GD providers, installers and assessors. Interviews were designed to establish the individual's opinion on the progress or the hindrances of the present schemes and if there were any areas for improvement and ways in which alternatives may operate better.

INTERVIEW DATA COLLECTION

To provide a comparison with the differing barrier themes detailed in Table 1, the following areas were covered in the semistructured interviews (Table 2). These interview themes are discussed in relation to responses from participants, and also in relation to the literature discussing barriers to growth within the EERS sector.

Results, emerging trends from respondents

Here key themes which are reoccurring from within the interview transcripts are detailed with relationship characteristics between policy and EERS sector practitioners.

POLICY DELIVERY

The first theme which emerged from within the interview data is that of the position of policy makers and the fact that they are the drivers of how the GD and ECO have taken formation.

Without exception all eight practitioners spoke of concern for the fact that due to a divide between the ways in which the Department of Energy and Climate Change (DECC) and the energy companies operate distrust is encountered between the administrating parties which ultimately inhibits change. Participants stated that this suspicion has the effect that differing parties operating to implement policy feel as if they are taking on greater risk and others, this means businesses are utilising risk aversion tactics such as limiting resources focused on growth, investment and innovation. The majority of respondents stated that with the market entirely reliant upon government and Energy Company funding there is doubt from practitioners as to the actual availability of finance, particularly to SMEs. The issue of accessibility to funding from the cash back scheme and GD Home Improvement Fund was also stated to be prevalent in the way that, to discourage a rush to take advantage of the finance before it closes, the incentive streams are closed without warning leaving businesses uncertain at all times as to the opportunities available to them.

All interviewees also stated that the high amount of due diligence and compliance required to gain access to the funding means that for businesses with limited resources there is a feeling that policy administrators have made it as hard as possible for the finance to be accessed.

The majority of individuals from smaller businesses stated that they felt unable to compete for large installation contracts such as those for housing associations, due to a belief that there is a trend for these business opportunities to be offered solely to larger businesses. This issue is exacerbated by the factor that within smaller companies, the skill base to enable tender competition and extensive successful marketing is limited.

Respondents who operate away from urban centres also spoke of the factor that the policy structure did not offer incentives for businesses to operate across rural areas, who may encounter higher costs due to the extended geography of services and customers. This means that householders in properties away from urban centres may have been without access to a business offering GD services.

From a more positive perspective, all practitioners did state that the policy delivery method to prioritize accreditation and assessment of providers, assessors and installers was a constructive method of improving the approachability of the sector for end users. Secondly, half of interviewees thought that the assessments themselves have been met with approval as they are considered to not only offer a method of evaluating properties equally, but also providing a method of tackling the issue of behavioural change at the same time. Linked within these two points is the third benefit of the scheme, in that the majority of participants believed that the policy connected the end user to an organisation which can lead them through the process and provide a method of linking GD and ECO offerings with other businesses such as non-renewable providers. This enables a more comprehensive offering to the customer, which businesses found to be advantageous when involving differing aspects of their business structure to customer needs.

DELIVERY CHAIN FORMATION

Energy efficiency retrofitting represents a significant challenge for what is in many ways an embryonic industry, with a large increase in capacity required. Therefore the trends indentified from the data indicated that there is a need for an increase of joined up and integrated delivery chains, comprised of increased levels of communication and also improved distribution of responsibility and risk.

Due to the fluctuating levels of work available via the GD and ECO, and also due to an uncertainty in the time periods over which the policies and their cash back or GD Home Improvement Funds are active, it was stated by the majority of busi-

Policy delivery	GD and ECO, impacts upon businesses, related to; – Industry growth and profit levels. – Supply of property. – Innovation. – Network of practitioners.
Delivery chain formation	EERS sector in relation to; – 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; – Rate of change and perceived reasons. – Negative or positive impact of changes.
Market conditions and policy	Level of policy success, related to; – Perceived levels of retrofit activity. – Improvement from previous policy mechanisms. – Viability of present scheme into the future. – Main barriers to growth into the future.

Table 2. Energy Efficiency Retrofitting services sector practitioner interview question summary.

nesses that a sub contract model of operation is required. This enables businesses to limit the risk associated will carrying a large amount of overheads. The impact of operating within this model however is that businesses were concerned that levels of quality are put at risk, profit margins reduced due to more stakeholders being involved within the delivery chain, and also the journey of the customer becomes protracted. Plus, with an over reliance upon sub contractors due to limited certainty in industry prospects, the EERS sector cannot compete with more mainstream established industries.

Due to the ways in which the GD and ECO are funded, to ensure business are paid on time, due diligence and completion of administration alongside retrofit projects was a major concern for 100 % of respondent practitioners. It was stated that particularly with ECO which is funded by the energy companies, ensuring payment and cash flow was considered difficult. Plus, it was stated that as the majority of EERS sector companies operate within ECO, the scheme is the major economic driver through the sector, meaning reliance upon the compliance heavy processes to ensure works and related contracts are watertight, is important.

At this point where the EERS sector is still in its early growth stages, many businesses completing low carbon retrofit work under government schemes, are doing so whilst also running more mainstream construction or facilities management organisations alongside. Practitioners within these businesses stated a requirement for delivery chains to be inclusive and provide opportunities for all differing types of businesses, including SMEs and self employed individuals. It is considered that only with these caveats will the sector be able to grow and compete with mainstream established construction methods. Alongside this is the factor that businesses that are operating in both mainstream construction areas and the EERS sector, certainty is required from the types of income available from policy lead schemes. This is considered key for forward planning, and for the risk of being exposed to one market minimised.

CHANGES IN INDUSTRY

Both the GD and ECO are unprecedented in the demands they place upon EERS sector practitioners, therefore the roles of low carbon retrofit business individuals have evolved. Initially accreditation and process compliance had to be an area whereby companies need to increase awareness and knowledge, along with detailed understanding of how profit margins could be generated by implementing policy.

One area identified by all respondents as a method of ensuring work levels, is to take advantage of cash back and government financed funds. In taking this route however, companies need to become adept at lead generation and cash back administration. As many cash back eligible households are within priority groups, where levels of computer literacy can be lower than average, the administration of the scheme was stated as an area where significant resources had to be dedicated. Furthermore, in utilising cash back incentives or the GD Home Improvement Fund to gain work, businesses also stated a need to ensure they have an ability to soak up levels of high and low work periods. This is due to the fact tranches of funded can be cut off at short notice, which means that for many businesses who were able to pre-empt this change in incentive offering, work could be top-loaded or resources channelled to differing areas of the business structure.

Feedback from the majority of business practitioners regarded the emphasis of customer service which the policy creates an effective method of creating a sector which is entirely focused upon the end user. This means that administration channels are tailored to differing types of customer, trade peoples on site are considerate and compliant with procedures, and after sales care is high. This effect is contributed to by the fact that many business operate at a local level alone, meaning both managers and employees are members of the community in which they operate, adding to the need to provide a considerate service.

MARKET CONDITIONS AND POLICY

The concept of forward planning and positioning businesses to enable growth into the future was also a theme evident within all interviews. It was stated by all individuals that due to the ways in which the GD and ECO is administered, the cash back incentives are seen as the best way to gain clients by businesses, due to the unattractiveness of the interest rates attached to unsubsidized finance packages. This however was also stated to create market conditions whereby activity within the industry is stop start, with funding for cash back schemes uncertain over extended periods of time.

All business practitioners spoke of the constricted nature they felt acting between end users who were trying to take advantage of the finance incentives, and the fact that policy administrators where not wanting top loading of cash back or GD Home Improvement fund applications, and therefore switching the finance stream off without any prior notice. This lack of certainty in market conditions means that businesses are unable to strategically plan ahead or indeed utilise resources innovatively and create streamlined approaches to operations. In practice, taking advantage of government fund offers was stated as comparable to boom or bust business operations, and whenever finance was available all resources were channelled to applying on behalf of customers for the incentive. This method of operation creates a market where companies are minimising overheads and utilising differing sub contracting businesses to complete works (used by the majority of respondents). This in turn reduces the quality of customer journey.

Furthermore, an area which was a reoccurring trend within all practitioner interviews was that of the financial structure of the GD and ECO. This produces numerous differing areas of concern;

This first area whereby businesses stated they encountered issues was that there is a problem with the way in which the GD was pitched. The assumption was that you could get your house retrofitted with GD finance, however in practice this didn't live up to its billing, because it was found that in reality a contribution from the customer was required to complete retrofit works, in the majority of cases. The effect of this shortfall in available funding is that in the main only early adopters are going to be enticed to complete retrofit works under the scheme. This creates only a very small market, and a continuing effect that the EERS sector will only be able to continue with assistance from government intervention. Respondents stated that this reliance on assistance would remain until the energy crisis and the cost of running a home reaches a critical point, whereby home owners are almost forced to complete retrofit works.

The second financial trend reoccurring within interviews is that of interest rates. Without exception, business practitioners stated that in their consideration interest rates for GD finance packages was too high. The interest levels were stated as unattractive to gain customers and also stated as being an issue for some individual's moral stance. Therefore businesses are placed in a position of selling a package which is already uncompetitive when compared to other finance raising methods, such as remortgaging, and also selling this product to local people, who live around them, if they both live and work locally. This was stated as a large concern for retaining the reputation of a business and indeed family name, as stated by one respondent.

Discussion

Linking back to the literature review, the results of the completed interviews will now be related to differing theories covering the reasons why the barriers and drivers discussed with respondents are in place. Table 3 connects the differing areas of business/policy interaction detailed by interviewees, with the details of the related barrier.

From this overview of responses, what is evident is that although the UK government has opted to have financial incentives as a policy design at the spearhead of the retrofit policy landscape, respondents on the ground believe that perhaps many other negative influences are stopping sector growth. Therefore, when evaluating policy mechanisms aimed at breaking down barriers to growth of the EERS sector (Table 1), the success of a policy tools in generating energy efficiency at scale relies more on considering policy design than simply financial structure. From this sentiment, the significance of a holistic nature to policy is necessary. In outlining the differing areas of importance to EERS sector practitioners (Table 3), this research shows that key elements of policy which are causing negative impacts upon businesses are:

- Relationships between differing parties are showing that each party wants differing things from the policy. This differential is causing the principal agent problem whereby mistrust means resources are being utilized by businesses to limit the amount of risk or perceived risk they are being exposed to by partaking in policy delivery. This distrust is evident across differing aspects of policy, including the level of government support, longevity of policy and ability to pay businesses for completed works.
- Operating as a business implementing the policy also brings numerous areas of additional overheads and costs, including finance to ensure due diligence and compliance to guarantee payment once works have been completed, funds to complete rural property retrofits which are unsupported by government, administration of applications along with hand holding of customers, and costs associated with ensuring working contracts between businesses and sub contractors are in place. Furthermore, all of these costs are required to be paid without the guarantee that the costs will be covered by a policy or incentive scheme that will have significant longevity.
- From a business's organisational perspective, the policy/ sector interactions stated by respondents' shows that policy tools are significantly unsuited to provide drivers to aid the creation of; innovation within the EERS sector, businesses able to identify niches, organisations equipped to deal with changing capacity requirements and to offer an integrated service. Instead the policy at present are stated to offer only uncertainty fuelling a sector reluctant to invest, innovate or accept risk.

Barrier to Growth (Table 1)	Related respondent feedback
Principal agent problem	 Risk aversion tactics due to perceived distrust from policy administrators. Disbelieve from practitioners as to finance availability. Business practitioners constricted due to acting between end users and policy makers.
Transaction Costs	 Significant due diligence to become eligible for funding No addition funding for rural policy practitioners. Administration requires significant resources.
Credibility and trust	- Use of sub-contractors cause quality issues.
Inertia	 Additional contributions are required from end users.
Form of information	 Tailored approach from businesses increased suitability of information, but increases required resources.
Organisational barriers	 Fluctuating volume of work means businesses carry limited overheads and operate a sub-contracting model. Delivery chains need to be more inclusive and have more opportunities for small businesses.
Imperfect information	 High levels of interaction between businesses and end users limit the issue of imperfect information.
Bounded rationality	 High interest rates required problem solving from end users and therefore bounded rationality.

Table 3. Linking emergent themes to barriers to growth (Table 1).

- Businesses have mixed opinions as to the effect of the policy on how the end user perceives the EERS sector. From one standpoint, the factor that practitioners provide an accredited service, whereby the structure of the policy encourages a 'hand holding' service for end users means customer service is made a high priority. This level of customer service also encourages knowledge transfer from businesses to members of the public which can aid behavioural change. From the opposite viewpoint however, there are concerns that the need to use sub contractors due to a limiting of funding and resources, means that quality and service may be at risk.
- Although there is the concept above that the policy provides high levels of customer service there is still the concern from practitioners that without increased inclusiveness for differing types of practitioners to be present in the delivery chain, some end users will remain unaffected by the policy. This increase of competition within the supply chain could drive down prices to end users and encourage the EERS sector to grow and become more mainstream. This is important as many householders have to provide an additional contribution on top of a GD finance package, a package which is still relatively unattractive due to the interest rate, when compared to remortgaging for instance. This complex optimisation required from end users as to which route is best from a financial perspective, is not only causing bounded rationality and a limiting of rational thought, but also in turn an increase of inertia.

Conclusions and policy implications

From this research assessing policy and EERS sector business interaction, to achieve a scheme which generates highs levels of participation, innovative instruments are needed which motivate both industry actors and end users, to grow the low carbon retrofit market. The policy landscape of the GD and ECO considered here shows that barriers are not being broken down to the extent required. Even though there is progress in increasing the appeal of the EERS sector to members of the public the level of retrofit is still considered insufficient. For instance, the background literature discussed here relating to barriers against retrofit, consists of concepts discussed prior to the GD's conception. Therefore barriers to progress which are well documented have been untackled by the GD and ECO. The effect of the enduring barriers is that government intervention is still required, and the concept of achieving a whole house approach at scale which prioritises carbon savings and occupant comfort, is still out of reach.

Although the GD with its expectation of private industry generating leads and providing a growing sector is, in its aim, including the requirements of both private companies and householders, high levels of private finance to galvanise efforts of growth have yet to appear. As stated by the respondents, the concept of certainty is an area in need of significant attention; therefore an emphasis on the long term interaction of policy and industry is required. This focus highlights the need to not only provide commercial arenas for investment and innovation, but to also highlight the longer term goals of altering the public's perception on how energy should be used. In evaluating the GD and ECO here attention is clearly necessary in considering how policy tools reliant on private industry supply chains relate to the supply chains and householders from number differing viewpoints. In doing this, policies could generate a self sufficient EERS sector, with characteristics of growth, good customer service and innovation.

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