Using Carbon Co-op's 'Community Green Deal' programme as a case study to examine how widely quoted barriers to whole house retrofit can be overcome by a community energy co-operative and what further challenges to wider uptake exist

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ABSTRACT

Whole House Retrofit is seen as crucial to meeting UK carbon emission reduction targets yet widely quoted barriers exist around trust, performance, cost, disruption, supply chain and access to finance that mean private householders often fail to convert interest in to actual work. Greater Manchester-based, Carbon Co-op is a community benefit society, a 'community energy' co-operative aggregating demand for whole house retrofit. Funded under DECC's Go Early programme, and in partnership with urban design specialists URBED, Carbon Co-op have delivered a programme of nine whole house retrofits on owner occupier homes, averaging works costs of £40,500 per property with householders contributing the majority of costs via zero interest loans and/or savings. Learning from the programme demonstrates how a community energy organisation can be effective in leveraging high levels of householder trust and overcoming other barriers to carrying out whole house retrofit at scale. However, significant issues remain around the model and question marks exist around the viability of a community aggregator within the current market and policy context.

Introduction

Carbon Co-op's contention is that the process of improving homes to 2050 standards will be quicker, easier and cheaper by co-operative action, leveraging the peer support of friends and neighbours to share experience and knowledge and reducing costs through bulk purchase. Membership of Carbon Co-op acts as a gateway to technical advice, skills and resources as well as the opportunity to meet like-minded householders working to similar goals.

The Department for Energy and Climate Change's (DECC) 'Go Early' programme[1] aimed to test some of the key mechanisms of the Green Deal with Greater Manchester obtaining £3.5m of funding for a range of projects, mainly in the social housing sector. As part of this programme, Carbon Co-op, working with technical consultants URBED[2],

1 Go Early programme (2012) was a series of initiatives across England funded by DECC to help kick start the Green Deal. Core Cities benefited from funding.

2 URBED (Urbanism Environment Design), specialists in whole house retrofit www.urbed.coop

delivered a £500,000 project. Its title 'Community Green Deal' was a reference to URBED's 2012 report for the Sustainable Housing Action Partnership (SHAP) on the viability of a community-based intermediary for whole house retrofit[3].

The project consisted of 14 whole house retrofits in owner occupied properties, delivering CO_2 and energy savings of up to 80%. Grant funding covered assessments and technical ground work for the project whilst the majority of DECC assistance went in to the creation of a zero interest loan pot for householders. In addition to loans, some householders chose to contribute funds from savings with figures ranging from £500 to £13,000 per property. Carbon Co-op accessed ECO and Green Deal Cashback funding to cover some costs. Work was procured via a housing association framework intermediary, Procure Plus, with a single contractor appointed. URBED provided architecture and design as well as contract management services.

To date, work on nine of the 14 properties is complete. The University of Salford is conducting in-depth technical evaluation of the programme, but this paper is intended to provide some interim learning from URBED and Carbon Co-op. With that in mind, the methodology behind this paper is limited to the experience of the project team and informal discussions with householders.

The case for retrofit

Carbon reduction targets The UK has a target of an 80% reduction in greenhouse gas emissions by 2050 (based on 1990 levels). With homes accountable for around a quarter of total emissions, substantially improving the efficiency of our housing stock has the potential to deliver real environmental, social and economic benefits. The Technology Strategy Board's (TSB) Retrofit for the Future (2013) project demonstrated that 80% reductions in CO_2 are attainable through whole house retrofit improvements.

Existing housing stock The latest English Housing Survey (DCLG, 2013) highlights that although the efficiency of existing housing has increased through programmes designed to upgrade basic insulation, the privately owned and rented sector is lagging behind. In 2012, 20% of owner occupied homes failed to meet the Decent Homes Standard. Estimates suggest that around 80% of the existing housing will be in use by 2050 and that retrofitting is crucial to carbon reduction targets (Integrated Greater Manchester Assessment: Environment Evidence Base, 2013).

Fuel bills Rising energy bills are squeezing living standards in the UK (Platt *et al.,* 2013), with the average energy bill currently at £1,320, having risen from £605 in 2004 (Ofgem 2013, CCC 2012).

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3 Community Green Deal - developing a model to benefit whole communities, for SHAP (Sustainable Housing Action Partnership), by URBED, December 2010 (http://www.urbed.coop/projects/community-green-deal)

Whole House Retrofit

The UK Energy Research Council study (Parkhill *et al.,* 2013) suggests energy efficiency improvements should not be thought about in isolation but rather as a key part of a range of household issues. They use the example of loft insulation considered in relation to other uses such as storage or glazing thought of with security and noise reduction. Wilson *et al.,* (2013) argue energy efficiency improvements are rarely done alone (only 1 in 10 would consider doing this), whereas including alongside other 'amenity renovations' is three times as common. Coupled with the practical and logistical benefits of undertaking a package of improvements this creates a strong argument for whole house retrofit. The Retrofit Insights report (Institute for Sustainability, 2012) gives a useful description of a whole house retrofit. 'Deep (whole house) and shallow retrofit are qualitatively different. While shallow retrofit can be achieved by insulation, deep retrofit…typically also requires replacement of existing heating and ventilating systems, and the installation of renewables.'

Barriers to retrofit

Though important cost (in terms of capital and future bill savings) is not the only factor in whole house retrofit decision making (Parkhill *et al.,* 2013). Performance, comfort, status, convenience etc have been shown to be important to uptake. The UKERC study argues recognising and developing strategies to address 'other factors' is crucial as householders will not trade these off against 'low cost.' In examining homeowner's renovation decisions, Wilson *et al.*, (2013) argued 'energy-efficiency measures, like amenity measures, are a means of adapting the home to better meet the demands of domestic life,' questioning the conventional emphasis of government and providers in emphasising money saving on energy bills as the key sales route for retrofit.

Other widely quoted barriers to whole house energy efficiency improvements range from householder trust (in contractors, intermediaries, energy suppliers, government), access to affordable finance and appropriate technical expertise. It is widely accepted that local supply chains need to be significantly strengthened in order to support greater uptake of whole house retrofit; the Retrofit Insights report (Institute for Sustainability, 2012) suggests that 'to develop a UK retrofit industry, government should consider at least one if not several further pilot programmes, intermediate in scale…[and that] more work is needed to develop local/UK supply chains and to embed the knowledge needed to successfully routinise large-scale retrofit.'

Why local? Why a community energy organisation?

Much of the conceptual ground work for Carbon Co-op's role as a retrofit intermediary was developed in the Community Green Deal report (URBED, 2010). A key factor was leveraging high levels of trust in order to overcome barriers to retrofit.

Platt *et al.,* (2013) identified householders' need to access information on how energy efficiency measures might be suitable for their home and that this should come from a

trusted organisation. As Wilson *et al.,* (2013) explain, to go from 'considering' to 'acting' requires extra impetus; something provided on this project by in-depth Carbon Co-op home energy assessments or from visiting eco-homes and talking to occupiers as part of open homes events.

Once a decision has been made, information requirements become more specific and detailed. As Wilson *et al.,* (2013) describe, questions are raised around costs, installer selection and timing. They argue the 'renovation value proposition' becomes important, for example, the product (e.g. type of insulation), additional services (e.g. quality assurance offered) and delivery mechanisms (e.g. a community based approach). They cite 'the most important features of an attractive value proposition [as] (in order): lower upfront cost, more reliable contractors, less disruption to domestic life and less 'hassle factor'. Arguably this is the stage at which most schemes fall short, with householders feeling poorly equipped to make the right decisions, hence the role for a Community Energy organisation in 'hand-holding' and householder advocacy.

Community Green Deal

Assessment and design

The Community Green Deal project commenced in 2012 with candidate householders recruited via a number of existing Carbon Co-op engagement routes including local authority Community Champion programmes, eco-home bus tours, events and the Carbon Co-op membership.

Householders received in-depth 'Carbon Co-op Whole House Assessments' using a methodology developed by URBED based on full SAP.[4] Reports provided more detailed recommendations than comparative Green Deal Assessments. From a bank of 40 assessments, 14 householders progressed on the basis of willingness to carry out whole house works, housing archetype and geographical location.

Following consultation with each householder, packages of improvements were agreed to deliver as close to an 80% reduction in CO_2 as possible (most required solar PV to bring them to this target). Property types varied with mid-terraces, end-terraces and semi-detached houses. A more detailed list of improvements is provided in table 1.

Table 1. Improvements installed under the Carbon Co-op whole house retrofit programme

Fabric	Building systems	Additional works
External wall insulation Internal wall insulation Cavity wall insulation	Condensing boiler Heating zone control	Solar PV Loft storage

4 As opposed to the Reduced version of SAP (RdSAP) on which Energy Performance Certificates (EPCs) and Green Deal Advice Reports (GDAR) are based.

Loft insulation Rafter insulation Floor insulation Perimeter floor insulation (below external wall insulation) Triple glazing (windows and doors) Secondary glazing to existing windows High performance insulated doors Draught proofing Air-tightness works Chimney fill insulation/balloon Pipework insulation	TRVs Passive stack ventilation	

Procurement and supply chain

Carbon Co-op tendered for a single contractor with the assistance of Procure Plus, a social housing buying framework organisation. Although presenting additional cost, Procure Plus enabled Carbon Co-op to take advantage of well-established procurement systems and acted as conduit to a range of contractors familiar with energy efficiency improvements through social housing improvement schemes.

Procurement of a local contractor was important as Carbon Co-op sought to support local supply chains. Practical reasons included minimising travel to site and knowledge of local housing stock. Feedback from other schemes (e.g. the DECC funded Go Early project in Bristol[5]) showed householders expressing a strong preference for local installers.

A two stage tendering process, detailed design work, securing planning and consents and ongoing problems accessing ECO led to extensive delays, a projected start date of Spring 2013 became January 2014. A steep learning curve for all parties within the project team meant that total works timescales for initial properties stretched to six to seven months whilst later properties were finished in less than two.

Learning from the project

Householder experience - disruption and managing expectations

Privately owned homes present a different set of challenges to contractors familiar with social housing programmes i.e. small packages of measures applied to multiple houses at the same time. Community Green Deal presented a range of housing archetypes, geographically dispersed and requiring specific and unique detailing.

5 The Bristol Home Energy Upgrade was a pilot scheme to provide grants for home improvements across Bristol, further details including a final report can be found here: www.cse.org.uk/bheu

Householders reported different levels of disruption; some experienced little or none whilst others were affected by high levels of noise, poor air quality, the necessity to move furniture and the requirement to allow access to contractors on an ongoing and unpredictable basis.

Some householders had past experience of building works and a good understanding of the likely disruption, but an issue acceptable to one householder might be unacceptable to another given occupancy patterns (working from home or retired), levels of health, age and general willingness to accept disturbance. Householders suggested that precise information, provided in advance, on specific elements of work and the likely nature of disruption would assist in reducing levels of disruption - a challenge for contractors and providers in the context of whole house retrofit.

The benefit of a co-operative approach

It is widely accepted individuals are heavily influenced by peer behaviour, positively in terms of activity developing quickly once a critical mass is reached or negatively in terms of placing a brake on positive change (Platt *et al.,* 2013).

Through participation in a co-operative intermediary, Carbon Co-op householders overcame the fear of moving too early, exemplifying their role as 'retrofit pioneers.' Householders reported they were incentivised by this, believing that they are smoothing the way for future householders.

Carbon Co-op sought to maximise co-operative action in a number of ways. Regular householder meetings enabled participants to raise issues, ask questions and share contact details. Some householders opened up their homes during building works, providing insight into the programme for professionals and householders. An online project blog was set up with householders contributing experiences and photos.

Ultimately, co-operative action was found to have positive and negative aspects. Householders supported each other and shared experiences, the staged nature of works meant householders could highlight what to expect and project team members could source valuable information on the progress of work. However, sharing problems at times created unnecessary anxiety for other householders. Perceptions of disruption varied and householder communications had the potential to cause confusion and misunderstanding. Responding to these issues and offering reassurance required significant additional management resource.

In terms of bulk cost savings, procuring building works collectively brought reductions estimated at between 25-50% on singly procured whole house retrofit. However, whilst the final accounting process is unfinished, it is likely that some anticipated cost reductions and efficiencies have not been realised and that these have been made up through voluntary time contributions, the good will of participants and the understanding that this pilot project will lead to future work.

Risk and liabilities

Procuring works via a co-operative intermediary presented significant benefits to householders in terms of sharing risk; moving contractual liability away from householders removes a key barrier to participation. Conversely, for a community energy organisation, positioning itself between the householder and the contractor presents significant risk with contract issues left to Carbon Co-op, effectively sitting between one contractor and 14 individual householders. Though pro-bono legal advice was secured via Carbon Leapfrog, the complexity of such relationships is often beyond the level of knowledge of volunteer board members. Figure 1 below shows the contractual and functional links between the parties involved.

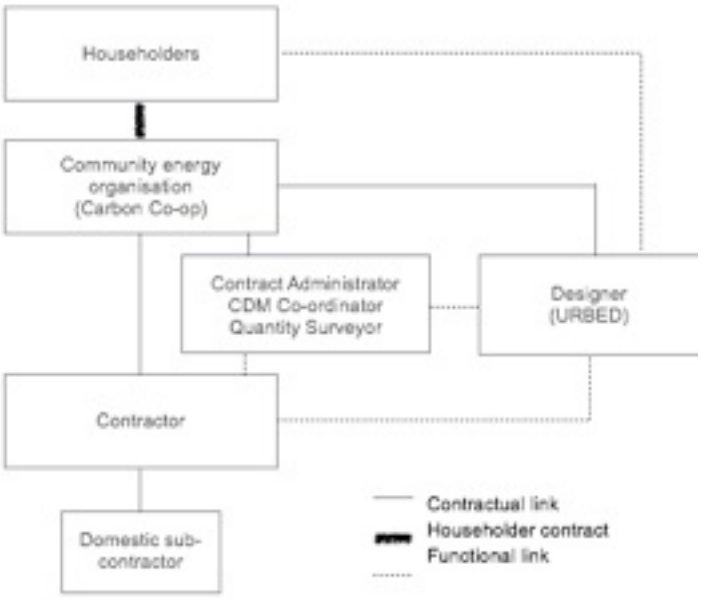

Figure 1. Contractual and functional links, Carbon Co-op whole house retrofit programme

Financial risks

Again, sitting in between contractor and 14 householders presented significant financial risks for Carbon Co-op. Payment to contractors was required as work was completed irrespective of the circumstances and priorities of individual householders.

Energy Company Obligation (ECO) funding took many months to find, negotiate and secure with the process and administrative burden excessive. The Centre for Sustainable Energy's (2014) evaluation of the first year of ECO summarising reported that 'ECO's very precise eligibility criteria and onerous reporting requirements have increased delivery costs, slowed down activity and hindered customer take-up.' Changes to the ECO framework announced in the 2013 Autumn Statement significantly

affected programme delivery and with a tight deadline imposed and knock-on implications for the works programme.

ECO and similar funding mechanisms are increasingly prohibitive for community energy organisations due the administrative complexity and liabilities, with clauses in ECO contracts for non-compliance commonplace and often including financial penalties. Short-term funding schemes[6] are not conducive to long term planning. Although incentives can encourage demand, releasing and withdrawing funding from the market does little to provide confidence and certainty to the supply chain.

Conclusions and recommendations

Although Carbon Co-op and URBED are in the early stages of evaluating the Community Green Deal programme some initial findings are emerging. We have a better understanding of how to navigate some of the previously discussed barriers to whole house retrofit, yet challenges remain and new barriers have emerged.

Key challenges

Cost The Community Green Deal project succeeded in delivering whole house retrofit packages that were within reach of owner occupiers. However, it benefitted from one off funding pots i.e. subsidised development costs, a zero interest loan fund and ECO. As discussed the real cost of these works is likely to be higher than initially anticipated.

As the Institute for Sustainability (2012) states, 'more work is needed to establish how far the funding gap can be closed by a combination of accounting measures to reduce interest rates, reductions in retrofit costs, carefully thought-through reductions in retrofit ambition, and identification and measurement of additional streams of value such as benefits to health.'

Disruption Better strategies are required to communicate potential disruption to householders in advance of work commencing, for example, information sheets, videos, and the knowledge of previous retrofit pioneers. Contractors need to develop strategies to be able to more effectively manage these issues and assist householders in adapting such as temporary decanting and dedicated and experienced householder support staff.

Local supply chains The project has presented a steep learning curve for all involved and shown key areas for supply chain development, in particular for contractors around a multi-skilled workforce, logistics management and just-in-time supply chains.

Government incentives Green Deal and ECO frameworks have been prohibitive to project delivery with product accreditation restricting choice and performance. Accreditation systems need to be responsive to the needs of a range of housing archetypes (including heritage buildings), as well as being accessible and affordable to

6 Such as the Green Deal Home Improvement Fund and Green Deal Cashback scheme.

innovative products and smaller manufacturers. A dependable, predictable government incentive regime is required for the future success of whole house retrofit in the UK.

Catering for the needs a diverse membership base Community Energy organisations face questions around the range of services they offer members. Householder demands vary from full retrofit services to DIY approaches. Community Energy intermediaries need to assess acceptable levels of risk and liabilities.

Fuel poverty Fuel poor households are typically only offered a basic range of energy efficiency improvements but far more substantial interventions are often required. Although cost is a consideration, this neglects the health and comfort aspects of energy efficiency. With the assistance of the Chesshire Lehmann Trust, URBED and Carbon Co-op will be evaluating how the process might need to be adapted for fuel poor households.

Performance Community Energy organisations have an important role in monitoring and feedback. For example, Carbon Co-op has worked closely with OpenEnergyMonitor on this project. Physical monitoring of Community Green Deal houses and PhD research into buildability and the performance gap is being undertaken by Salford University.

Concluding thoughts

The UKERC's research (Wilson *et al.*, 2013) shows that although upfront costs and lack of capital are cited most widely as key barriers, neither lower annual incomes or current financial difficulties prevent householders from considering renovations. Part of the challenge to wider roll out of Whole House Retrofit is around encouraging householders to move from considering renovations, to acting. Community energy organisations have an important role to play in demonstrating what is possible through pilot projects, open homes events, carrying out research and evaluation and sharing learning.

Throughout Community Green Deal, householders have identified trust in Carbon Co-op as a key motivator in their participation in the project. This has centred on trust in Carbon Co-op's motivations as a Community Energy organisation (i.e. community-owned, co-operative governance, no external shareholders etc) and trust in its technical track record (i.e. via its partnership with URBED). Replication of this project in other parts of the UK would require a significant investment in the skills and capacity of similar Community Energy organisations as well as a more supportive policy environment and a much more developed supply chain.

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