Buro Happold

Oliver Colvile MP
Chair – APPG Excellence in the Built Environment

Via E-mail: **APPGInquiry@cic.org.uk**.

10 April 2013

Dear Sirs,

Buro Happold Response: APPG for Excellence in the Built Environment Inquiry into Sustainable Construction and the Green Deal

We are pleased to respond to the above inquiry.

Yours faithfully

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"The Green Deal - is the policy the right one? What can be done to ensure take up?".

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Executive summary

From now on, the Green Deal is scheduled to be the UK's main energy efficiency scheme. However, there is risk it will fail due to low consumer appeal, low investor incentives and a number of technical issues. Furthermore, there is a risk that a number of the finance providers will 'game' the situation so that the value of programme increases for them and decreases for the country. This paper sets out and reviews the key barriers to successfully implementing the Green Deal on a national scale, including findings of strategic gaming exercises to evaluate preliminary investment scenarios for the Green Deal.

1.0 Introduction

During the launch of Green Deal, the Energy and Climate Change Secretary announced a "third industrial revolution: a green revolution", one that would allow the most inefficient households to save £550 per year on their fuel bills, increase the number of jobs in the insulation industry from 27,000 to 250,000 and reduce nationwide spending on gas by up to £2.5 billion per year (Huhne 2010). While being an elegant idea, there are many who believe this simply will not be achieved, due to a number of fundamental issues such as low consumer appeal and investor incentives. These issues, plus others are described below:

2.0 Barriers to the Green Deal

2.1 Consumer appeal

As the Green Deal does not offer subsidies for retrofit works, it is feared this shift will make energy efficiency improvements less attractive to consumers, causing the number of homes being insulated to plummet (Gardiner 2012). Early 2011 trials for the Green Deal, including Affinity Sutton's "FutureFit project" and the B&Q loft clearance service in the London Borough of Sutton have not been encouraging. The FutureFit project offered to pay for the upfront cost of energy efficiency improvements through a financing mechanism resembling Green Deal. However, take-up rates from advertising were just 4.8%, and of those who took part 23% dropped out during the lead up to retrofit works (Mckann 2011). In contrast, B&Q provided a 40% grant and offered to clear out a homeowner's loft in order to install insulation. Out of 400 household who expressed an interest, 126 agreed to an energy audit and only 66 went ahead with any insulation (Withers 2011). The primary reason for the 60 homeowners not pursuing the grant following the energy audit was that they were sceptical regarding the levels of long-term energy savings that would be achieved (Withers 2011).

2.2 Investor incentives

We (Buro Happold) have been investigating the financial attractiveness of large-scale Green Deal investments by developing a series of retrofit assessment tools to facilitate strategic business modelling / 'gaming' workshops. When trialled internally, we assumed that each finance provider (acting as a bank, retailer or energy company) would be looking to obtain an internal rate of return of up to 11-15% due to the unknown risks attached with Green Deal. To date, we have found, with this constraint, that it is difficult to make the Green Deal attractive as a way to make money (although we do recognise that it can appeal to companies who are in a position to provide finance for reasons other than an internal rate of return). Our modelling has also shown that it becomes more difficult to achieve a return on investment if a property does not fall under the category of "most in-efficient", e.g. if it has a C-rated boiler as opposed to an F-rated boiler. We therefore expect investors to segment the Green Deal market and target households that offer the best returns. Only limited profiling is possible, but Green Deal companies may have to spend money on data mining and marketing to facilitate the most profitable opportunities. Further to this, our modelling has shown that the recent cut in tariff rates to renewable energy measures, maintenance costs (if included in the contract) and the upfront cost of energy audits (if not passed onto the bill payer) can prolong the investment periods detrimentally.

2.3 Technical issues

The Golden Rule was established to protect consumers and investors from over extending themselves financially. However, it could in fact be restricting the level of CO_2 savings obtainable from whole house retrofitting, because it limits the size of a Green Deal loan to the amount that can be repaid by savings generated. Paradoxically, meeting the Golden Rule will be problematic because it is difficult to predict accurately the annual energy savings from different retrofit packages without fully understanding the technical performance of the building and the energy usage patterns

of its inhabitants; including any re-bound effect with improved comfort conditions. Lainé (2012) expressed concern that the current RdSAP engine, used to facilitate Green Deal assessments, will not recommend cavity wall insulation if the existing U-value is below 0.6 W/m^2 K, despite the opportunity to implement low-cost insulation to achieve a U-value of 0.35 W/m^2 K. This would mean that up to 2.3 million cavity-walled homes built since 1983 could be given incorrect advice and would not be able to use Green Deal to finance the work (Lainé 2012).

Those in fuel poverty, a fifth of all households, look to be ignored by the scheme. If a household struggles to pay for fuel, it will be in a weak position to raise Green Deal finance for building improvements. There are also problems with multiple-occupancy buildings and whether everyone in such buildings needs to agree before the building fabric can be improved. It should be noted as well that the effect of a 'Green Deal' on a property's value and ease of re-sell is unknown. The innovation in how Green Deal attaches the loan to the building rather than the occupier looks to be positive but the market implications of this are untested.

3.0 Wider barriers for the UK retrofit challenge

3.1 Discrepancies between predicted and actual savings

According to Power (2008) and Roberts (2008a), there are a number of conventional cost-effective measures yet to be implemented throughout the UK housing stock and many older homes have vast potential for reduced energy consumption. However, as Lowe and Oreszczyn (2008) and Ravetz (2008) claim, a large proportion of cost-effective measures have already been employed, yet significant energy savings are still to be experienced. As a result, both Olivier (2001) and Lowe and Oreszczyn (2008) argue that actual energy performance of the UK building stock may be significantly lower than previously assumed.

Hong et al. (2006) published a paper looking at the impact of energy efficient refurbishments on the space heating fuel consumption of English dwellings. Here, the performance of 1,372 properties treated through the Warm Front scheme were analysed: before and after a conventional retrofit with cavity wall insulation, loft insulation and a new central heating system. The aim was to lower energy consumption to alleviate low-income houses from fuel poverty, along with raising thermal comfort standards to modern levels. Prior to installation, theoretical calculations suggested that cavity wall insulation and loft insulation would save 49% of fuel consumption, however, actual monitoring following the refurbishment showed that only 10-17% energy savings were achieved. Conclusions were that the refurbishment did raise thermal comfort standards and homes were cheaper to heat, but the expected energy savings were not achieved (Hong et al. 2006). Regarding the complexities of achieving actual energy savings, Hong et al. (2006) claimed that large uncertainties related to the impacts of thermal bridges, gaps in insulation and the occupants using more heating following the refurbishment. Thermal imaging on a sample of 72 dwellings showed that 20% of cavity wall areas and 13% of the loft areas lacked insulation. It was revealed that the introduction of the new heating system resulted in a loss of 35% of savings as they were taken back to raise thermal comfort in the home.

3.2 Difficulty meeting Building Regulations

In a report by Olivier (2001), it was argued that the official figures for U-values are optimistic and not achieved in practice. This is because actual U-values are often found to be higher than expected when measured in-situ, due to errors in the quality of construction, as well as thermal bridges and gaps in insulation. According to Hamza and Greenwood (2008), Building Regulations do improve design teams' abilities to meet energy targets, however, many within the industry express concern about uncertainties and difficulties with compliance. Lowe and Oreszczyn (2008) claim that little is known regarding the actual impact of updates to the Building Regulations due to a lack of monitoring following construction. Similarly, Olivier (2001) states there has been no evaluation of the 1982, 1990 or 1995 building regulations since there is no individual or legal binding body to assess energy performance after on-site retrofitting work is complete.

3.3 Too much focus on zero carbon targets

Taking a top-down approach, Lowe and Oreszczyn (2008) believe that many issues hindering the progress of energy efficiency relate to ill-advised policies from the government causing debate within industry. Lowe and Oreszczyn (2008), claim that the government is putting too much pressure on the industry to achieve zero carbon targets, particularly in new build, without fully understanding the complications surrounding fabric improvements in existing homes. Lowe and Oreszczyn (2008) propose that too much investment is being spent on expensive renewable technologies without fully understanding the importance of maximising the performance of the building fabric.

3.4 Increased use of heating following refurbishment

This issue of thermal comfort 'take-back' was reported by Bell and Lowe (2000) in a study analysing the savings of energy efficient refurbishments on four similar sized semi-detached houses. The aim was to confirm that significant savings could be gained from conventional 1980s retrofit technologies. Following an extensive two-week energy monitoring period, a 47% reduction in energy consumption was observed, proving that significant savings could be achieved from conventional retrofit measures. However, this was 40% lower than their predictions, which Bell and Lowe (2000) suggested was mostly due to people's behaviour and thermal comfort take-back from the new heating systems.

3.5 Socio-economic status of household

According to Binggeli (2003) and Roberts (2008a), before the introduction of gas powered central heating systems in the 1970s, most people preferred indoor temperatures at 20^{o}C or less, and would wear more clothes during winter to prevent paying high energy costs. By comparison, nowadays people have developed thermal comfort preferences of 23-25^{o}C, which tends to be satisfied through higher quantities of energy consumed for heating (Binggeli 2008, Roberts 2008a). Both Clinch and Healy (2001), and Milne and Boardman (2000), claim a large proportion of this take-back relates to the socio-economic status of the household prior to the refurbishment. Milne and Boardman (2000) found that low-income houses, originally heated to 14.5^{o}C, experience energy savings that are only 50% of those anticipated; whereas slightly higher-income homes, originally heated to 16.5^{o}C, tended to experience 70% of the anticipated energy savings, due to a lower thermal comfort take-back. Clinch and Healy (2001) believe there is a lack of studies looking at take-backs in high income-homes. Here it would be expected that dwellings would see greater energy bill savings since the home is likely to already be heated to reasonable levels.

3.6 Additional barriers within society

Ravetz (2008) claims that many people do not view energy efficient refurbishments as a high priority when updating their homes. Major barriers are the perceived hassle of installation, upfront costs, uncertainties over lower fuel bills and a lack of knowledge over payback periods (UKGBC 2008). Power (2008) states that energy efficient refurbishment is undervalued by communities. People seem to prefer amenities such as new kitchens, bathrooms, central heating, and general repairs instead of energy efficient refurbishments since the social gains are more obvious (Bell and Lowe 2000). Ravetz (2008) forecasts that technological shifts threaten to counter the efforts of energy efficiency. For example, more homes will become increasingly diverse in their use of energy with more appliances, lighting and domestic air-conditioning.

4.0 Conclusion

From now on, the Green Deal is scheduled to be the UK's main energy efficiency scheme. However, there is risk this scheme will fail to meets its targets, particularly due to low consumer appeal and low investor incentives. To meet the 2050 CO_2 reduction target, it is imperative that the Green Deal targets and improves the performance of all households and not just those which are easy to treat using conventional measures. This will require more information to the bill payer, such as realistic projections for long-term fuel reductions, more transparency regarding the benefits and disruption of different retrofit packages and more information about the wider implications of the scheme such as how it impacts fuel poverty, household value and re-saleability.

We have found that gaming exercises can be an essential useful tool in understanding the implications and unintended consequences of this policy. We have used it to evaluate preliminary investment scenarios for the Green Deal. It has shown there is some scope for Green Deal players to 'game' the unfolding situation resulting in adverse effects for the country. Better access to housing stock, capital cost and energy savings data at a local level, combined with more clarity on marketing, administration and energy assessment costs will help to improve the accuracy of this process. Evidently, more attention needs to be given to areas of the housing stock which are less cost-effective to improve. Poor quality construction, thermal comfort take-back and a lack of monitoring following refurbishments pose a serious threat to obtaining real, long-term energy savings. This could be particularly problematic for the Green Deal, with its 'golden rule' financing mechanism, based heavily on predicted savings rather than actual fuel bill savings.

For a wider context into the UK retrofit challenge please see Dowson et al. (2012).

References

Bell, M., Lowe, R., 2000. Energy Efficient Modernisation of Housing - A UK Case Study, Energy and Buildings, 32, 267-280.

Binggeli, C., 2003. Building Systems for Interior Designers, 1st edition, John Wiley & Sons, New Jersey, USA.

Clinch, J., Healy, J., 2000. Cost Benefit Analysis of Domestic Energy Efficiency, Energy Policy, 29, 113-124.

Dowson, M., Poole, A., Harrison, D., Susman, G., Domestic UK Retrofit Challenge: Drivers, Barriers and Incentives leading into the Green Deal, Energy Policy, 2012, 50, 294-305.

Gardiner J., Is the Green Deal heading for failure?, Building, 13 January 2012, Available from: http://www.building.co.uk/is-the-green-deal-heading-for-failure?/5030176.article

Hamza, N., Greenwood, D., 2008. Energy Conservation Regulations: Impacts on Design and Procurement of Low Energy Buildings, Building and Environment, 4, 929–936.

Hong, S., Oreszczyn, T., Ridley, I., 2006. The impact of energy efficient refurbishment on the space heating and fuel consumption in English dwellings, Energy and Buildings, 38, 1171-1181.

Huhne C., 2010. Green growth: the transition to a sustainable economy, Speech to LSE, 02 November 2010, Available from: http://www.decc.gov.uk/en/content/cms/news/lse_chspeech/lse_chspeech.aspx

Lainé, L., 2012. Filling the gaps: accuracy of Green Deal advice for cavity-walled homes, Consumer focus, London, UK.

Lowe, R., Oreszczyn, T., 2008. Regulatory standards and barriers to improved performance for housing, Energy Policy, 36, 4475-4481.

McCann K., 2011, Top tips: delivering the Green Deal, Guardian, 24 September 2011, Available from: http://www.guardian.co.uk/housing-network/2011/sep/24/top-tips-green-deal-housing?INTCMP=SRCH

Milne, G., Boardman, B., 2000. Making cold homes warmer - the effect of energy efficiency improvements in low-income homes, Energy Policy, 28, 411-424.

Olivier, D., 2001. Building in ignorance: demolishing complacency, improving the energy performance of 21st century homes, EEASOX and ACE, Herefordshire, UK.

Power, A., 2008. Does demolition or refurbishment of old and inefficient homes help to increase our environmental, social and economic viability? Energy Policy, 36, 4487-4501.

Ravetz, J., 2008. State of the stock - what do we know about existing buildings and their future prospects? Energy Policy, 36, 4462-4470.

Roberts, S., 2008a. Altering Existing Buildings in the UK, Energy Policy, 36, 4482-4486

UKGBC – United Kingdom Green Building Council., 2008. Low carbon existing homes - report, supported by energy efficient partnership for homes, sustainable development commission and technology strategy board, London, UK.

Withers I., 2011. Nearly half of householders turn down Green Deal in trial, Building, 12 November 2011, Available from: http://www.building.co.uk/sustainability/sustainability-news/nearly-half-of-householders-turn-down-green-deal-in-trial/5023001.article