

The Green Deal and the Energy Company Obligation

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Current UK energy efficiency policy is very fluid, with a number of new policies due to be introduced in 2012 and 2013, including the Green Deal and Energy Company Obligation. These mark a substantial change from the existing policy regime in a number of ways, notably the explicit aim of supporting higher cost energy efficiency technologies in housing and an attempt to engage new sources of private sector finance. This paper provides a critical analysis of the proposed policy changes both in terms of the institutional changes and the implications of a new finance mechanism for energy efficiency policy, as well as the overall impact on reduction of greenhouse gasses, in particular through the installation of different types of retrofitted insulation.

1. Introduction

The vision for the Green Deal and the new Energy Company Obligation (ECO) is an ambitious and far-reaching one. It's a world where the UK leads with a dynamic new energy efficiency market, with nationwide brands, local businesses and community organisations competing to deliver the best proposition for the consumer (DECC, 2011a: p. 10)

This quote taken from the UK government's proposals illustrates the ambition and the scale of the new policies that are going to be introduced. The Green Deal is a new policy instrument, untested in the UK, allowing financing of energy efficiency retrofits of buildings by way of an on-bill charge, which is attached to the property rather than the occupant. The Energy Company Obligation (ECO) is a continuation of previous obligations on energy companies to deliver energy efficiency measures across the housing stock, but with a much stronger emphasis on higher cost insulation measures. In combination, the two instruments are supposed to achieve a large-scale reduction of greenhouse gas from existing buildings in the UK.

This paper discusses to what extent the Green Deal and the ECO are likely to deliver the scale of carbon dioxide reductions projected by government. Because the Green Deal/ECO proposals are very detailed and cannot be discussed in their entirety, the paper focuses on key aspects and critically discusses the major policy changes. First, the paper sets the scene by providing the background to the policy proposals, as well as the policy instruments they replace. Second, a number of concerns are pointed out. Third, the implications of the concerns raised are discussed. Finally, the paper concludes that although the Green Deal comprises an innovative policy instrument that could potentially leverage additional resources for 'low-carbon' building refurbishment, the current proposals are unlikely to deliver as much carbon saving as the policies they replace.

2. Background

2.1 Historical context

In the UK, policies aimed at reducing greenhouse gas emissions from the existing housing stock have evolved over many years and mainly consist of obligations on energy companies to save energy and reduce carbon dioxide equivalent emissions in existing homes. Supplier obligations have been in place since 1994 and, although they have been modified, the general approach has been consistent (Rosenow, 2012). The basic concept of the supplier obligations is that government, in this case the Department of Energy and Climate Change (DECC), imposes an energy or 'carbon savings' target on large energy companies that has to be achieved by installing defined energy and carbon saving measures in houses. Energy suppliers choose different strategies to meet the obligations. Some suppliers, such as British Gas, developed their own subsidiary businesses in order to carry out the installation of measures themselves. Other companies, for example Scottish Power, outsource most of their obligation to third parties, which deliver the measures on their behalf. Promotion of energy-efficient technologies through retailers and supermarkets, as well as work with social housing providers, comprise additional delivery routes. For a detailed description of how supplier obligations work in the UK please refer to Rosenow (2012).

2.2 Policy reform

The key policies for carbon dioxide reduction in households in place until December 2012 were the Carbon Emissions Reduction Target (CERT) and the Community Energy Saving Programme (CESP) (DECC, 2011b). Both policies will be succeeded by the ECO. The major government fuel poverty programme in England (Warm Front) will also end at about the same time, and therefore the ECO has been designed to

replace both carbon saving and fuel poverty programmes. ECO places three obligations on energy companies: a carbon saving obligation (CSO) similar to previous obligations, a carbon saving communities obligation focused on the delivery of 'carbon reduction' measures to the 15% most deprived areas and eligible rural households, and an affordable warmth obligation requiring a defined reduction in energy costs in low-income households (DECC, 2012b).

Alongside ECO, the Green Deal is supposed to deliver significant carbon reductions. The Green Deal is based on the idea of attaching loans for low-carbon refurbishment of buildings not to the owner, but to the property itself, technically the electricity meter in the property. Repayment of the loan is then by way of a surcharge on the electricity bill, collected by the electricity supplier and paid on to the Green Deal provider. If the value of the energy savings triggered by the measures installed is greater than this surcharge, the occupant is better off financially. The Green Deal approach was tested in the UK from November 2009 to July 2011 in so-called 'pay as you save' (PAYS) pilots, an initiative put forward by the previous government. However, the Green Deal differs from PAYS in a number of ways and particularly with regard to the finance mechanism. The Green Deal is subject to a 'golden rule', which prescribes that estimated savings must be greater than repayments (DECC, 2012c). Households taking part in the PAYS pilot schemes were not subject to this golden rule and could also install measures that would not pay back within the chosen repayment timeframe (DECC and Energy Saving Trust, 2011). Also, the Green Deal applies not only to households but also non-domestic properties.

2.3 Technologies supported

2.3.1 Green Deal

Because the Green Deal focuses on the most cost-effective measures, ECO is supposed to cover those measures that do not meet the golden rule and provide assistance to customers living in fuel poverty. The two policy instruments will not operate separately but are linked by various mechanisms. Green Deal providers, that is businesses that offer Green Deal packages to occupants, may offer finance plans that combine funding from ECO and the Green Deal mechanism. Those measures that do not fulfill the golden rule can be funded by ECO and be bundled with Green Deal funded measures. A brokerage mechanism is supposed to allow Green Deal providers to access ECO funding from the energy companies by offering carbon savings in competition with other providers (DECC, 2012c).

At least 45 different measures are eligible for Green Deal funding, provided they are installed in packages that DECC's standardised assessment tools indicate will be compliant with

the golden rule (DECC, 2012e). The list of measures currently covers a wide range of technologies including

- insulation: cavity wall insulation (CWI), loft insulation, roof insulation, under-floor insulation, external and internal wall insulation systems, hot water cylinder insulation
- heating and hot water controls
- condensing boilers
- heat recovery devices
- microgeneration: biomass, solar thermal, micro-wind, heat pumps, micro-combined heat and power.

Note that the above list is not comprehensive; please refer to the latest DECC publication for a complete list of measures (DECC, 2012e). Some measures are explicitly excluded from the Green Deal such as photovoltaics and lighting systems.

The potential savings are modelled with the reduced data standard assessment procedure tool, which is the UK standard for assessing energy efficiency (e.g. for energy performance certificates) with easily obtainable data. Reduced data standard assessment procedure tool energy savings are based on documented U-values and efficiencies (BRE, 2009), based on monitored data where these are available and the assumption that all houses are maintained at a standard temperature. For the purposes of the golden rule, savings will be reduced by 'in-use factors' that represent the extent to which this assessment can overestimate actual energy use. Green Deal providers can apply for specific measures to be added to the list. It is expected that the measures list will be updated on a regular basis, at least annually. Cost savings are calculated using prices averaged across regions for the previous 3 years.

Whether a package of measures is suitable for Green Deal finance depends, however, on the individual property. Only when the projected savings exceed the investment is the proposed investment deemed eligible. Households can co-finance measures either by providing some of the required investment themselves or by using assistance from other policy instruments such as ECO. This 'partial financing' means that where customers choose measures that are unlikely to pay for themselves in their lifetime, they can still get money towards the installation cost up to the value of the estimated savings.

2.3.2 ECO

The eligible measures are different for each of ECO's sub-targets (DECC, 2012e). The CSO is the most restrictive part of ECO. The main measures supported are external and internal solid wall insulation (SWI) and hard-to-treat CWI. If delivered as part of a package with SWI or hard-to-treat CWI, additional measures can be included (mainly low-cost insulation measures, such as loft insulation).

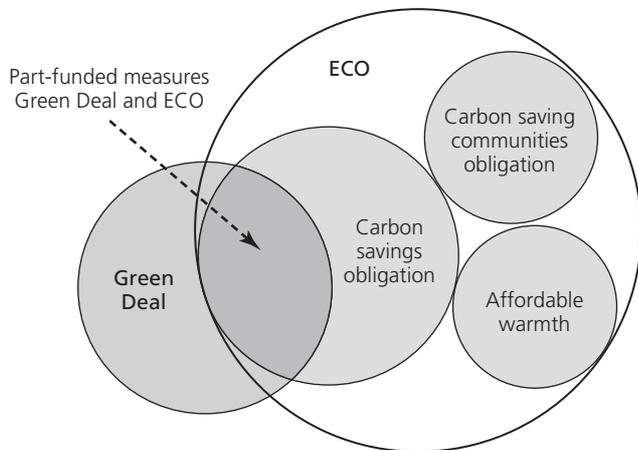


Figure 1. Interaction between Green Deal and ECO

Under the carbon saving community obligation the same measures as under the CSO are allowed but without the restriction to be delivered as part of a package with SWI or hard-to-treat CWI.

Almost all of the measures eligible for Green Deal funding (see above) can receive support from the affordable warmth obligation, except those measures applicable only to the non-domestic sector.

Figure 1 illustrates how the Green Deal and ECO are interacting. The CSO element of ECO provides part-funding to properties taking up the Green Deal and vice versa.

3. Critical assessment

While the Green Deal is an innovative policy instrument that has the potential to create new markets and mobilise additional funding streams, there are a number of concerns with regard to the short and mid-term impacts of the policy changes proposed.

In this section the following issues are discussed

- (a) the projected contribution to carbon reduction
- (b) potential barriers to uptake
- (c) the design choices made and their implications
- (d) the supply chain’s capacity to deliver
- (e) the effect on employment
- (f) the implications for fuel poverty.

3.1 Contribution to carbon reductions

Projections for the Green Deal of expected carbon savings are provided by DECC in the impact assessment of the Green Deal and the ECO and indicate that their carbon reduction impact will be significantly less than that of previous policies. The impact assessment estimates that, by 2022, that is over a period of 10 years, the Green Deal and the ECO together will result in savings of 84 Mt of non-traded (emissions not covered by EU Emissions Trading System) carbon dioxide (lifetime) and 44 Mt of traded (emissions covered by EU Emissions Trading System) carbon dioxide (lifetime) (DECC, 2012b). This equates to 12.8 Mt of carbon dioxide (lifetime) per year. However, the figure includes both the Green Deal and the ECO. The impact assessment does not apportion the savings for Green Deal and ECO separately. However, unpublished data provided by DECC (in 2013, ‘Carbon savings predicted by the Green Deal and ECO’), on which the impact assessment is based, give a breakdown of the overall savings figure (Table 1).

In order to determine the actual savings, free rider effects have to be subtracted (labelled ‘business as usual’ (BAU) in Table 1). Free rider effects are defined here as the activity that would have happened in the absence of the programme, a widely used definition in the literature. The underlying assumptions of the estimates provided by DECC can be found in the impact assessment and are mainly based on historic activity prior to significant energy efficiency policies.

The authors assume that because ECO focuses on high-cost measures, with almost no BAU activity, and low-income households, also with very little BAU activity, most of the free rider

	Savings from 2013 to 2022: Mt CO ₂ (lifetime)	Average annual savings: Mt CO ₂ (lifetime)
Business-as-usual (BAU) domestic only	14.88	1.488
Green Deal domestic	27.51	2.751
Green Deal non-domestic	16.86	1.686
ECO carbon saving communities obligation	23.53	2.353
ECO carbon saving obligation	64.38	6.438
ECO affordable warmth obligation	10.91	1.091
Total savings minus BAU	128.31	12.831

Source: DECC (2013)

Table 1. Breakdown of savings

effects apply to Green Deal only. If subtracted, the savings of the Green Deal from 2013 to 2022 account for 29.5 Mt carbon dioxide. This does not allow for any free rider effects in the non-domestic component of the Green Deal.

Compared to the existing policies, ECO and the Green Deal will result in significantly lower carbon savings. Per year of policy implementation, the most recent policies (CERT and CESP) deliver about 68 Mt carbon dioxide (lifetime) in savings (based on DECC, 2009; DECC, 2010a). Hence, over the period 2013–2022, the Green Deal and ECO will only deliver 19% of the carbon savings of previous policies (years 2009–2012).

There are a number of factors that contribute to the reduction.

- (a) The estimates of savings from individual measures are lower now than in CERT, for example, 2.67 MWh/year for CWI compared to an estimate of 3.54 MWh/year in CERT, that is a 25% reduction. This is due to a change in methodology, from an approach that may lead to an overestimate to one likely to produce an underestimate. Similar changes apply to other measures, but because CWI forms such an important part of both CERT and Green Deal, a 25% reduction is a reasonable estimate of the effect of all methodological changes combined.
- (b) ECO and Green Deal are focused on buildings, so that the lighting and appliance measures that contributed significantly to CERT, and even more to earlier obligations, are not included (although the non-domestic part of the Green Deal includes some lighting measures). There was no real justification of this policy change in the Green Deal policy proposals.
- (c) Last, but probably most important, there is a significant reduction in the projected rate of installation of key, low-cost, insulation measures – CWI and loft insulation – which is not compensated for by rising rates of SWI and hard-to-fill CWI. This is driven by excluding standard CWI and loft insulation from the carbon saving obligation component of ECO.

However, there are some caveats to this comparison.

- (a) During the first 4 years of CERT 21.4% of savings were delivered from lighting measures, which included mainly compact fluorescent light bulbs (CFLs) (OFGEM, 2012b). After almost 300 million CFLs had been distributed (DECC, 2010b), CFLs ceased to be eligible under CERT because of concerns that savings from CFLs might not be additional any longer because those might not have been installed (OFGEM, 2011b). Hence, part of the accredited savings need to be deducted to allow for a more accurate comparison. Given that CFLs are no longer eligible and

that 82.5% of the total obligation had been delivered at the end of year 4, the contribution to the total savings at the end of the scheme will be 17.7%. Deducting all of the CFL savings, the Green Deal and ECO achieve 22.6% of the policies in place before 2013, CERT and CESP.

- (b) The Green Deal savings include a large share of savings from the non-domestic sector, about 38% are projected to result from measures being delivered in this sector (DECC, 2013). However, CERT and CESP did not include any non-domestic sector savings.
- (c) DECC expects that the most cost-effective measures will be deployed in the early years and therefore more savings will occur in earlier years.
- (d) The remaining potential for low-cost measures has decreased over the last two decades as a result of energy efficiency policy. Although in the short term there is still potential for further low-cost measures, future savings will come at a higher price and for the same amount of finance a lower amount of energy and carbon savings is available.

Still, although it is not possible to determine the exact size of the actual reduction in terms of policy effort, the analysis above shows that it is substantial.

Compared to past supplier obligations, the proposals are now at lower levels than under the energy efficiency commitment 2, which ran from 2005 to 2008 (Figure 2).

This is consistent with the observation that the proposed level of energy supplier investment is broadly similar (DECC, 2009, 2010a, 2012b) to that of CERT/CESP in 2008–2012 and that the costs of delivering SWI and hard-to-treat CWI are much higher than for the measures that have dominated CERT and its predecessors. For example, the installation of easy-to-treat cavity insulation costs around €600 compared to more than €5000 for internal and more than €10 000 for external SWI. Hard-to-treat cavity insulation is estimated to cost more than €2000 (DECC 2012b).

The availability of low-cost options in the form of loft insulation and CWI will decline over the next few years if recent rates of installation are maintained. It is therefore to be expected that as energy saving measures transition to higher cost measures, cost effectiveness will fall. However, the scale of change proposed between the original projections for the last round of CERT/CESP and Green Deal/ECO is very large – a factor of more than 5 reduction in the scale of carbon saving. Even taking account of the caveats above, the expected rate of carbon dioxide emissions reduction will only be about one-third of the previous policies CERT and CESP. The underlying reason is the focus on high-cost measures of ECO, with much lower uptake rates of the key lower cost measures in the

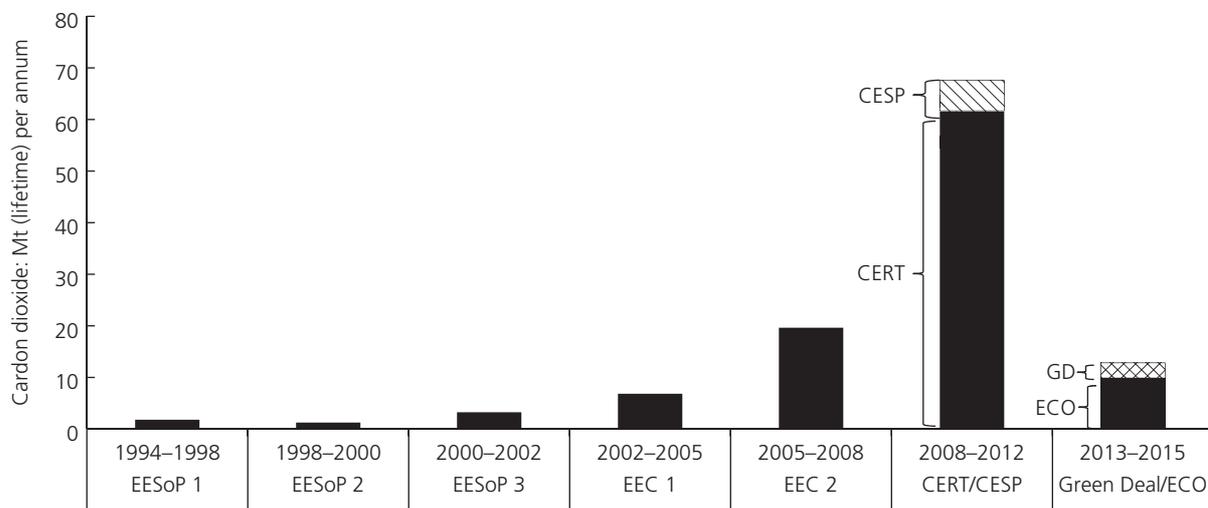


Figure 2. Changing ambition of energy efficiency programmes in the UK (EEC: energy efficiency commitment; EESoP: energy efficiency standards of performance) (Source: based on various sources: DECC (2012b, 2013); Lees (2006, 2008); OFGEM (2005, 2008, 2011a, 2012a); OFGEM and Energy Saving Trust (2003); Rosenow (2011, 2012); Rosenow and Eyre (2012))

Green Deal than in CERT. The projected Green Deal contribution could, of course, be an underestimation and much higher carbon savings may be generated through the Green Deal if uptake is exceeding projections. However, the sections below illustrate that this is very unlikely to be the case.

3.2 Barriers to uptake

The approach of attaching payments for energy efficiency investment to the electricity meter is new; there is no experience worldwide with this approach, and therefore the outcomes are uncertain. However, there is evidence from which some conclusions can be drawn.

There is an extensive literature on the barriers to energy efficiency (Brown, 2001; Eyre, 1997; Hirst and Brown, 1990; Jaffe and Stavins, 1994; Sanstad and Howarth, 1994; Sorrell *et al.*, 2004; Tietenberg, 2009; Weber, 1997). This identifies upfront cost and decisions that place much greater emphasis on cost than on energy savings as a barrier. The underlying approach of the Green Deal is to remove this barrier by enabling investments at zero upfront cost to energy users, with the cost of the investments paid back out of the energy savings achieved. In principle the Green Deal therefore addresses this barrier.

However, initial cost is not the only barrier. Other issues are potentially more important, notably the hassle and disruption of building work, low priority given to energy issues by many consumers, the lack of reliable advice at the point of installation and the current, poor integration of the supply chain. It is therefore unlikely that the availability of Green Deal finance alone

will make a major difference to the attractiveness of investments. This analysis is supported by the fact that energy suppliers have found it necessary to offer quite significant discounts (typically 50–100%) under CERT to householders to incentivise purchases. Recent analysis of 30 years of experience with energy efficiency programmes in the USA also shows that addressing the financial barriers on their own is by no means sufficient to generate high enough customer demand (Borgeson *et al.*, 2012; Fuller *et al.*, 2010).

For the low-cost measures, on which delivery of short-term targets depends, market research undertaken for the government showed that commercial loans have very limited attractiveness for most consumers (Dawson, 2005). Loans can be effective for some customers in some contexts. The best example of a large and successful loan scheme is the KfW scheme in Germany, which has broadly similar carbon saving outcomes to supplier obligations in the UK (Rosenow, 2011). However, this does not operate at market interest rates and is underpinned by €1.5 billion of government funding every year – similar in scale to current CERT spending (Rosenow, 2013).

The Green Deal package is not a complete solution for a number of reasons. First, enabling consumers to choose accredited suppliers and finance packages does not fundamentally address the difficulties of ‘raising awareness’ as these choices necessarily follow on from rather than precede awareness. Second, studies show that most consumers are actually aware that insulation can save them money on heating bills (Thornton, 2009), but they are equally aware that the time, effort,

disruption, uncertainty, etc. of efficiency improvements are good reasons not to proceed. The challenge is less one of awareness and more one of commitment, intention, or disposition. The Green Deal will affect the renovation decision process of those already interested in efficiency improvements, but the 'conversion' of non-interested to interested remains a key problem. If and how Green Deal changes the marketing of energy efficiency to homeowners and the supply chain is therefore crucial and, inevitably, uncertain (Eyre *et al.*, 2012).

3.3 Design choices

Research indicates that every major energy supplier obligation has been designed to promote minimum cost delivery of energy savings, that is to utilise cheap measures, both in North America (York, 2008) and Europe (Eyre *et al.*, 2009). The best-known example of a successful loan programme in energy refurbishment, the KfW scheme in Germany (Kuckshinrichs *et al.*, 2010; Rosenow, 2011; Schroeder *et al.*, 2011), is designed to incentivise high-cost, high-performance refurbishment. Essentially, the former have been driven by energy regulation with an emphasis on marginal cost optimisation, and the latter by housing policies looking more broadly at building refurbishment. ECO and Green Deal turn this experience on its head: Green Deal (a building refurbishment programme) aims to finance low-cost measures, whereas ECO (an energy regulation programme) mostly focuses on high-cost measures such as SWI and hard-to-treat CWI (DECC, 2012c).

Current policy is not clear on whether it is envisaged that, over the long term, ECO will support all future SWI installations. The total investment cost of these, at the costs set out in the government's impact assessment, is in the range £30–60 billion. Even with a contribution from Green Deal finance, that would be a significant sum to fund from an obligation on electricity bill payers, most of whom will not benefit from SWI. While that is a possible political choice, it would clearly be a controversial one and therefore susceptible to reversal, with a risk of leaving no effective policy for SWI. A safer policy strategy, consistent with what has worked effectively in different countries, would be to retain a policy like CERT proved to deliver low-cost measures and to seek to introduce other sources of capital for higher cost measures. A Green Deal type financing instrument could achieve this, but the combination of the golden rule and commercial interest rates in the current proposals effectively excludes Green Deal finance alone from being able to fund higher cost measures.

The proposed focus of the ECO on insulation also implies that supplier-funded subsidies will be removed for all lighting and appliance energy efficiency measures. The focus of Green Deal on building thermal performance means that these measures are not covered there either. There has been significant, and justifiable, criticism of the use of compact fluorescent lamps in

recent CERT programmes. However, this should not obscure the bigger picture that incentives from CERT and predecessors have played a part in market transformation in both lighting and appliance markets (Lees, 2006, 2008). Incentives paid by energy suppliers to retailers of lights and appliances have been an important part of raising the market share of energy efficient options. Given the rising share of demand for these end uses and their dominance of electricity end uses, abandoning this approach is a very significant policy change. At a technical level, the domestic sector now incorporates large numbers of tungsten halogen fittings, which have a luminous efficacy barely distinguishable from conventional incandescent. Replacing these with light-emitting diodes is now possible and to first order would reduce energy use by a factor of ~5 (Reineke *et al.*, 2009). The objective should be not to abandon support for efficient lighting, but to refocus it.

3.4 Supply chain

Effective delivery of energy efficiency measures not only depends on sufficient demand (which the Green Deal and the ECO is supposed to increase), but also on a well-developed and integrated supply chain. Past experience in the UK shows that the supply chain responds to policy incentives, an example is the expansion of CWI installations from less than 100 000 per year before 1994 (Lees, 2006) to an average of 550 000 per year since 2005 (OFGEM, 2006, 2007, 2008, 2009, 2010, 2011c). The pace of change, however, is limited by the capacity of the supply chain to deliver measures and can only increase to a certain extent every year, even if policy incentives are significant (Shorrocks 1999).

There are concerns that some of the assumptions made about the uptake of measures under Green Deal/ECO are overly optimistic. For example, with regard to the uptake of SWI, the Green Deal/ECO impact assessment assumes SWI to be delivered at an average rate of roughly 100 000 installations per year for 10 years, that is almost 1 million by 2022. In 2013, about 45 000 SWIs are expected to be installed, in 2014 uptake is predicted to be about 75 000 per annum, and from 2015 100 000 SWIs are supposed to be delivered every year (DECC, 2012b).

According to the last CERT annual review, during the first 3 years 39 672 SWIs were installed under CERT (OFGEM, 2011c), that is on average 13 200 SWIs per year. Sources for the whole market indicate ranges for external wall insulation of 15 000–21 000 installations per year and for internal wall insulation of 10 000–16 000 installations per year (Purple Market Research, 2009). DECC (2012b) quote 22 000 SWIs per year in 2011 in the Green Deal/ECO impact assessment. An increase to 100 000 per year within 3 years is therefore very ambitious. The insulation industry itself raised concerns that the pace of expected uptake of SWI is likely to be too

optimistic and urged government to rely less on SWI (NIA, 2012).

DECC also expects a rapid increase in the installation of hard-to-treat CWI, projecting that more than 150 000 properties will receive this type of measure in 2013 (DECC, 2012b). Historically, energy companies focused on easy-to-treat CWI in order to minimise the cost associated with obligations. The authors are not aware of reliable estimates for the current installation rate of hard-to-treat CWIs, but it is likely to be at a very low level compared to 150 000 installations per year.

The capacity in the supply chain may not allow for such a quick uptake, so focusing solely on solid wall and hard-to-treat cavity wall properties under the carbon savings target of ECO could risk that carbon target not being achieved.

3.5 Employment effects

DECC stress that under the Green Deal and ECO the number of jobs will have increased from 26 000 in 2012 to 60 000 in 2015, that is an increase of 130% (DECC, 2012d). This figure is, however, the upper estimate, the lower estimate is frequently left out. The upper estimate is based on the assumption that there will be almost 10 000 installers of insulation in 2015, and that for each installer an additional 4.75 jobs in the supply chain are created (DECC, 2012b). The ratio of installers to supply chain jobs, or direct to indirect employment effects, is based on a study commissioned by government assessing the UK market for low-carbon and environmental goods and services (Innovas, 2009). The lower estimate results from using a ratio of job to capital spending for housing repair and maintenance provided by Construction Skills (the sector skills council for construction). This estimated ratio of job to capital spending for housing repair and maintenance is 32.6 jobs per £1 million output. Assumed total capital investment in 2015 of around £1.08 billion results in 35 000 jobs in the whole of the insulation industry (direct and indirect employment effects). A further 3500 Green Deal assessors are added to this. It is unclear how DECC arrives at the figure of 26 000 jobs in 2012, but in the impact assessment of the Green Deal and the ECO, DECC compares the expected uptake to the year 2007, when there were 4700 installers, that is about 27 000 total jobs when applying the 4.75 factor used for including the supply chain jobs. It seems that DECC compares the projected number of jobs to 2007 levels. This approach is inaccurate given that the CERT target in the period of 2008–2012 was 2.4 times higher than it was in the previous obligation period. While the exact number of jobs in 2012 is unknown, it is likely to be above 40 000 given the significantly higher targets in place after 2008.

The insulation industry claims that the plans for the Green Deal and the ECO will cause job losses of 16 000 in 2013 (Insulation

Industry Forum, 2012). This claim is based on a report produced by the Association for the Conservation of Energy (ACE, 2012a), which concludes that employment figures will decrease rather than increase. ACE uses more or less the same method as DECC for establishing a high and a low estimate. An important difference between the government's assessment and the figures produced by ACE is that the figures for the status quo, in other words the reference point, differ significantly. DECC claims that in 2012 there were 26 000 jobs in the insulation industry and its supply chain, ACE provides a much higher estimate of 44 988–56 829 based on the number of measures likely to be delivered by CERT and CESP (ACE, 2012b). ACE's lower estimate for the years post-2012 are based on the number of measures projected by government, the assumed capital expenditure of those, and the same ratio as used by DECC of 32.6 jobs per £1 million output. The higher estimate is calculated by converting the number of days required in order to deliver the number of measures projected by DECC into full-time job equivalents. Using the same method as DECC, ACE applies the 4.75 factor for the supply chain resulting in the total number of jobs. Both methods show a decrease in the number of jobs of about 20% by 2015. This is because of the reference point in the year 2012, which is, as described above, much higher in ACE's analysis.

To conclude, the positive employment effects projected by DECC are largely based on a reference point 6 years in the past at a time when employment in the industry was lower than in 2012 and therefore likely to be misleading. Independent analysis illustrates that the Green Deal and ECO will lead to a reduction in employment rather than an increase.

3.6 Fuel poverty

The changes to CERT proposed for the new ECO include explicit goals for affordable warmth. CERT has historically focused on insulation measures, primarily to deliver carbon savings, even in priority group homes, whereas Warm Front (and related devolved country programmes) has undertaken heating system investment primarily to deliver affordable warmth. CERT has neither attempted nor allowed effective targeting of fuel poverty. With the removal of Warm Front, there has been increased political pressure for ECO to target fuel poverty, resulting in the proposed new approach, within which there is an explicit affordable warmth target more closely related to this policy goal.

The proposals indicate that the fuel poverty impact of ECO will be to take 125 000–250 000 households out of fuel poverty by 2023 (DECC, 2012b). The number of households currently in fuel poverty is about 20–40 times this figure (DECC, 2012a). Analysis by the ACE shows that the Green Deal/ECO proposals will cause a 29% reduction in total fuel poverty spending (ACE, 2012c). The proposals are therefore clearly insufficient

to deliver the government's statutory obligation with respect to eradicating fuel poverty by 2016 as far as reasonably possible (DTI, 2001). On the contrary, the fuel poverty review commissioned by DECC concludes that Green Deal and ECO 'would be expected to increase fuel poverty' (Hills, 2012: p. 112) owing to distributional impacts of the policy proposals.

4. Conclusion

The Green Deal proposals seek to introduce greater use of private (non-energy sector) finance into low-carbon building refurbishment. This is consistent with the goal of limiting costs to government and energy consumers of the very substantial investment required to bring the UK building stock to low-carbon standards. Mobilising new funding streams for low-carbon refurbishment, in theory, is a step in the right direction as neither energy company obligations nor public expenditure seems likely to be the source of all of the required investment.

However, the scale of activity set out in the details of the Green Deal/ECO proposals is not sufficient to meet ambitious carbon reduction targets or fuel poverty goals. Indeed the impact assessment of the proposals implies a significant reduction in the rate of energy efficiency improvement from that achieved in recent years. In particular, there is projected to be a major reduction in the rate of key low-cost insulation measures such as loft insulation – with negative implications for both carbon reduction and the insulation industry. However, there is also the risk that even the modest ambition of the Green Deal/ECO may not be achieved for a number of reasons.

First, the Green Deal is very much based on the premise that financial considerations are the major barrier to uptake and that a new finance mechanism, which attaches loans to the property instead of the owner, can leverage additional low-carbon refurbishment. However, there is a rich literature on other, non-financial, barriers to energy efficiency improvements and the Green Deal does not sufficiently address those. Second, the new policy framework made design choices that have been unprecedented. Countries that have implemented obligations on utilities mainly used these programmes to roll out low-cost measures. Loan programmes, such as the well-known KfW programmes in Germany, generally focus on high-cost measures. Under Green Deal/ECO this will be exactly the opposite. Third, the proposals for ECO imply a radical transition from low-cost measures to high-cost measures. Historic installation rates of expensive measures such as SWI and hard-to-treat CWI have been at a low level, but will need to rise at a very fast pace if the targets of ECO are going to be achieved. There are concerns that the supply chain may not be able to deliver within the timeframes defined. Fourth, the effect on employment within the insulation industry and its supply chain is likely to be negative because official claims that the proposals will increase the number of jobs are based on a comparison to

the year 2007 when employment was much lower than in 2012. Finally, the proposals are projected to make only a limited contribution to the alleviation of fuel poverty, because, even though the ECO contains an explicit fuel poverty target, it is insufficient to compensate for planned reductions in government-funded programmes.

Acknowledgements

The authors are grateful to Joanne Wade, Charlie Wilson and Bob Lowe for their contributions to the paper on which some of the analysis herein is based – 'UK Energy Research Centre's response to the consultation on the Green Deal and the Energy Company Obligation'. None of them is responsible for any errors in analysis or interpretations the present authors have added. An earlier version of this paper has been presented at the 9th BIEE Academic Conference, *European Energy in a Challenging World: The Impact of Emerging Markets* at St John's College, Oxford on 19–20 September 2012. The authors would like to thank the audience for their valuable comments.

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