

Title: GREEN DEAL AND THE ENERGY COMPANY OBLIGATION Lead department or agency: Department of Energy and Climate Change Other departments or agencies:	Impact Assessment (IA)
	IA No: DECC0072
	Date: 23/11/11
	Stage: Consultation
	Source of intervention: Domestic
	Type of measure: Secondary legislation
Contact for enquiries: Stephen Elderkin (0300 068 6956)	

Summary: Intervention and Options

<p>What is the problem under consideration? Why is government intervention necessary?</p> <p>Improvements to the UK's energy efficiency can reduce Greenhouse Gas emissions, improve energy security, mitigate fuel poverty, increase productivity and reduce the costs of meeting the UK's renewable energy target. Government intervention is justified to address market failures and barriers slowing take-up of socially cost-effective energy efficiency measures. These include access to capital and discount rates, information asymmetry, positive innovation externalities, inertia, and incentive incompatibility. They are each discussed in detail in section 4.3.</p>

<p>What are the policy objectives and the intended effects?</p> <p>The Green Deal and the Energy Company Obligation are complementary policy mechanisms intended to address market failures and barriers that slow the uptake of cost-effective energy efficiency measures. The Green Deal aims to overcome access to capital and mismatched incentive problems. The ECO aims to provide additional support to deliver socially costs-effective measures that are not likely to be taken up under current policies, and provides measures to relieve fuel poverty. The policies are intended to deliver a step change, accelerating the take-up of cost-effective energy efficiency measures. This would support the delivery of UK carbon budgets, improve energy security and help deliver fuel poverty and renewables energy targets.</p>

<p>What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)</p> <p>This Impact Assessment accompanies a consultation on secondary legislation on the detail of implementing the Green Deal and the design of an Energy Company Obligation. The impacts of the central preferred scenario (policy option 2) for the whole package is assessed and an options appraisal provided for each of the detailed design decisions for the two policy mechanisms.</p>
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Will the policy be reviewed? It will be reviewed. If applicable, set review date: October 2015	
What is the basis for this review? Evaluation strategy (to be published spring 2012).	
Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?	Yes

Ministerial Sign-off For consultation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister:



Date: 22/11/2011

Description: Green Deal Finance Mechanism only

Price Base Year 2011	PV Base Year 2011	Time Period Years 52	Net Benefit (Present Value (PV)) (£m)		
			Low: £600	High: £4,300	Best Estimate: £3,100

COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		Optional	£5,200
High	Optional		Optional	£8,000
Best Estimate				£6,200

Description and scale of key monetised costs by 'main affected groups'

The majority of the costs imposed by the Green Deal policy package are borne by those taking out the Green Deal plan or paying Green Deal repayment charges (in cases when the property is subsequently sold). The cost of administering the scheme would fall on energy companies, which would be likely to pass on the costs to energy consumers. The largest cost is for installation of the measures (from £2.6bn to £4.0bn in the low and high scenarios, respectively). Other costs include hidden costs (loss of internal living space and hassle and disruption costs, at £1.7bn to £2.3bn), assessment costs (£0.3bn to £0.5bn), finance costs (£0.5bn to £1.1bn) and GD mechanism costs (£0.15bn).

Other key non-monetised costs by 'main affected groups'

The installation of energy efficiency measures under the Green Deal may have adverse impacts on householder health in some cases. These costs have not been monetised.

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	£5,900
High	Optional		Optional	£12,200
Best Estimate				£9,300

Description and scale of key monetised benefits by 'main affected groups'

Those taking out Green Deals, or occupying properties with Green Deals plans, would benefit from the energy savings the energy efficiency measures deliver (ranging from £3.1bn to £7.6bn in the low and high scenarios, respectively) and from additional comfort from warmer buildings (£0.7bn to £1.2bn). There are also benefits to wider society from improved air quality (£0.3bn to £0.4bn), non-traded carbon savings (1.1bn to £2.0bn) and traded carbon allowance savings (£0.7bn to £1.0bn).

Other key non-monetised benefits by 'main affected groups'

The health benefits arising from warmer homes have not been monetised. Nor have the benefits from the energy reductions from the policy helping the UK to meet its renewables target in a more cost effective way. There may also be some benefits from raising quality in the construction sector if the Green Deal drives out some rogue traders.

Key assumptions/sensitivities/risks**Discount rate (%)**

3.5

There is uncertainty around both the costs and benefits of the policy package. The key assumptions that have been subjected to range of sensitivities are energy and carbon prices, interest rates, Solid Wall Insulation (SWI) costs and consumer preferences. The domestic housing evidence base is more comprehensive than for the non-domestic buildings market, which means the non-domestic sector's results are subject to more uncertainty.

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: £10	Benefits: £137	Net: -£126	Yes	ZERO IN

Description: Green Deal Finance Mechanism, 1.95 Mt Carbon Target annual CO₂ savings (0.52 MtCO₂ by March 2015), £13.5bn Affordable Warmth Target total lifetime bill savings (£3.4bn by March 2015)

Price Base Year 2011	PV Base Year 2011	Time Period Years 52	Net Benefit (Present Value (PV)) (£m)		
			Low: £0	High: £16,100	Best Estimate: £8,700

COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		Optional	£16,400
High	Optional		Optional	£26,000
Best Estimate				£20,600

Description and scale of key monetised costs by 'main affected groups'

The costs imposed by the Green Deal would be borne by those taking out the Green Deal plan or paying Green Deal repayment charges (in cases when the property is subsequently sold). The cost of meeting the ECO and administering the scheme would fall on energy companies, which would be likely to pass on the costs to energy consumers. Over the period of the obligation, to 2022, average domestic energy bills would be increased relative to the counterfactual but would be lower after 2022 for the remaining lifetime of the installed measures. The largest cost is for installation of the measures (from £12.5bn to £15.5bn in the low and high scenarios, respectively). Other costs include hidden costs (loss of internal living space and hassle and disruption costs, at £2.8bn to £6.7bn), assessment costs (£0.7bn to £1.1bn), finance costs (£0.2bn to £2.6bn) and GD mechanism costs (£0.22bn).

Other key non-monetised costs by 'main affected groups'

The installation of energy efficiency measures under the Green Deal may have adverse impacts on householder health in some cases. These costs have not been monetised.

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	£16,500
High	Optional		Optional	£42,100
Best Estimate				£29,200

Description and scale of key monetised benefits by 'main affected groups'

The main groups benefiting from the policy package are those taking out Green Deals, those occupying properties with Green Deal plans, and those receiving support from the ECO. These groups would benefit from the energy savings the energy efficiency measures deliver (ranging from £8.6bn to £25.4bn in the low and high scenarios, respectively) and from additional comfort from warmer buildings (£2.4bn to £5.4bn). There are also wider benefits to wider society from improved air quality (£1.3bn to £1.4bn), non-traded carbon savings (£3bn to £7.4bn) and traded carbon allowance savings (£1.4bn to £2.4bn).

Other key non-monetised benefits by 'main affected groups'

The health benefits arising from warmer homes have not been monetised. Nor have the benefits from the energy reductions from the policy helping the UK to meet its renewables target in a more cost effective way. There may also be some benefits from raising quality in the construction sector if the Green Deal drives out some rogue traders.

Key assumptions/sensitivities/risks	Discount rate (%)
There is uncertainty around both the costs and benefits of the policy package. The key assumptions that have been subjected to range of sensitivities are energy and carbon prices, interest rates, Solid Wall Insulation (SWI) costs and consumer preferences. The domestic housing evidence base is more comprehensive than for the non-domestic buildings market, which means the non-domestic sector's results are subject to more uncertainty.	3.5

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: £358	Benefits: £137	Net: £222	Yes	IN

Description: Green Deal Finance Mechanism, 2.05 Mt Carbon Target annual CO₂ savings (0.48 MtCO₂ by March 2015) and £14.7bn Affordable Warmth Target total lifetime bill savings(£3.7bn by March 2015)

Price Base Year 2011	PV Base Year 2011	Time Period Years 52	Net Benefit (Present Value (PV)) (£m)		
			Low: £0	High:£15,700	Best Estimate: £8,500

COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		Optional	£16,600
High	Optional		Optional	£27,400
Best Estimate				£21,200

Description and scale of key monetised costs by 'main affected groups'

The costs imposed by the Green Deal would be borne by those taking out the Green Deal plan or paying Green Deal repayment charges (in cases when the property is subsequently sold). The cost of meeting the ECO and administering the scheme would fall on energy companies, which would be likely to pass on the costs to energy consumers. Over the period of the obligation (to 2022) average domestic energy bills would be increased relative to the counterfactual but would be lower after 2022 for the remaining lifetime of the installed measures. The largest cost is for installation of the measures (from £12.7bn to £16.4bn in the low and high scenarios, respectively). Other costs include hidden costs (loss of internal living space and hassle and disruption costs, at £2.8bn to £7.1bn), assessment costs (£0.7bn to £1.1bn), finance costs (£0.2bn to £2.6bn) and GD mechanism costs (£0.22bn).

Other key non-monetised costs by 'main affected groups'

The installation of energy efficiency measures under the Green Deal may have adverse impacts on householders' health in some cases. These costs have not been monetised.

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	£16,800
High	Optional		Optional	£43,100
Best Estimate				£29,700

Description and scale of key monetised benefits by 'main affected groups'

The main groups benefiting from the policy package are those taking out Green Deals, those occupying properties with Green Deal plans, and those receiving support from the ECO. These groups would benefit from the energy savings the energy efficiency measures deliver (ranging from £8.6bn to £26.0bn in the low and high scenarios, respectively) and from additional comfort from warmer buildings (£2.4bn to £5.6bn). There are also wider benefits to wider society from improved air quality (£1.3bn to £1.5bn), non-traded carbon savings (£2.9bn to £7.5bn) and traded carbon allowance savings (£1.4bn to £2.5bn).

Other key non-monetised benefits by 'main affected groups'

The health benefits arising from warmer homes have not been monetised. Nor have the benefits from the energy reductions from the policy helping the UK to meet its renewables target in a more cost effective way. There may also be some benefits from raising quality in the construction sector if the Green Deal drives out some rogue traders.

Key assumptions/sensitivities/risks	Discount rate (%)
There is uncertainty around both the costs and benefits of the policy package. The key assumptions that have been subjected to range of sensitivities are energy and carbon prices, interest rates, Solid Wall Insulation (SWI) costs and consumer preferences. The domestic housing evidence base is more comprehensive than for the non-domestic buildings market, which means the non-domestic sector's results are subject to more uncertainty.	3.5

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: £445	Benefits: £137	Net: £309	Yes	IN

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			Great Britain		
From what date will the policy be implemented?			Late 2012		
Which organisation(s) will enforce the policy?			DECC, Green Deal Oversight Body, UKAS		
What is the annual change in enforcement cost (£m)?			6.28		
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			Yes		
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded: 53		Non-traded: 114
Does the proposal have an impact on competition?			Yes		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			Costs: 0		Benefits: 0
Distribution of annual cost (%) by organisation size (excl. Transition) (Constant Price)	Micro	< 20	Small	Medium	Large
Are any of these organisations exempt?	No	No	No	No	No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on...?	Impact	Page ref within IA
Statutory equality duties¹ Statutory Equality Duties Impact Test guidance	Yes	148

Economic impacts		
Competition Competition Assessment Impact Test guidance	Yes	139
Small firms Small Firms Impact Test guidance	Yes	145

Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	Yes	80
Wider environmental issues Wider Environmental Issues Impact Test guidance	No	

Social impacts		
Health and well-being Health and Well-being Impact Test guidance	Yes	131

¹ Public bodies including Whitehall departments are required to consider the impact of their policies and measures on race, disability and gender. It is intended to extend this consideration requirement under the Equality Act 2010 to cover age, sexual orientation, religion or belief and gender reassignment from April 2011 (to Great Britain only). The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Human rights Human Rights Impact Test guidance	No	
Justice system Justice Impact Test guidance	No	
Rural proofing Rural Proofing Impact Test guidance	No	

Sustainable development Sustainable Development Impact Test guidance	Yes	133
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Evidence Base (for summary sheets) – Notes

Use this space to set out the relevant references, evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Please fill in **References** section.

References

Include the links to relevant legislation and publications, such as public impact assessments of earlier stages (e.g. Consultation, Final, Enactment) and those of the matching IN or OUTs measures.

No.	Legislation or publication
1	The Green Deal and Energy Company Obligation consultation document http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx
2	Draft secondary legislation http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx
3	Impact Assessment for the Green Deal elements of Energy and Climate Change Bill (2010) http://www.decc.gov.uk/en/content/cms/legislation/energy_bill/energy_bill.aspx
4	The Energy Act 2011 http://www.legislation.gov.uk/ukpga/2011/16/contents/enacted/data.htm
5	Evaluation of the Community Energy Saving Programme http://www.decc.gov.uk/en/content/cms/funding/funding_ops/cesp/cesp.aspx
6	Evaluation of the delivery and uptake of the Carbon Emissions Reduction Target http://www.decc.gov.uk/en/content/cms/funding/funding_ops/cert/cert.aspx
7	Evaluation synthesis of energy supplier obligation policies http://www.decc.gov.uk/assets/decc/11/funding-support/3340-evaluation-synthesis-of-energy-supplier-obligation.pdf
<i>The following research has been uploaded to this website:</i> http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx	
8	Analysis of Green Deal measures – payback in the non-domestic sector, with separate Excel spreadsheet
9	Green Deal Consumer Research - RESEARCH SUMMARY, Understanding Potential Consumer Response to the Green Deal
10	Green Deal Consumer Research – Findings from a consumer survey on the potential response to the Green Deal
11	Annex A: Topline Findings, Annex B: Data Tables
12	Green Deal Consumer Research – understanding consumer needs and wants
13	Green Deal Consumer Research – Potential response to the Green Deal by the private rented sector
14	Green Deal and Local Authorities
15	The Green Deal Household Model Assumptions Document

Evidence Base

Ensure that the information in this section provides clear evidence of the information provided in the summary pages of this form (recommended maximum of 30 pages). Complete the **Annual profile of monetised costs and benefits** (transition and recurring) below over the life of the preferred policy (use the spreadsheet attached if the period is longer than 10 years).

The spreadsheet also contains an emission changes table that you will need to fill in if your measure has an impact on greenhouse gas emissions.

Annual profile of monetised costs and benefits* - (£m) constant prices (please see attached overleaf)

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1 INTRODUCTION

This document accompanies the consultation Green Deal and the new Energy Company Obligation (ECO) consultation on Secondary Legislation. It provides an assessment of the combined impacts of two policy interventions: the Green Deal and the Energy Company Obligation (ECO).

In the domestic market, the Green Deal and the ECO are designed to increase the uptake of energy efficiency measures and thereby reduce UK energy demand, greenhouse gas emissions and the costs of heating homes relative to the 'do nothing' counterfactual. The Green Deal would also be introduced into the non-domestic buildings market but there would be no ECO requirement. The next step for the implementation of these policies is to lay secondary legislation under the Energy Act (2011) and modify energy supplier licences.

This document provides an assessment of the aggregate impacts of the policy package under the central working scenario for the policies and an options appraisal for each implementation decision.

1.1 Structure of the document

The document has the following structure:

- **Background.** This section explains the policy objectives and the current policy context.
- **Central working option.** This section describes the vision for how the Green Deal and the ECO would work. The description is built on the preferred options for the detailed design decisions for the two policy mechanisms.
- **Rationale.** This section assesses the market failures addressed by the policies and the distributional rationale.
- **Counterfactual.** This section provides a projection of the take up of energy efficiency measures over the assessment period in the scenario where the Green Deal and the ECO are NOT implemented.
- **Aggregate impacts methodology.** This section explains the analytical methodology which has been used to estimate the impact of the Green Deal and the ECO.
- **Aggregate impacts.** This section provides the headline aggregate impacts of the Green Deal and the ECO central working option relative to the 'do nothing' counterfactual. Impacts include additional take-up of energy efficiency measures, energy savings, greenhouse gas reductions, distributional and wider impacts.
- **The Green Deal mechanism and the Energy Company Obligation options assessment.** This section summarises the detailed design decisions for the Green Deal and assesses the options for the design of the ECO policy mechanism.
- The Impact Assessment is completed by a **competition impact assessment**, a **health impact assessment**, an **equalities impact** assessment and a section on **post-implementation review**.
- **Annexes.** The annexes provide further detail on the analytical underpinnings for the impact assessment. They include the analytical assumptions that have been agreed across Government for the costs and energy savings from energy efficiency technologies as well as more detail on the modelling methodologies and the consumer survey commissioned by DECC to inform the modelling and more detailed outputs from the modelling runs carried

out for this impact assessment. A further annex provides a detailed discussion of the decisions required for the implementation of the Green Deal mechanism.

1.2 Summary

The IA identifies market failures and barriers which act to reduce the take-up of energy efficiency measures. There is also a distributional motivation for deploying heating and energy efficiency measures to low income and vulnerable households. Together these provide the rationale for Government intervention. Without intervention, UK carbon budgets will not be met cost-effectively, key technologies for long term mitigation targets (such as solid wall insulation) will not be deployed, more households will be in fuel poverty and UK dependence on imported fossil fuel will not be reduced.

The current market for energy efficiency measures in the domestic sector is heavily reliant on existing Government intervention which addresses a number of the market failures and barriers. In the non-domestic sector, fiscal incentives and requirements to monitor and report energy use have been used to encourage energy efficiency.

The most significant instrument in the domestic sector is a supplier obligation called the Carbon Emissions Reduction Target (CERT) which will end in December 2012. The dominant strategy for suppliers to meet their CERT targets has been to promote subsidised loft and cavity wall insulation. Under the 'do nothing' counterfactual, where there is no policy intervention replacing CERT, take-up rates for these energy efficiency measures are projected to collapse in 2013. For instance, cavity wall insulation has been installed at a rate of around 500,000 properties per year over the last three years (2008 – 2010). The Business as Usual, or counterfactual, take-up of cavity wall insulation from 2013 (where there is no obligation on suppliers to deploy measures and householders face the full cost of measures) is projected with modelling based on consumer preferences to fall to around 30,000 installations per year, about 5% of current rates. A further challenge for domestic energy efficiency policy is the diminishing opportunities for filling lofts and cavities owing to the success of current supplier obligations. The next generation of domestic energy efficiency policy is also targeting the delivery of measures, such as solid wall insulation, to harder to treat homes.

Three policy options are considered.

- Option 1: Implementation of the Green Deal mechanism only.
- Option 2: Implementation of the Green Deal mechanism alongside an Energy Company Obligation (ECO) obliging suppliers to meet a carbon target for deployment of energy efficiency measures in hard to treat homes and an Affordable Warmth target for the installation of heating and insulation measures in low income and vulnerable homes; and
- Option 3: As option 2 but with higher carbon and Affordable Warmth targets.

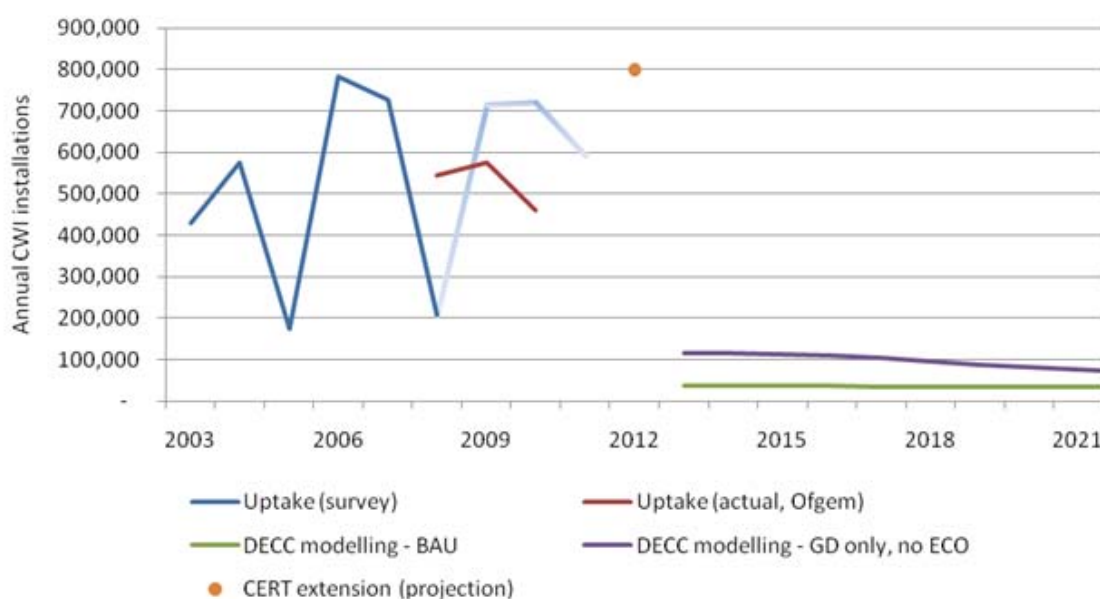
Under all three policy options there is an accelerated uptake of energy efficiency measures relative to the counterfactual of no further policy. The policy options all show a positive net present value.

Under option 1, the Green Deal mechanism acting on its own would affect take-up in several ways. It eases credit constraints for the 52% of households whose marginal finance cost would be to increase their existing unsecured personal borrowing, or credit card debts. The Green Deal also increases customer awareness and confidence. It provides advice for consumers and assurance of the quality and effectiveness of energy efficiency installations. Finally, some consumers would be

attracted by the Green Deal charge used to repay the costs of installation being attached to the property not the individual – particularly those who do not expect to remain in a property long enough for the investment in energy efficiency to pay back. In the domestic sector, the Green Deal also has a distributional benefit relative to a supplier obligation – the costs of installation are paid for by the beneficiaries of the measures rather than being socialised across all domestic energy consumers bills.

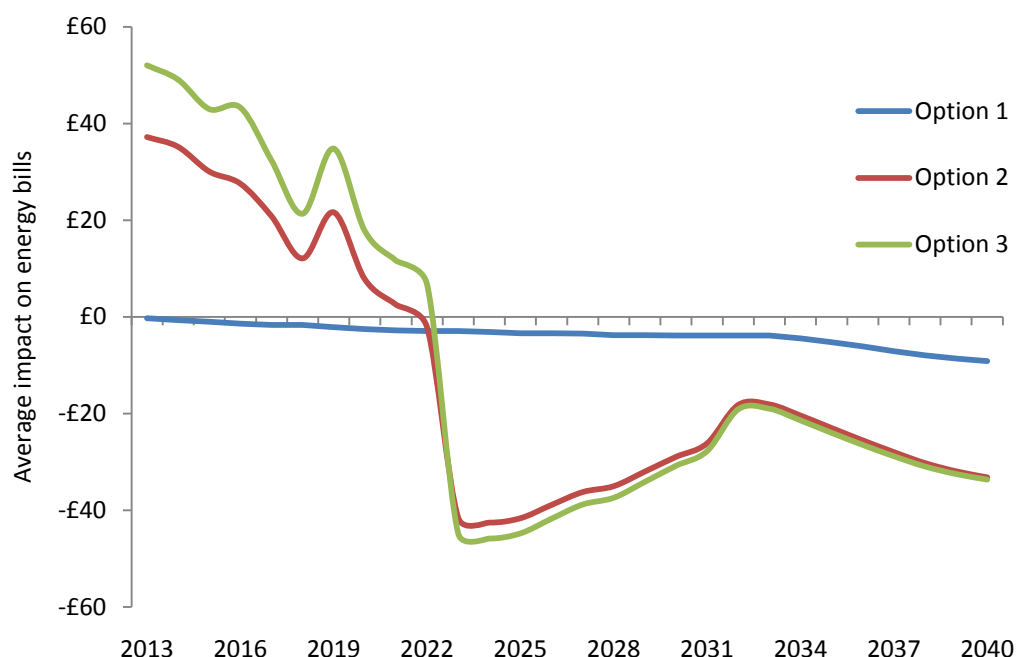
However, take-up of measures under option 1 is relatively low. There is limited take-up of solid wall insulation and installation rates for cavity wall insulation are around 15% of the rate achieved under the current CERT policy (see Figure 1 below). There is some additional take-up of energy efficiency measures in the non-domestic sector.

Figure 1: Historic and projected CWI installations under CERT, the counterfactual and option 1



Initially the Green Deal charge is expected to be roughly equal to the energy bill savings from the installation of measures. Over time, it is expected that average energy bill savings from this option would increase. This is the result of projected increases in energy prices, and the maturation of Green Deal plans. Figure 2 illustrates this effect for Option 1, and presents the average domestic energy bill impacts of all three policy options relative to the counterfactual.

Figure 2: Average domestic energy bill impacts of the three policy options relative to the counterfactual



Under option 2, the Green Deal and the ECO are complementary. Faced with the need to meet their obligation, suppliers would need to synthesise demand for measures in hard to treat homes and low income and vulnerable households. Demand would be synthesised through a combination of marketing, partnerships and importantly the offer of up front subsidies for those installing qualifying measures.

Subsidies could be combined with Green Deal finance. ECO companies would face inescapable, legally-binding targets which they would have to meet, and would want to meet at the least possible cost to themselves. Unlike current schemes (where there are only limited opportunities for matched-funding to offset their own subsidy), under the Green Deal they would be likely to want to work alongside organisations offering Green Deal finance, and have an interest in the Green Deal market exploiting all possible consumer opportunities.

In early 2011, DECC carried out a consumer survey of more than 2000 individuals who undertook more than 10,000 choice experiments, revealing preferences towards the main energy efficiency measures. Demand modelling has used these stated consumer preferences to estimate the level of subsidy that would have to be offered by suppliers to synthesise sufficient demand to meet their obligation. Further details on the Green Deal Household Model are in Annex B, and details of the consumer research are in Annex D.

In the modelling, the remaining cost of measures, after the upfront ECO subsidy, must meet the Green Deal's "Golden Rule" (that expected energy bill savings are greater than or equal to Green Deal charges in each year); this enables the remaining cost to be financed through the Green Deal mechanism (see section 19.1.2). Meeting the Golden Rule is a necessary but not sufficient condition for a measure to be taken-up. The subsidy level is estimated by the level that is sufficient to drive demand (including overcoming consumer aversion to solid wall insulation and their perception of hidden costs of installation). The modelling of consumer preferences indicates that the level of subsidy that would be required to drive demand for solid wall insulation is substantial. On average the payment of ECO subsidy to householders is estimated at 57% of the installation cost of the solid wall insulation installed under option 2.

The subsidy costs for suppliers and the costs of administering the scheme would be expected to be passed through onto consumer energy bills. For domestic energy consumers, over the operational period of the ECO policy, the passed through costs of the obligation exceed the annual energy bill savings achieved by the deployed energy efficiency measures. Energy bills would increase relative to the counterfactual up to 2022, but would be lower beyond that date. Beyond 2022 there would be ongoing energy bill savings from the installed energy efficiency measures but no further pass through costs of the obligation on bills (see Figure 2).

The costs to suppliers do not carry an opportunity cost in the form of alternative investments that could have been made by suppliers. Their costs in meeting the obligation are expected to be passed through to consumers through higher energy prices— in a competitive market where all suppliers face obligations which increase their marginal cost of supply, all suppliers would be expected to make a corresponding increase in their energy prices. This increase in energy prices would not have been profitable in a competitive market without the supplier obligation. The revenue used by suppliers to pay for the supplier obligation is only available when the obligation is in place.

Option 3 is similar to option 2 apart from the scale of ambition for the ECO, which is higher. There is a corresponding increase in the quantity of energy efficiency measures that the suppliers are obligated to deploy. However, to increase the demand for Solid Wall insulation sufficiently, demand must be synthesised in households that are less willing to pay for it. Higher subsidies must be offered by suppliers, on average the ECO subsidy payments to households are equal to 57% of the installation cost under option 3. Higher subsidies imply higher costs to suppliers which increases the costs passed through onto domestic energy bills. Again energy bills would be higher to 2022 than in the counterfactual, but lower thereafter.

Table 1: Headline social impacts of the Green Deal policy package

		Option 1	Option 2	Option 3
Costs (£m)	Installation costs	£3,219	£13,764	£14,479
	Hidden costs ²	£1,760	£4,113	£4,079
	Assessment costs	£434	£912	£928
	Finance costs	£673	£1,540	£1,525
	GD mechanism costs	£151	£222	£224
	Total costs (£m)	£6,237	£20,550	£21,234
Benefits (£m)	Energy savings (Variable element)	£5,526	£16,841	£17,174
	Comfort benefits	£993	£3,760	£3,854
	Air quality benefits	£360	£1,313	£1,323
	Lifetime non-traded carbon savings	£1,607	£5,377	£5,385
	Lifetime EU Allowance savings	£851	£1,917	£1,996
	Total benefits (£m)	£9,337	£29,209	£29,731
Total (£m)	Net Present Value (£m)	£3,099	£8,659	£8,497
	Equity-weighted NPV	£3,771	£10,986	£9,864

² Additional costs include the loss of internal living space, and hassle and disruption costs (the cost assumptions used are based on published guidance). These costs are largely driven by the installation of internal SWI, but are not fully reflected in the consumer preference coefficients. These costs fall between options 2 and 3 because a number of households switch from installing internal to installing external SWI. This is because as the subsidy is increased external SWI meets the Golden Rule in a larger number of cases, and the consumer choice coefficients lead some households to switch measure.

Carbon & Energy savings	2020 Non-traded carbon savings (MtCO ₂ pa)	1.26	2.11	2.02
	- Domestic GD and CT measures	0.36	2.49	2.53
	- Domestic AW measures	0.00	-1.28	-1.41
	- Non domestic sector	0.90	0.90	0.90
	2020 Traded carbon savings (MtCO ₂ pa)	1.29	3.77	3.96

Table 2: Breakdown on non-traded carbon emissions for the different options

	Option 1	Option 2	Option 3
Carbon Budget 2			
Total Non-traded carbon savings (MtCO ₂ pa)	1.93	5.57	5.49
- From domestic insulation measures (MtCO ₂ pa)	0.77	6.29	6.42
- From domestic AW heating measures (MtCO ₂ pa)	0.00	-1.88	-2.08
- From non-domestic sector (MtCO ₂ pa)	1.16	1.16	1.16
Carbon Budget 3			
Total Non-traded carbon savings (MtCO ₂ pa)	6.14	11.26	10.91
- From domestic insulation measures (MtCO ₂ pa)	1.77	12.44	12.64
- From domestic AW heating measures (MtCO ₂ pa)	0.00	-5.54	-6.10
- From non-domestic sector (MtCO ₂ pa)	4.37	4.37	4.37
Carbon Budget 4			
Total Non-traded carbon savings (MtCO ₂ pa)	6.37	12.63	12.32
- From domestic insulation measures (MtCO ₂ pa)	2.02	13.91	14.15
- From domestic AW heating measures (MtCO ₂ pa)	0.00	-5.63	-6.18
- From non-domestic sector (MtCO ₂ pa)	4.35	4.35	4.35

This Impact Assessment combines a range of evidence and assumptions. DECC are keen to receive responses to the consultation that strengthen the evidence base for the Green Deal and the ECO to enable the estimate of the policies impacts to be refined. In particular DECC would welcome further evidence on the following:

- What is the technical potential for deployment of energy efficiency measures? (see section 5.1);
- What are the likely costs and benefits of energy efficiency measures including innovative measures, estimates of comfort taking and rebound effects? (see Annex A);
- What is the potential for the installation industry to ramp up capacity – particularly for the installation of solid wall insulation? (see section 5.3);
- What are consumer preferences towards energy efficiency measures? (see Annex D);
- What is the frequency of unexpected cost arising during installation of measures, and what are the associated market practices? (see section 19.1.2.7);
- What is the pricing behavior of energy suppliers, and what is the likely nature of the pass through of the costs of the obligation? (see section 9);
- What are the likely costs and benefits associated with detailed decisions on Green Deal legislation? (see Annex F);
- What is the nature of the impact of the accreditation requirements of the Green Deal for business?; and
- For the ECO (see section 9);

- What is the appropriate target metric?
- What is the best way to allocate the obligations?
- Should there be a distributional safeguard?

2 BACKGROUND

2.1 Government Objectives supported by Improved Energy Efficiency

Implementation of Green Deal and the ECO would support three Government objectives:

- reduce UK Greenhouse Gas Emissions (GHGs);
- maintain the security of UK energy supply; and
- address the drivers of fuel poverty.

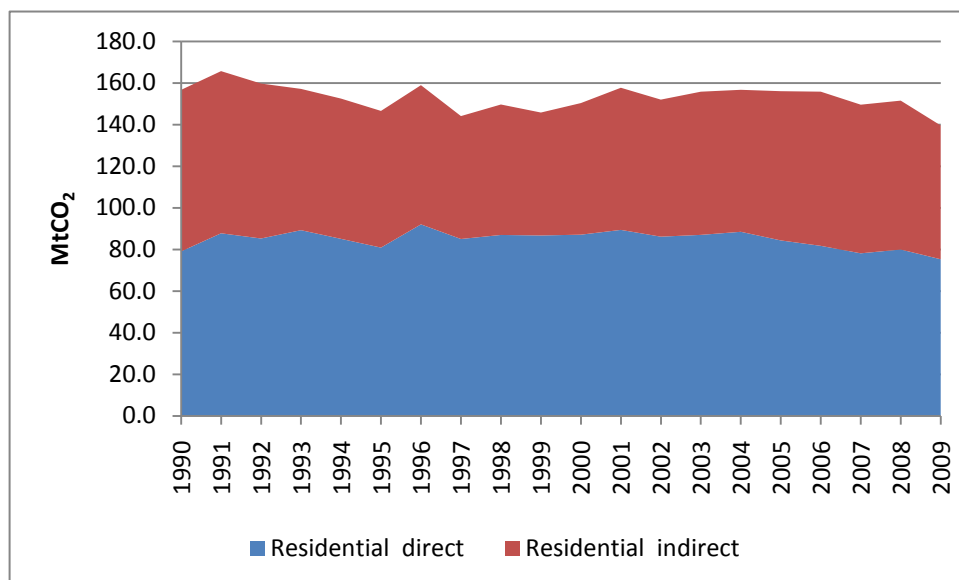
Improved energy efficiency would also mitigate health impacts arising from housing which offers inadequate thermal comfort, improve productivity and reduce the costs of meeting the UK's renewable energy target.

2.1.1 Reducing Greenhouse Gas Emissions

A primary aim of the Green Deal and the ECO is to contribute to meeting the UK's legally binding GHG reduction targets at the lowest possible cost to society. Climate change results from the build up of GHGs in the atmosphere. The Climate Change Act (2008) created a legal commitment for the Government to reduce UK greenhouse gas emissions by at least 80% by 2050 relative to 1990. The first three carbon budgets (2008-2022) mean that UK GHG emissions must fall by at least 34% in 2020 relative to 1990 levels. The fourth carbon budget (2023-2027) set in June 2011 requires a 50% reduction in UK GHG emissions by 2025 relative to 1990.

Emissions from buildings (non-domestic³ and domestic) were 93MtCO₂e direct and 111MtCO₂e indirect (from electricity consumption) in 2009. This was 43% of total UK emissions in 2009⁴. Carbon budgets would not be able to be met without reductions in emissions from the built environment.

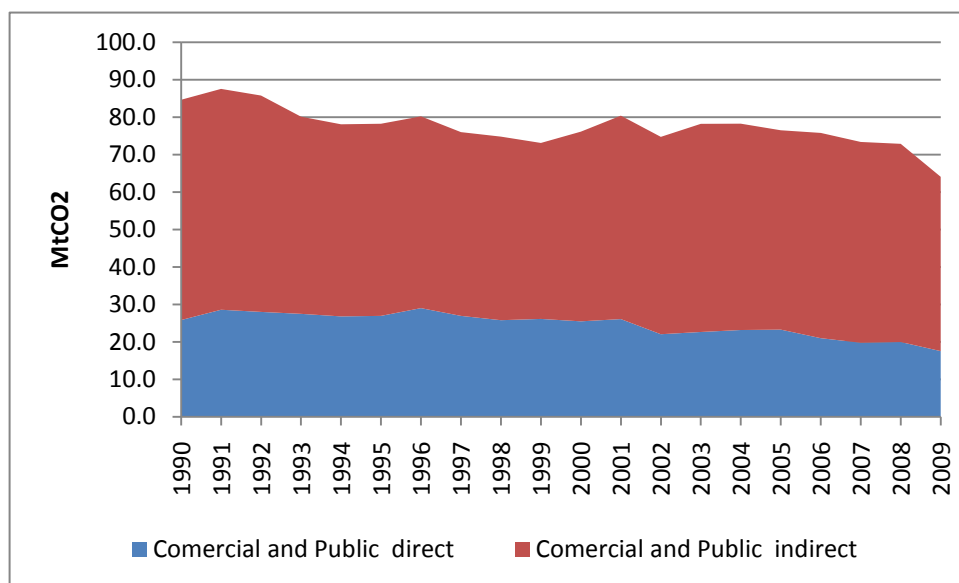
Figure 3: Historic emissions from the domestic sector (1990 to 2009) – disaggregated by direct and indirect emissions



³ Only commercial and public buildings are considered, however some industrial businesses will be included in the non-domestic category.

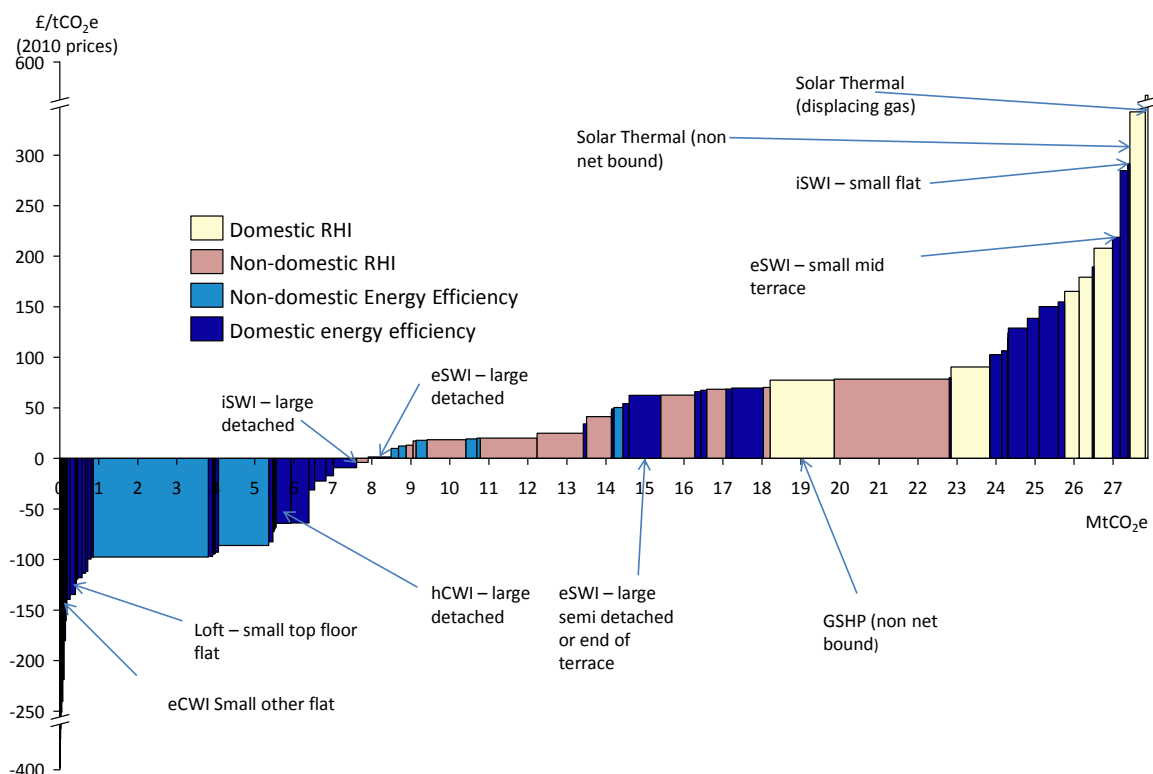
⁴ http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/2009_final/2009_final.aspx

Figure 4: Historic emissions from the commercial and public sector (1990 to 2009) – disaggregated by direct and indirect emissions



Both the non-domestic and household sectors have the potential to play a big role in delivering the emissions reductions required to meet UK carbon budget targets cost-effectively. Cost-effective abatement measures are available in both sectors. Figure 5 demonstrates that the majority of cost effective measures in the domestic and non-domestic sectors are energy efficiency measures. However, there are a range of market failures and barriers that prevent the uptake of these abatement measures (discussed below).

Figure 5: Marginal Abatement Cost curve for domestic and non-domestic energy efficiency and renewable heat incentive (RHI) measures.⁵



6

2.1.2 Maintaining Security of Energy Supply

The UK needs secure, clean and affordable energy, and both consumers and businesses expect reliable light, warmth and fuel when they need it. It is a core function of Government to ensure that these expectations are met. However, the UK faces a series of risks to energy security, which are often global in nature.

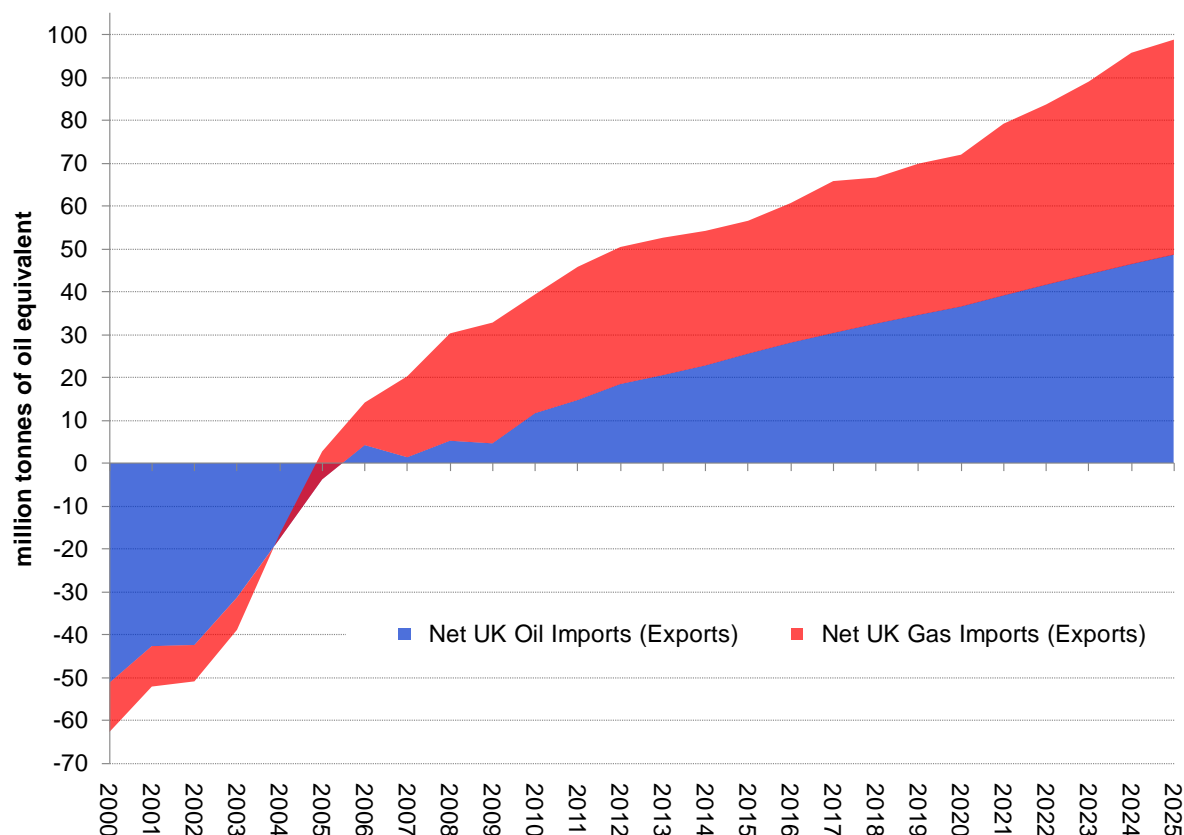
The UK is increasingly dependent on fossil fuel imports, with the result that the UK is becoming more exposed to risks from rising global demand, limitations on production and price volatility. These risks are unlikely to diminish in the short or medium term. Figure 4 shows that the UK has become a net importer of gas and oil. Net exports of 66 Megatons of Oil Equivalent (Mtoe) in 2000 became net imports totalling 41 Mtoe in 2010. This equates to UK production of oil and gas falling from

⁵ Domestic energy efficiency data has been calculated through the GDHM. The number of potential installations for each measure comes from the English House Condition Survey, the Scottish House Condition Survey and Living in Wales survey. The energy savings each measure delivers is estimated using SAP 2005, calibrated by wall inaccessibility, underperformance, and comfort taking. Non-domestic energy efficiency data is based on BRE's Non-Domestic Buildings Energy and Emissions Model (N-DEEM). RHI data is taken from modelling carried out by NERA/AEA for the renewable heat incentive and is consistent with the analysis done for the RHI Impact assessment published in March 2011.

⁶ hCWI – hard to treat cavity wall insulation; eSWI – external solid wall insulation; iSWI – internal solid wall insulation

134% of national demand in 2000 to only 76% of demand in 2010. Recent published projections put this figure at only 52% in 2020⁷.

Figure 4: Net energy imports 2000-2025 (post 2010 numbers are projections)



Three complementary actions are required in order to adapt to these pressures:

- Ensuring the country has strong, resilient markets and infrastructure;
- Securing our energy supplies through greater use of domestic supplies and managing our relationships with other countries; and
- Reducing domestic demand for energy

It is predominantly the last of these on which the Green Deal and the Energy Company Obligation would impact. The take-up of energy efficiency measures in buildings brought about by these policies would reduce UK energy consumption which would in turn contribute to the reduction in the UK's dependence on imported energy. By reducing UK demand for energy it would be easier to satisfy fuel needs. The benefits of this not only include reducing the risk of interruption to energy supply, but they also include reducing price uncertainties that can impact negatively on the ease with which firms plan their businesses and households afford to satisfy their energy needs.

2.1.3 Reducing Fuel Poverty

A primary aim of the ECO is to provide an efficient mechanism for addressing a root cause of fuel poverty - homes with poor levels of thermal efficiency. A household is defined as fuel poor if it

⁷ https://www.og.decc.gov.uk/information/bb_updates/chapters/production_projections.pdf

would need to spend more than 10% of its income to achieve an adequate level of warmth⁸ in the home. The Government has a statutory target to eradicate fuel poverty, as far as reasonably practicable, in England by 2016. Estimates suggest around 4.1 million households were fuel poor in England in 2011⁹. Scotland and Northern Ireland have targets to eliminate fuel poverty as far as is reasonably practicable by 2016 and the Welsh Assembly Government has a target to ensure that no household is living in fuel poverty by 2018. The Secretary of State has commissioned Professor John Hills to lead an Independent Review of the fuel poverty target and definition, due to report in early 2012.

There are three key drivers of fuel poverty; household income, domestic energy prices and the thermal efficiency of the home. Poorer thermal efficiency of the home results in a larger energy consumption requirement to heat the home to an adequate standard. In 2009, around 55% of houses with a SAP¹⁰ rating of 30 or below were lived in by fuel poor households and around 60% of all fuel poor households reside in a home with a SAP of 50 or below¹¹.

Delivering energy efficiency and heating measures and providing direct support with energy bills are the most cost-effective means of delivering progress against this target. The delivery of heating and insulation measures to vulnerable low income households through the Energy Company Obligation would be a key element of the Government's efforts tackle fuel poverty.

2.1.4 Improving Health

Many low-income and vulnerable households under-heat their homes. Living in cold conditions is linked to a number of detrimental physical and mental health impacts (particularly the risk of excess winter deaths in the elderly; the risk of developing respiratory disease among children; and the risk of diseases such as pneumonia and asthma among adults)¹². Improved thermal efficiency, leading to increased indoor temperatures would have a positive impact on the health and wellbeing of household members¹³. This would lead to improved social welfare, savings in health care provision as a result of fewer visits to GPs/hospitals; smaller losses to businesses as a result of worker ill health; and fewer lost school days as a consequence of child ill-health and a reduction in the consequent required care in these periods¹⁴.

2.1.5 Improving Productivity

Greater energy efficiency allows the same level of energy services to be produced for less energy input. For business, cost-effective energy efficiency technology can enhance productivity. Increased productivity for business boosts business competitiveness. A recent Defra study estimated that there was the potential for resource efficiencies (including energy efficiency) which could save

⁸ Defined as 21°C for the main living area and 18°C for other rooms.

⁹ <http://www.decc.gov.uk/assets/decc/Statistics/fuelpoverty/2181-annual-report-fuel-poverty-stats-2011.pdf>

¹⁰ Standard Assessment Procedure

¹¹ http://www.decc.gov.uk/en/content/cms/statistics/fuelpov_stats/fuelpov_stats.aspx

¹² For more discussion of the health implications of cold housing see; "The Health Impacts of Cold Homes and Fuel Poverty", May 2011, Friends of the Earth and Marmot Review Team, http://www.foe.co.uk/resource/reports/cold_homes_health.pdf

¹³ For an overview of the health benefits of energy efficiency schemes, see Liddell, C. and Morris, C. (2010). Fuel Poverty and Human Health: A Review of Recent Evidence. *Energy Policy*, 38, 2987 – 2997.

¹⁴ Chapman, R. et al. (2009). Retrofitting houses with insulation: A cost-benefit analysis of a randomised community trial. *Journal of Epidemiol and Community Health*, 63, 271-277.

business amongst commercial and industrial sectors £1.06 billion pounds through the take-up of low or zero cost energy saving measures which payback within a year.¹⁵ For homes, cost-effective energy efficiency can increase welfare by reducing expenditure on energy, enabling increased expenditure on other welfare enhancing activities.

2.1.6 Reducing the costs of the UK's Renewable Energy Target

The EU directive on renewable energy requires that 15% of UK final energy consumption in 2020 is generated from renewable energy sources.¹⁶ This directive will see renewable technologies deployed at scale across Europe thereby driving down their costs and reducing EU reliance on imported fossil fuels. The UK can meet its target through a combination of deploying renewable energy and reducing final energy consumption – the required level of renewable energy deployment would reduce as final energy consumption goes down.

At the margin, renewable energy generation is expensive. Delivering a MWh of renewable energy in 2020 requires the commitment to technologies with lifetimes in excess of 20 years. Over that lifetime, the marginal net present cost to the UK of delivering a MWh within the target year of 2020 has been estimated to be in excess of £700¹⁷. In contrast, there is substantial potential for highly cost-effective energy efficiency measures. A greater emphasis on energy efficiency and reducing final energy consumption could reduce the overall cost of meeting the UK's renewable energy target.

2.2 Policy context

2.2.1 Current Domestic Energy Efficiency Schemes

A supplier obligation has been in existence for a number of years now, starting with the Energy Efficiency Commitment in 2002 and currently embodied by the Carbon Emissions Reduction Target (CERT) extension¹⁸.

CERT applies in England, Scotland and Wales and commenced on 1st April 2008, concluding on 31st December 2012. Its objective is to drive an increase in cost effective and long lived energy efficiency measures by helping overcome barriers preventing consumers from accessing and taking up energy efficiency measures. Furthermore it aims for the benefits from improved energy efficiency to be delivered in an equitable way across income groups. Through CERT, Government sets a carbon savings obligation on electricity and gas suppliers who have more than 50,000¹⁹ customers. Suppliers must promote (e.g. by marketing or through subsidy) measures to domestic energy users which can be proven to reduce households' carbon footprint through increased energy efficiency or reduced energy demand. Failure to meet the obligation would result in a large penalty. Certain percentages of the carbon saving obligation have to be achieved in a priority group, and within that a super

¹⁵ See Oakdene Hollins report for Defra (2011) on 'The further benefits of business resource efficiency' (http://randd.defra.gov.uk/Document.aspx?Document=EV0441_10072_FRP.pdf).

¹⁶ http://ec.europa.eu/energy/renewables/targets_en.htm

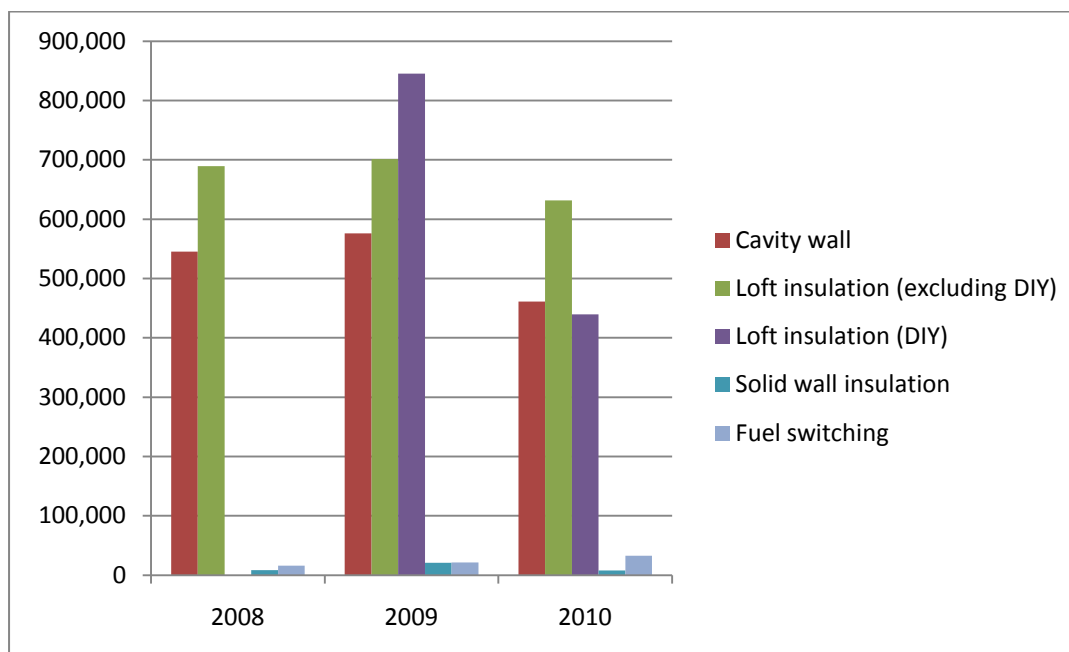
¹⁷ Based on deployment of offshore wind turbines with a lifetime of 23 years.

¹⁸ http://www.decc.gov.uk/en/content/cms/what_we_do/consumers/saving_energy/cert/cert.aspx

¹⁹ On 9th June 2011, Government announced that, following consultation, the level of threshold would be increased to 250,000 customers so as to ensure it maintained small firms growth and competitiveness. This will come into effect for the final year of operation of CERT and CESP.

priority group of low income, vulnerable and elderly households²⁰. Under the extension to CERT, at least 68% of the carbon savings must be achieved through professionally installed insulation measures. Suppliers are able to generate credit for carbon savings from DIY insulation by subsidising the sale of insulation materials through DIY outlets.

Figure 6: Number of measures delivered under the CERT programme 2008-10



The Community Energy Saving Programme (CESP)²¹, has the twin objectives of significantly reducing the fuel bills of some of those living in deprived areas (defined by Lower Super Output Areas in the bottom decile of the income domain of the Indices of Multiple Deprivation in England, the lowest 15% in Wales and the lowest 15% of Data Zones in Scotland); and contributing to the improvement of the energy efficiency of the existing housing stock in order to reduce the UK's GHG emissions. It provides incentives for "whole house" treatments, for more costly measures such as solid wall insulation, and for intensive area based approaches to the uptake of household energy efficiency. It runs from September 2009 to 31st December 2012.

CESP places an obligation on electricity generators as well as energy suppliers. However, the Government announced on 8 December 2010 that generators would not be subject to the future Energy Company Obligation (see below).

DECC has undertaken independent evaluations of CERT and CESP, which have provided part of the evidence base to inform the development of the ECO. The evaluations examined the design and delivery of the policies, the uptake of energy efficiency measures, and the resultant impacts for households. Analysis of the impacts of energy efficiency measures delivered under the Energy Efficiency Commitment (EEC) has also been considered (due to a lag in data availability this was the latest data available). A summary report which brings together findings from the evaluations is

²⁰ More detail on the priority and super priority group can be found in the CERT extension IA:

<http://www.decc.gov.uk/assets/decc/consultations/certextension/121-iacertextension.pdf>

²¹ <http://www.decc.gov.uk/en/content/cms/consultations/open/cesp/cesp.aspx>

published alongside the impact assessment (the underlying evaluation reports are also published)²². They key findings of the evaluations are:

- Under CERT and CESP energy suppliers have developed multiple delivery routes and established partnerships with a wide range of organisations to deliver energy efficiency measures. The most effective delivery routes were found to be schemes involving the local authority, which was considered crucial to reassure householders of a schemes credibility and therefore drive uptake.
- The CERT evaluation found that the unsubsidised cost of cavity wall insulation was quoted by stakeholders to be £500-600, while loft insulation was quoted as costing £300-500. With the energy supplier subsidies stimulated by CERT, both professionally-installed loft insulation and cavity wall insulation have been made available to Priority Group customers for free, and offered to non-Priority Group customers for £75-250.
- Interviews with energy suppliers in the CERT/CESP evaluation²³ suggests that most of the major energy suppliers would not have delivered energy efficiency measures at all without CERT. Others felt they might have done so on a smaller scale. There was also consensus amongst stakeholders that the CERT subsidy from energy suppliers was highly significant in driving the market for loft and cavity wall insulation, rather than true demand from householders. Consequently, there was an associated concern amongst delivery stakeholders that demand for these measures would decrease drastically in response to a change or stopping the policy. The household survey also found that a lot of priority group customers believed that they had paid the full price of a measure when in fact it had been subsidised.
- In the main, energy suppliers contracted delivery partners by setting the price per tonne of carbon saved. OFGEM reports that by the end of the third year three of the six obligated energy suppliers had traded between 1 and 5% of their carbon savings²⁴.
- The research suggests that CERT has successfully driven cost-effective delivery of relatively low-cost energy efficiency measures (especially loft and cavity wall insulation) and led to increased capacity in the supply chain. However, there was also consensus amongst delivery stakeholders that the CERT subsidy from energy suppliers was highly significant in driving

²² Evaluation synthesis of energy supplier obligation policies, DECC, 2011
<http://www.decc.gov.uk/assets/decc/11/funding-support/3340-evaluation-synthesis-of-energy-supplier-obligation.pdf>

²³ Evaluation synthesis of energy supplier obligation policies, DECC, 2011
<http://www.decc.gov.uk/assets/decc/11/funding-support/3340-evaluation-synthesis-of-energy-supplier-obligation.pdf>

²⁴ OFGEM (2011), "A review of the third year of the Carbon Emissions Reduction Target"
<http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=233&refer=Sustainability/Environment/EnergyEff>

the market for loft and cavity wall insulation, with an expectation amongst many consumers for free or cheap measures rather than true demand for insulation.

- Although still in fairly early stages of scheme completion, CESP has successfully incentivised delivery of higher cost measures such as solid wall insulation using an area-based approach, which CERT has comparatively struggled to do. Both schemes, however, have focused on promoting such higher cost measures only in social housing. Additionally, although CESP has helped stimulate higher cost measures, the broader complexity of its scoring arrangements is widely considered a barrier to development of schemes.
- Key drivers for uptake of energy efficiency measures were expectations of energy bill savings, and desire to make the home warmer / easier to heat; which were realised as the main direct benefits experienced by householders. This was confirmed by evidence of actual reductions in annual household gas consumption following installation of measures.
- CERT has helped address barriers to uptake of measures including information deficiencies, uncertainty about benefits, access to capital, and skills and capacity in the market. However, some key barriers to uptake remain, including perceptions of high up-front costs, often due to lack of awareness about offers and/or energy efficiency measures generally.

2.2.2 Current Fuel Poverty Programme

DECC's Fuel Poverty Programme aims to focus resources on more of the most low income and vulnerable to enable them to afford to heat their homes to an adequate level. Upgrading the thermal efficiency of the dwelling is usually the most cost-effective way of removing a household from fuel poverty on a sustained basis. However, upgrading the housing stock can only be achieved gradually, so it is important that other types of support are available to provide direct support to households. As such, there are currently a range of policies that contribute towards addressing the three drivers of fuel poverty: incomes (Winter Fuel Payments and Cold Weather Payments), energy prices (Warm Home Discount) and household thermal efficiency (currently CERT and Warm Front).

2.2.3 Current Non-domestic energy efficiency policies

Unlike some of the policies in the domestic sector, where energy suppliers have been obliged to intervene in the market, policies in the non-domestic have looked to the occupants and owners of buildings to drive energy efficiency improvements.

The CRC Energy Efficiency Scheme (CRC) targets non-energy intensive consumers of energy. It covers public and private sector organisations who tend to be less energy intensive than those covered by Climate Change Agreements (see below), but consume more energy than most small to medium-sized organisations. All those outside CCAs but with half hourly meters with an annual consumption greater than 6GWh of energy will be covered by the CRC. It is estimated that 53MtCO₂e of non-domestic building emissions are covered by CRCs, based on initial CRC returns.²⁵

²⁵ The CRC returns detail carbon emissions from organisations covered by the CRC. The exact figure for buildings as opposed to process emissions cannot be obtained for industrial organisations.

The CRC encourages organisations to improve their energy efficiency in two ways. The purchase of CRC allowances provides a financial incentive to reduce energy use. Secondly, it mandates that organisations report their energy consumption and emissions figures.

2.2.3.1 Climate Change Agreements

Climate Change Agreements (CCAs) are awarded to organisations working in 54 energy intensive industrial sectors and who meet certain qualification criteria. The agreements impose energy efficiency targets, in return for which the organisations are entitled to discounted levels of the Climate Change Levy, an energy tax. Although it primarily covers energy used in industrial processes, some of the energy use covered by CCAs can relate to buildings.

2.2.4 Overlapping policies

In addition to overarching policies targeting energy efficiency, for both the domestic and non-domestic sectors there are a number of overlapping policies that must be accounted for when considering the impact of the Green Deal and the ECO policy package. Overlapping policies include building regulations, products policy (including mandatory minimum standards of energy efficiency for energy using products), energy taxation (such as the Climate Change Levy), the Renewable Heat Incentive and Feed in Tariffs. These policies can target the same energy efficiency measures as the GD and the ECO or reduce the carbon intensity of energy supply thereby reducing emissions savings from energy efficiency measures. These policies are accounted for in the generation of the counterfactual (see section 6).

2.3 The Market for improvements to building energy efficiency

This section briefly summarises the current market for the installation of energy efficiency measures. DECC is undertaking more detailed analysis of the market potential for energy efficiency measures, the findings of which will be reported in the final Impact Assessment.

2.3.1 Domestic Buildings

The market for energy efficiency measures in the domestic residential sector has been boosted by the supplier-led policies (highlighted above). The overall market size in 2007 was estimated at £8.25bn²⁶, mainly attributable to double glazing, insulation, boiler replacement and wet appliances. Heat controls, efficient lighting and micro-generation accounted for the smallest share. More recent figures on some sub-sectors of this market are presented in the table, below. DECC is undertaking further work to build on its understanding of the energy efficiency market that will be available for the final impact assessment, expected in 2012.

Table 3: Market size of energy efficiency measures

Measure	Market Size (£bn) ²⁷	Installations	Year
Lighting	0.6	81.6m	2010
Space and Water Heating	0.7	1.5m	2010

²⁶ Source: *Assessment of the Size of the UK Household Energy Efficiency Market*; Element Energy Ltd and Quantum Strategy & Technology Ltd; November 2008

²⁷ Source: AMA research (www.amaresearch.co.uk, reports of various dates) and *Assessment of the Size of the UK Household Energy Efficiency Market*; Element Energy Ltd and Quantum Strategy & Technology Ltd; November 2008. The methodologies used in these two studies are different.

Doors and Windows	1.9	3.7m	2009
Ventilation and Air Conditioning	0.9	1.5m	2009
Heat Pumps	0.07	6,700	2010
Insulation	0.7	(see figure 6)	2007
Solar Thermal	n/a	20,000	2010
Biomass	n/a	2,060	2010
Draught Proofing	n/a	26,000	2010
Photovoltaic Panels	n/a	75,000 ²⁸	2010/11

Within the insulation market, the majority of work is in filling lofts and cavity walls, which was the main focus of energy suppliers in order to comply with the CERT-related measures. There were just over 1 million lofts, 590,000 cavity walls and 10,000 solid walls insulated during the year to April 2011. This compares to around 1.5 million lofts, 0.7 million cavities and 21,000 solid walls over the preceding year.

The market is estimated to support around 75,000 manufacturing jobs²⁶, the majority of which are in the manufacture of glass and double glazed windows and doors. For the installation market, it is more difficult to assess the number of jobs supported because many energy efficiency measures may be installed as part of larger renovation or extension projects. It is therefore difficult to attribute a particular proportion of domestic construction jobs to energy efficiency. Specialist construction skills are not required to install windows and energy efficient boilers typically have the same installation process as inefficient ones. Estimates suggest around 3,400 installers²⁹ were employed in the insulation market in 2007/8, which covers loft and wall insulation.

2.3.2 Non-Domestic Buildings

It is difficult to assess the current size of the energy efficiency market in the non-domestic buildings as there are no delivery policies from which installation statistics are available. However, there are known trigger points where energy efficiency measures are taken up, or when the market is more likely to take steps to improve their premises' energy efficiency. These trigger points are as follows:

- Breaks in tenancy agreements: the period in between existing tenants moving out and new tenants moving into a leased premises presents an opportunity to landlords to undertake essential works and cosmetic improvements to a premises.
- Consequential improvements: the 2010 Building Regulations state that if a property over 1000m² is being extended, or a fixed building service is being installed or its capacity increased, then the energy efficiency of the rest of the property must be brought in line with the current Building Regulations standards (consequential improvements). This creates a market for energy efficiency improvements on the existing building stock.
- Major refurbishment: buildings undergo a major refurbishment every 25 years or so³⁰. This means that around four per cent of the building stock has a good opportunity to re-model as well as refurbish the internal and external space.

²⁸ Total take-up of PV panels since the launch of feed in tariffs in April 2010.

²⁹ Source: *Low Carbon and Environmental Goods and Services: an Industry Analysis*; Innovas; 2009

³⁰ Duration recommended by the Department of Communities and Local Government

In addition to these natural trigger points, there are organisations whose core business is delivering energy efficiency measures into non-domestic buildings. Energy service companies (ESCOs) and those delivering energy performance contracts rely on this market for their business models.

The market in which these companies operate is where savings from energy efficiency measures and energy management can be guaranteed. In the UK, ESCOs, or contract energy management (CEM) companies have been in existence since the 1970s, although the market is less mature than in Germany, for instance, which had an estimated 50,000 ESCO contracts running in 2005 and a market potential for 1.3m³¹. ESCO contracts typically cover refurbishments and retrofits as well as new buildings. The service can include finance and performance guarantees as well as installing significant energy efficiency measures. These contracts are most suitable for organisations that have a high, stable energy use and have capital constraints, such as the hotels and hospitals market. Service models include shared savings, guaranteed savings, and a heat service, depending on the client's needs and preferences. CEMs and ESCOs are more common in the private than the public sector.

³¹ Source: *ESCOs Around the World – Lessons Learned in 49 Countries*; Hansen, S J, P Langlois, P Bertoldi; 2009

3 The Central Working Option

This section describes the central working option for the implementation of the Green Deal mechanism and the Energy Company Obligation (ECO). It is constructed from the preferred options for each of the detailed implementation decisions for the policies and is used to assess the aggregate impacts of the policies.

3.1 Central Working Option for the Green Deal Mechanism

The Green Deal aims to increase the uptake of energy efficiency measures while simultaneously increasing the proportion of the installation cost paid for by the beneficiary of the measure rather than subsidy paid for by all energy consumers. There are two principal barriers to this in the current market: absence of a suitable financing mechanism to (part-)finance the installation of measures through the resulting savings, and lack of trust in and awareness of the current market providers.

Green Deal and the ECO would overcome the finance barrier by allowing the costs of installing energy efficiency measures to be repaid through a charge attached to a property's electricity bill. The obligation to pay the charge would pass to the new bill payer should the Green Deal improve move away. This mechanism would let householders, private landlords and businesses enjoy the benefits of energy efficiency measures without the need for their own up-front finance. Instead, the upfront costs of installing measures would be met by the Green Deal provider who would recoup their costs, including interest, through the charge attached to the electricity bill. Green Deal and the ECO would increase trust and awareness. Consumer safeguards and a remote advice service would ensure consumer confidence in the quality of the energy efficiency measures that they were installing.

The Green Deal would be, vitally, a voluntary, market driven framework. No single player would be obliged to offer consumers Green Deal plans, to assess a property, or install measures to particular standards. However, should they wish to, certain standards – set out in a Code of Practice – would have to be met. This would reassure consumers of the quality of the offer, and enable Green Deal providers to have confidence that repayments would be made.

Consumer protections³² underpin the proposed design for the Green Deal. These are intended to ensure that consumers would be confident in the arrangement they enter into – critically supporting demand for the Green Deal, and in turn helping to drive down the cost of finance. The proposed consumer protections include:

- Green Deal advisors, installers and providers would all be accredited to a publically available standard;
- Products installed would be guaranteed for the lifetime of the Green Deal plan either through their original manufacturer's warranty and guarantee or by the Green Deal

³² Further details of the principles of the consumer protection framework were published during the passage of the Energy Bill:

http://www.decc.gov.uk/assets/decc/What%20we%20do/Supporting%20consumers/green_deal/1733-consumer-protection-in-the-green-deal.pdf

provider, who would be required to extend the guarantee for the product to the lifetime of its plan if this period was not covered by the original warranty or guarantee

- Green Deal providers would have to meet the requirements of the Consumer Credit Act (which would, for example, protect against mis-selling, require providers to obtain an Office of Fair Trading (OFT) licence before offering credit, and limit early repayment charges);
- Repayments made through electricity suppliers would be regulated by Ofgem;
- disclosure of the Green Deal where there is a transfer of the liability to repay the plan; and
- right of redress through a comprehensive redress and sanctions process.

3.1.1 How the Green Deal would work in practice

Step 1: information & consumer awareness

Accredited Green Deal providers would be expected to market the Green Deal ‘offer’ to energy consumers. In addition to this, Government proposes to support a Remote Advice Service to enable interested individuals to obtain independent information, online and over the telephone, about a range of issues linked to the Green Deal.

Step 2: assessment

An accredited, impartial Green Deal advisor would undertake both a fabric assessment of the consumer’s property, and provide additional advice based on how they use energy in their home/business. It would be left to the market to decide how the costs of this assessment would be paid for. It could be paid upfront by the consumer, incorporated into the Green Deal plan, or offered free as an incentive by the Green Deal provider.

The advisor would then make a recommendation on which measures could be installed. Eligible measures must be non-portable (i.e., fixed to the property). They would indicate which measures are potentially “suitable” for finance and the amount of Green Deal finance that could be raised for particular measures, either in their entirety or part-financed from elsewhere. The calculation of how much Green Deal finance could be raised would be based on estimates of their energy bill savings taken from the bespoke assessment of the individual property.

The assessment information would be communicated to consumers in a revised Energy Performance Certificate, designed to increase understanding of the impact of energy saving measures. All recommendations would be based on an improved assessment methodology, intended to give greater assurance to consumers that savings calculations are accurate and reduce the desire to get a ‘second opinion’ through multiple assessments.

Box 1: The Golden Rule

The Golden Rule: “the *expected* financial savings from the installation of energy saving measures must be equal to or greater than the costs attached to the energy bill”.

This principle is important, as it:

ensures that the expected default rate of the Green Deal customers would be no higher than the standard energy default rate, helping to keep the costs of finance low; and

provides protection for consumers, so that properties with a Green Deal could be expected to have

lower or at least equal energy bills to those without one.

Energy bills, including the Green Deal charge, would be at least as low as long as energy use in the property remains in line with the assumptions made in the Green Deal assessment and energy prices paid by the property's bill payer do not fall in nominal terms. Over time, if the nominal price of a unit of energy rises, the consumer who has taken out a Green Deal would make greater and greater savings.

For more expensive works, such as solid wall insulation, the application of the Golden Rule would mean that the repayment term could be around 15 – 25 years or longer, and in many cases would require subsidy from the ECO to ensure that the measure meets the Golden Rule. Minimising the amount of interest paid over the term of the finance package would make it easier for measures to meet the Golden Rule.

Measures could also be part-financed by the Green Deal, where the limit of the finance is set by the Golden Rule so that bill savings still at least meet the Green Deal charge.

There would not be any guarantees that the Golden Rule would be met: energy usage at the property may fluctuate, and energy prices can go down as well as up.

As an extension of the Golden Rule principle, the length of time for which a bill-payer would have to pay the Green Deal charge must be less than or equal to the expected lifetime of the measure. For example, if the expected lifetime of a new boiler was only ten years, then it would not be possible to attach a charge to the bill which had to be paid over fifteen years – i.e. for five years after the point the boiler is expected to stop working efficiently.

The Golden Rule applies to the financial costs associated with the energy bill and the Green Deal charge. Households would also incur the non-financial 'hidden costs' from the installation of Green Deal measures; for example time costs of dealing with installers. These hidden costs reduce the attractiveness of installing energy efficiency measures and have been accounted for in the demand modelling (see section 5) and cost benefit analysis.

Step 3: shopping around for the best quote

Once in receipt of an assessment, the consumer would be able to shop around for a quotation for the installation of measures under the Green Deal. This could promote competition in the Green Deal provider market by standardising the package of measures on which prices are offered. Where Green Deal Providers have paid for the assessment as a "loss leading" incentive, they would be expected to structure their marketing activities in such a way as to minimise the extent of their losses should consumers choose to seek a range of quotes elsewhere. An accredited Green Deal Provider would make a finance offer based on the assessment of the estimated energy savings that would result from the measures, if installed, and their costs for the installation work (including finance costs). The products actually installed in the property would have to meet health and safety and performance standards referred to in a Green Deal Code of Practice.

The price quoted to consumers would integrate any available subsidy from licensed suppliers seeking to fulfil their energy company obligation. In many cases where the unsubsidised cost of a project would exceed the expected savings, support under the energy company obligation (or part-

payment by the consumer) would be necessary to bring down the costs attached to the energy bill within the golden rule.

Box 2: Which measures can be installed?

There would be no standard list of Green Deal measures that are appropriate for every property in the market. A list of measures that qualify for being wholly or part-funded by the Green Deal is shown in Annex G. What would be appropriate for a property depends on a number of factors including the work already done to the property, the characteristics of the building and in some cases, the geographical location. It is also important to draw distinctions between:

- measures - improvements made to a property, for example, loft or cavity wall insulation; and
- product - the branded materials which are installed.

Further information on how specific products to be installed can be selected was published alongside the Energy Bill in June 2010, and can be found here:

http://www.decc.gov.uk/assets/decc/What%20we%20do/Supporting%20consumers/green_deal/1734-what-measures-does-the-green-deal-cover.pdf

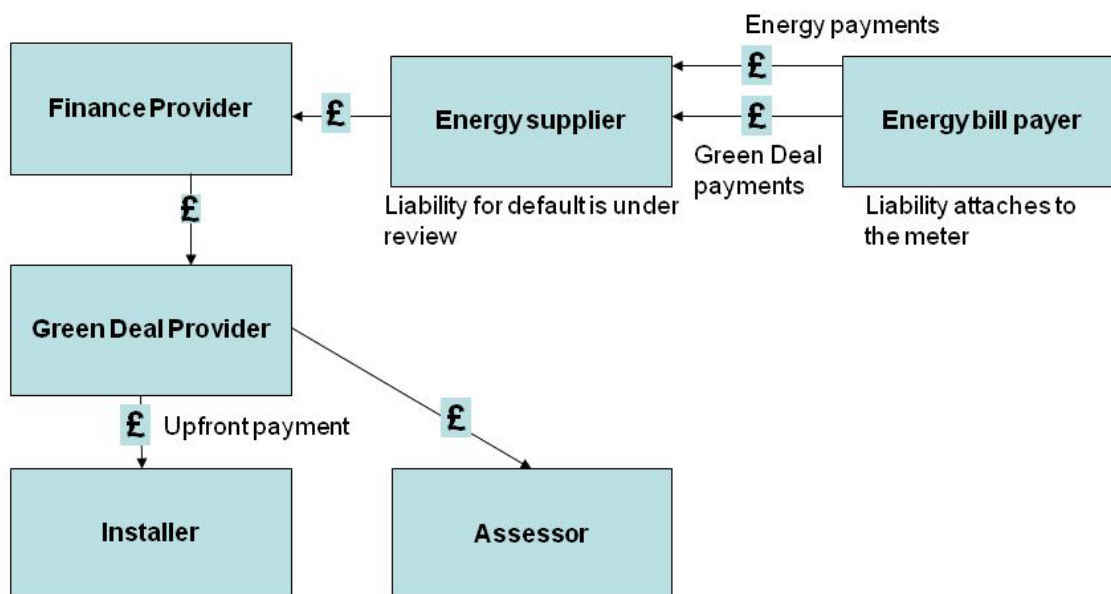
Step 4: installation

Once the consumer has agreed on a quote, the Green Deal provider would arrange for the measures to be installed by an accredited installer, and the consumer would be required to sign off that the work has been carried out to their satisfaction. The Green Deal provider would lodge a new Energy Performance Certificate (EPC) on the Landmark register with details of the work carried out. This would be a key component of ensuring disclosure of the Green Deal plan in the case of a transfer of obligation to repay the Green Deal.

Step 5: Repayment

The costs of installation would be paid back alongside the Green Deal applicant's electricity bill. The fuel and Green Deal elements would be paid together and, in the case of default or under-payment, the energy supplier and the Green Deal provider would share liability on a *pari passu* basis. This creates a low risk repayment mechanism – default on energy bills is low – which would encourage lower costs of finance.

Figure 7: Green Deal Finance Flows



Box 3: Reducing the costs of the Green Deal financial package

Green Deal providers would require major finance to fund works and provide consumer credit: the cost of their financing would be an important element to keep overall costs of Green Deal offers at an attractive level. Lower finance costs have been sought through designing a Green Deal legislative framework that reduces risk for investors, by protecting the payment stream, promoting consumer demand and ensuring that necessary information could pass easily from one relevant organisation to another.

The lowest cost sources of finance are generally capital market institutions (for example, pension and insurance funds). To access these, Green Deal repayments could be aggregated and when sufficient volume had been achieved refinanced through the capital markets, e.g. exchanged for capital through a bond issuance. In order to achieve this scale, Green Deal finance would have to provide attractive, long term and stable cash flows that meet the needs of institutional investors.

Where projects would be reliant on support from the ECO to meet the golden rule, the lower the cost of capital, the greater the level of Green Deal finance that would be able to be raised for the installation of measures. More Green Deal finance lowers the requirement for ECO subsidy, reducing the cost per unit of carbon saved to energy bill payers. A functioning Green Deal finance market is therefore a key determinant of improved value for money³³ for energy bill payers.

³³ This is not necessarily the case where a subsidy is 100% or greater than the cost of the energy efficiency measure, at the margin.

3.2 Central Working Option for the ECO

The ECO would operate with two separate legal obligations for measures specifically intended to reduce GHGs (the 'Carbon Reduction' target), and measures intended to improve the ability of low income and vulnerable households to heat their homes at affordable cost (the 'Affordable Warmth' target). Both obligations would use target metrics based on the SAP methodology, with the carbon target set in terms of CO₂ reduction, and the Affordable Warmth target set in terms of heating cost reductions. The Secretary of State would establish a Great Britain wide ambition for each target, which the ECO administrator would then distribute to the obligated energy suppliers according to their market share (as currently under CERT). Market share could be determined on the basis of customer accounts, or of sales volumes. In the absence of a preferred option on how market share is determined, the default option assumed here is on the basis of customer accounts. There would be protections to ensure that smaller suppliers do not face the potentially disproportionate costs of an ECO obligation.

The Affordable Warmth obligation would be targeted exclusively at an eligible group of low income vulnerable households living in private housing and identified through the benefits system. Eligibility would be similar to the CERT Super Priority Group³⁴ which equates to around 12% of GB households.

Suppliers would receive scores for each measure or package of measures installed based on the annual reductions in CO₂ or heating costs they would be expected to deliver in the property.³⁵ The Green Deal assessment process would provide the data underpinning these scores, so the requirement for an assessment would not add additional cost to energy companies where they are combining ECO with Green Deal finance. A more basic survey to determine scores could be provided by suppliers where households were only receiving help through the Affordable Warmth obligation. Scoring would be kept simple. £1 reduced from a property's annual heating bill would earn one credit towards their Affordable Warmth target; and 1 tonne of annual CO₂ cut from a property's emissions would earn 1 credit towards their CO₂ target. No artificial incentives or uplifts would be necessary.

The administrator would audit delivery and verify scores. In general this would occur through cross-checking with information in the EPC and Green Deal plan databases. In the minority of case where cross-checking is not possible, the administrator would carry out spot checks on a small proportion of properties to verify delivery and scores.

New product innovations would be tested and incorporated into the Green Deal assessment tool and, once recognised, would be available to energy companies as options to meet their obligations.

A referrals system would be provided through the remote advice service³⁶, to help to identify households who expressed an interest in improving energy efficiency and who were eligible under the Affordable Warmth criteria. The information would be passed on to energy companies, who in

³⁴ The same group but the definition may change subject to changes in the benefits system

³⁵ The consultation will include a question on ECO points should be awarded on the basis of annual or lifetime carbon and bill savings. The use of an annual metric would lead to measures with shorter lifetimes receiving the same level of subsidy, and so might not lead to the most cost effective outcome. See section 9.1.5 for a detailed discussion of the options.

³⁶ The remote advice service would be funded by DECC

turn would agree to follow up all referrals. This would help to reduce the costs to energy suppliers of finding eligible households.

The eligibility of specific measures and actions would vary between the Carbon and Affordable Warmth obligations. The Affordable Warmth obligation would support measures that allow households to reduce the cost of heating their home (such as new or repaired heating systems and loft and cavity wall insulation). The Carbon obligation would focus on solid wall insulation (SWI) but incentivise a whole house approach by allowing credit for any CO₂ reductions delivered through other measures included in packages which include SWI. Where installed measures could count towards either obligation, suppliers would need to choose which of the two obligations a given package of measures counted towards.

The consultation will include a question on the introduction of a Distributional Safeguard sub-target to the Carbon Reduction obligation to ensure equitable delivery of the benefits of measures such as SWI. This would require energy companies to deliver a certain proportion of their Carbon Target to households that meet the Affordable Warmth eligibility criteria. There would be no further sub-targets beyond the distributional safeguard (e.g. no regional delivery targets), and no specific requirement for energy companies to partner with other organisations such as local authorities. Local and community partnerships would be expected to develop naturally.

Subsidies combined with other sources of finance, including Green Deal Finance packages or funding from Devolved Authority programmes or local authorities, would receive a full score regardless of the level of subsidy, provided the ECO contribution was critical to the delivery of the measure (i.e. that the ECO engendered genuinely *additional* activity³⁷). Green Deal finance would not be expected to play a role in paying for measures under the Affordable Warmth obligation.

A brokerage service would be set up allowing Green Deal providers and Energy Companies to communicate and trade delivery of ECO improvements for cash subsidy, and a commitment would be sought from the companies to use this mechanism to deliver a significant proportion of their obligation.

Interim targets would ensure suppliers invest early and help drive a strong Green Deal market from the outset, whilst transition arrangements from CERT and CESP should ensure suppliers get off to a head start and that supply chains for SWI ramp up before the ECO begins. Interim targets with limited banking and borrowing would also help to reduce economic rents and drive more action for a given level of ECO subsidy.

It is not clear yet what the accreditation requirements for the Green Deal/ECO will be and how they will impact on incumbent firms in the market. Further work is being carried out to understand and quantify the impact of these, particularly for those firms that are micro-business. We welcome views from incumbent CERT installers on what the potential implications of changes to accreditation from the existing arrangements would be.

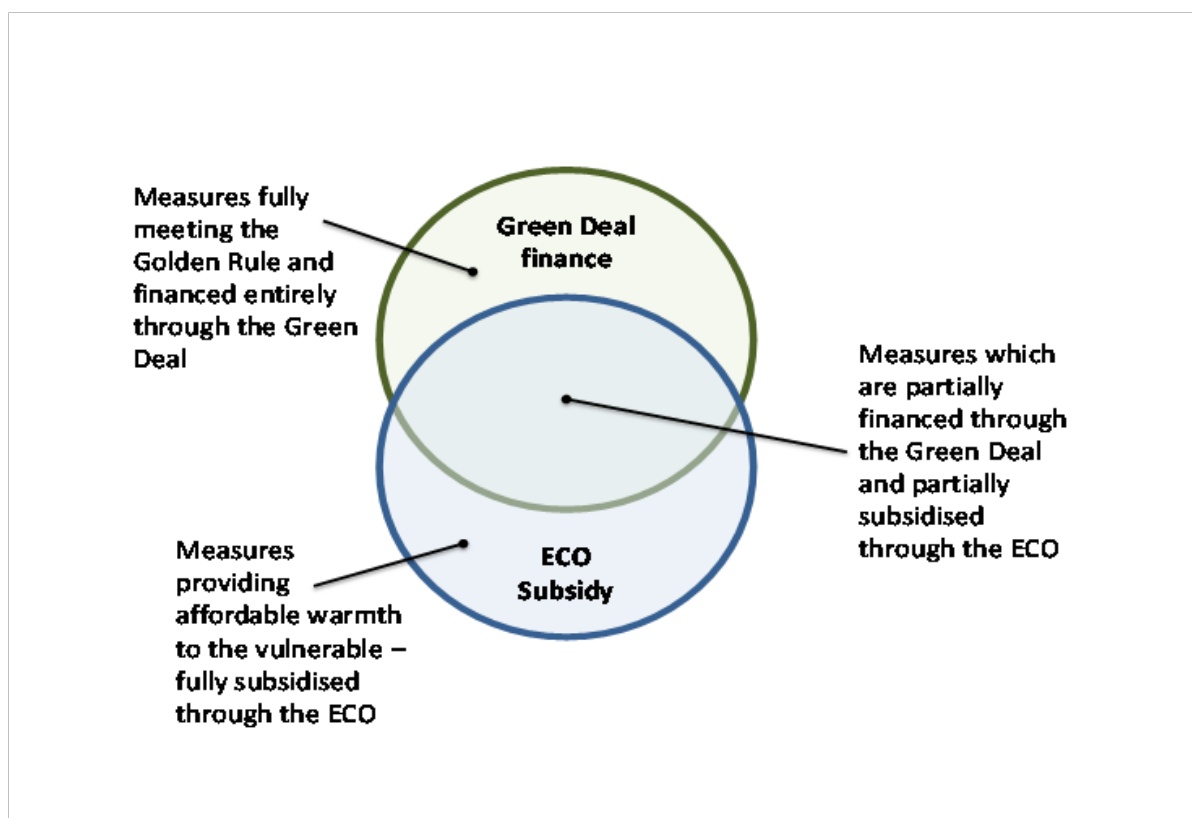
³⁷ In practice, it will be difficult to ensure the full additionality of an ECO subsidy. However, it is likely to be applied to those measures whose cost effectiveness means that some form of subsidy is necessary for its take-up.

Energy companies would be required to report activity completed on a monthly basis and for activity to be claimed towards their target it must be reported within two months of being delivered. Installers of ECO improvements would be required to meet the standards of the Green Deal accreditation system. Verification of the scores claimed by suppliers would be assisted by spot checking their returns against the national EPC databases. The scheme would be subject to periodic review (every two or three years) to assess the costs and benefits and, if necessary, to adjust the level of ambition of the scheme to manage the impact on consumer bills.

3.3 Summary of how the policies would work together

The Green Deal and the ECO are two distinct policies and in some instances they would operate independently. For measures which meet the Golden Rule, such as loft and cavity wall insulation, it is expected that they would be financed entirely through a Green Deal where they were not being installed in the homes of low income and vulnerable customers. In contrast, for some households Green Deal finance would not be a suitable option. This situation could arise for some low income and vulnerable customers who under-heat their homes prior to receiving measures. These households might not generate a sufficiently large stream of savings to recoup the costs of installation, and might be less attractive customers for Green Deal providers in general as they are less likely to present opportunities for cross-selling other products at the same time. In these households, ECO subsidy would be expected to cover the full cost of installing measures. However, for hard to treat homes, it is expected the Green Deal and the ECO would work together, with measures receiving partial subsidy through the ECO with the remaining cost financed through the Green Deal.

Figure 8: Overlap between Green Deal and ECO



Some energy efficiency measures that save a lot of carbon and deliver significant energy efficiency benefits, such as solid wall insulation, can be socially cost-effective but would not be fully financeable under the Green Deal because they would not meet the Golden Rule. However with ECO subsidy providing upfront capital support, funding such measures in combination with Green Deal finance (the relative proportions of finance would vary) large scale delivery becomes possible.

Green Deal providers would be incentivised to gain ECO subsidy to bring the cost of measures within the Golden Rule, thereby allowing them to put an attractive offer to their customers. Energy companies would be incentivised to combine their ECO subsidy with Green Deal finance. This is because energy companies would get “ECO credits” towards their obligations for packages of measures including SWI. Irrespective of the amount of ECO subsidy they provide they would receive full credit³⁸. Therefore because energy companies would be expected to want to meet their obligation as cheaply as possible, they would be incentivised to leverage in as many other types of funding as possible, including Green Deal finance, self finance from the customer, and local authority funding.

Under the Affordable Warmth obligation, energy companies would be expected not to combine ECO subsidy with Green Deal finance to fund the installation of measures (as the eligible households are unlikely to choose or have access to GD finance plans), such as new or repaired heating systems and loft and cavity wall insulation, although there would be no restriction on leveraging in other sources of co-financing upfront.

Energy companies and Green Deal Providers would need to work together to provide an offer to the consumer that comprises the optimum mix of support between Green Deal finance and ECO subsidy. It would not, however, fall to the consumer to bring Green Deal finance and ECO subsidy together. It is anticipated that the details would be arranged behind the scenes. The consumer would see one seamless package and offer from a Green Deal provider. In addition it is expected that any measures provided with ECO subsidy (whether through a Green Deal or not) would need to meet the same standards of quality and accreditation as those delivered through the wider Green Deal.

³⁸ as long as they can show the given measure or package of measures would not have been installed otherwise at that time.

4 Rationale for the Green Deal and the Energy Company Obligation

Least cost achievement of the UK's legally binding GHG targets and contributing to meeting the Government's statutory fuel poverty target would require deployment of cost-effective energy efficiency and thermal performance measures. The Green Deal and the ECO would address market failures and barriers that slow the take-up of these measures. In addition, the Green Deal and the ECO would enhance energy security.

This section looks at:

- market failures and barriers addressed by the Green Deal and the ECO;
- distributional rationale;
- alternative policy options; and
- strategic fit.

4.1 Market Failures and Barriers addressed by Green Deal Finance and the Energy Company Obligation

4.1.1 Negative externalities from the release of greenhouse gas emissions

Climate change is caused by the emission of greenhouse gases into the atmosphere. An externality exists as those who emit do not have to bear directly the full cost of their actions. The price of energy does not always reflect these external costs. For example, VAT on gas is low (5%) and there is no carbon price attached to residential gas use, whereas electricity prices include the cost of carbon determined in the EU Emissions Trading System³⁹. Therefore, investment decisions which are cost effective to society may not appear as cost effective to consumers. The ECO would address this through subsidies for socially but not privately cost-effective measures, while also temporarily raising prices through the costs passed on by the energy suppliers.⁴⁰

4.1.2 Access to Capital and Discount Rates

Access to capital: Many households cannot access conventional finance markets to fund energy efficiency improvements, while other households and businesses may face high costs of capital that do not reflect the particular nature of energy efficiency investments i.e. a reliable stream of bill savings.⁴¹ These households are credit constrained with their opportunity cost of investments in energy efficiency measures exceeding the social discount rate.

³⁹ For a discussion of carbon valuation in public policy appraisal see:

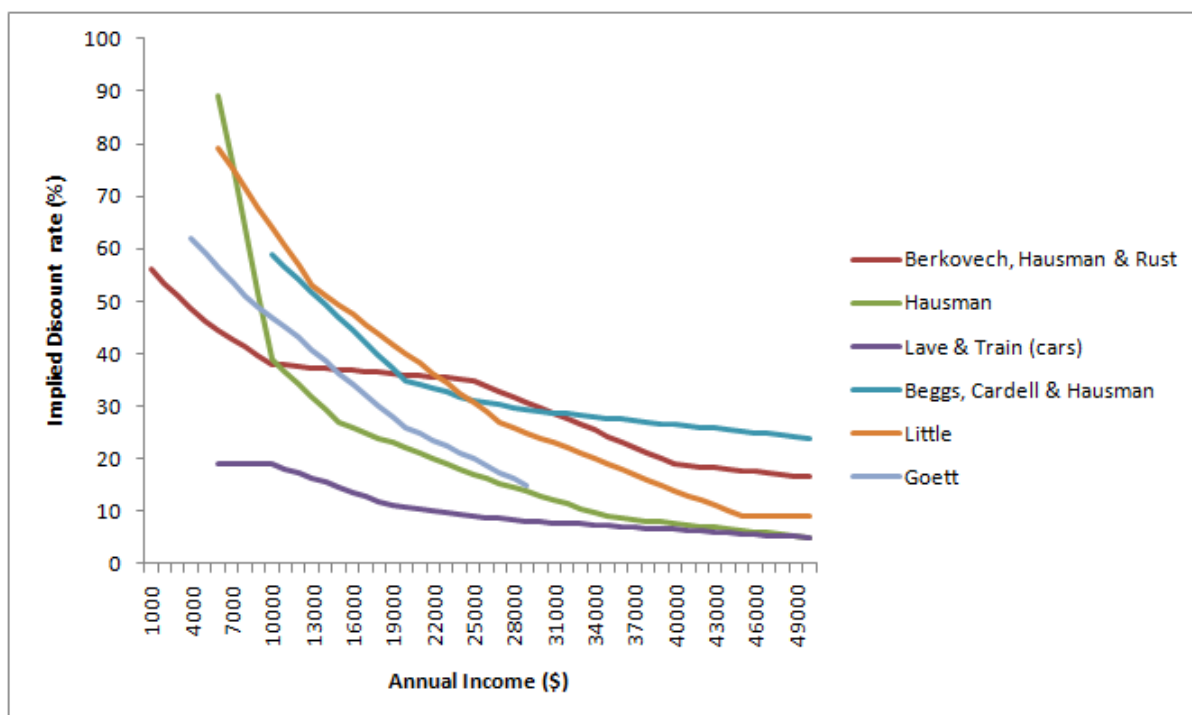
http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/valuation/valuation.aspx

⁴⁰ Where subsidies are offered, the energy companies would be expected to pass on the costs to their consumers, thereby increasing energy prices in the short-term.

⁴¹ DECC's Green Deal Consumer Survey (2011) shows that the main reason people are prevented from making their homes more energy efficient is a lack of money. This is more likely among those on low incomes and in financial difficulties (see Annex D).

Over the last 40 years a substantial academic literature has developed on the topic of implied discount rates shown by consumers towards energy efficiency investments⁴². Many of these studies suggest that there is an ‘energy efficiency gap’ with individuals demanding a higher rate of return on energy efficiency investments than for alternative investments. However the studies have also shown that there is a strongly negative relationship between income levels and the implied discount rates revealed by individuals’ behaviour or stated preferences. Those with lower incomes reveal higher implied discount rates with highest earners revealing discount rates that closely approximate prevailing market interest rates. Figure 9, below, based on Train (1985)⁴³ summarises the relationship between income and discount rate found in a number of studies.

Figure 9: Empirical estimates of the relationship between discount rates for energy efficiency investments and income (Train 1985)



Higher discount rates for those with lower incomes strongly suggest that at least part of the energy efficiency gap can be explained by credit constraints. Sutherland (2006)⁴⁴ notes that the inverse relationship between discount rates and household income is expected. The discount rate is determined by the opportunity cost of capital. For those on very low incomes, with limited access to credit, the opportunity cost of investment in greater energy efficiency is essentials such as food, clothing and shelter, or high interest rates on unsecured personal credit. Their opportunity cost is higher than for a high income individual for whom the alternative is a smaller mortgage or a financial investment, the proceeds from which are taxed.

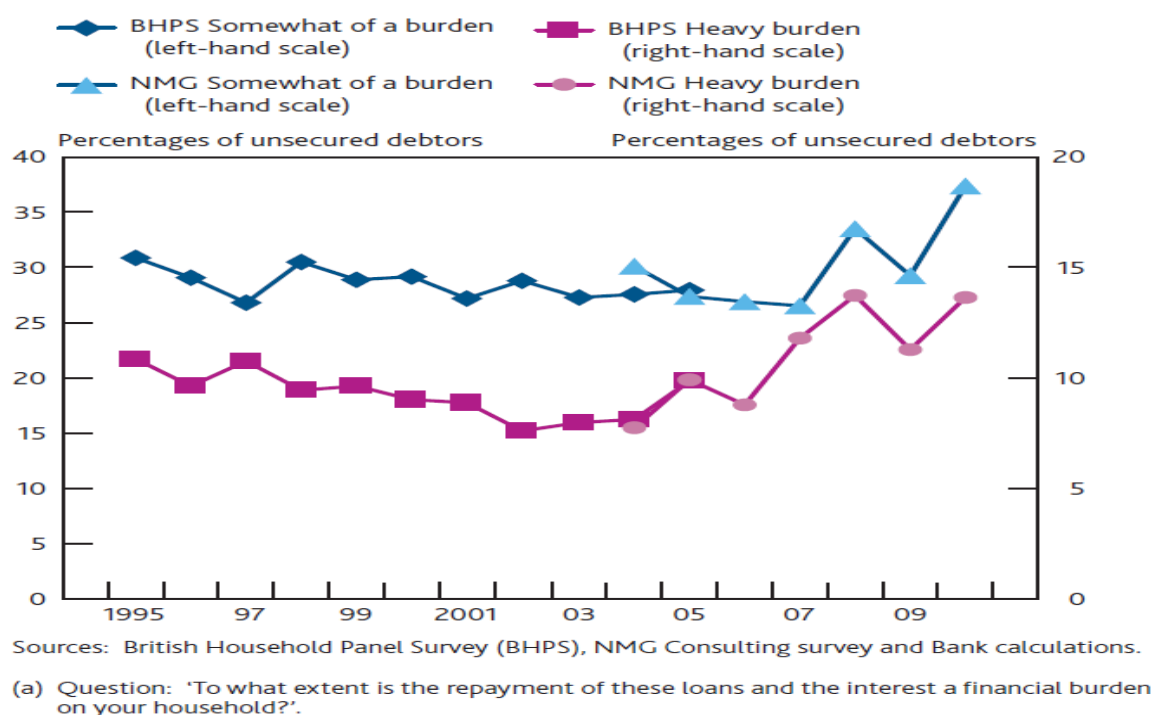
⁴² Such as: J. Hausman. “Individual discount rates and the purchase and utilization of energy-using Durables”. The Bell Journal of Economics, 10(1):33_54, 1979 or A. Jaffe. “The energy-efficiency gap what does it mean?” Energy Policy, 22(10):804_810, October 1994.

⁴³ K. Train. Discount rates in consumers' energy-related decisions: A review of the literature. Energy, 10(12):1243_1253, December 1985.

⁴⁴ R. Sutherland. The distributive effects of direct regulation, chapter 5, pages 171_196 in ‘The Distributional Effects of Environmental Policy’ OECD, Edward Elgar, Cheltenham, UK, 2006.

The Green Deal could significantly reduce the opportunity cost of capital for investments in energy efficiency, particularly for low income households for whom access to credit may otherwise be difficult or at least expensive (such as the high interest rates charged on credit cards). 52% of households currently have unsecured debts, 51% of whom find this debt a burden (see figure, below).⁴⁵ The Green Deal should free up the availability of finance for the installation of energy efficiency measures and reduce the opportunity cost of this finance compared to the costs for the 52% of households using unsecured debt. The costs of funding energy efficiency measures through unsecured debt would be around 7.3% for personal loans and 18.3% for interest-only credit cards in August 2011. By attaching the Green Deal charge to the property, it should not affect the credit rating of the individual and their wider access to credit for other purposes. Reducing the opportunity cost of investing in energy efficiency from 18.3% to the cost of Green Deal finance⁴⁶ would increase the attractiveness of energy efficiency investments and so accelerate take-up in those households who are currently credit constrained. Indeed, DECC's Green Deal Consumer Survey (2011)⁴⁷ found the main reason for preventing households investing in energy efficiency measures was lack of money (35% of respondents) and that groups with higher levels of interest in the Green Deal included those struggling to pay their bills, those on means benefits and those living in deprived areas.

Figure 10: Burden of unsecured debt



Attaching the repayment charge to the electricity bill reduces the default risk for the finance provider relative to unsecured personal loans and should provide lower cost access to capital for

⁴⁵ Source: *The financial position of British households: evidence from the 2010 NMG Consulting Survey*, Bank of England (www.bankofengland.co.uk/publications/quarterlybulletin/qb100408.pdf)

⁴⁶ estimated at 7% for this impact assessment but the new Green Deal Finance Corporation has suggested interest rates could be lower than this

⁴⁷ See the Consumer Insight/Social Research Annex for more information.

energy efficiency investments for lower income householders.⁴⁸ The domestic energy bill default rates are 1 to 2 percent of gross revenue, compared with broader consumer credit costs of default which are significantly higher (see Box 4 below for more details). Paying utility bills and maintaining energy supplies to the home is a necessity and so payments will have one of the first calls on a householder's budget. The application of a conservative Golden Rule means that there is a high degree of confidence that the fuel bills would be lower after taking out a Green Deal than they would otherwise have been. It is not expected for there to be a substantial impact on the default rate on energy bills from the taking out of a Green Deal.

Box 4: Reduced default risk for finance providers

Under the Green Deal, energy companies would bill for Green Deal repayments as part of a combined energy and Green Deal charge. Householders would not therefore be able to withhold Green Deal repayments while paying for energy, and default rates for Green Deal payments should mirror those for electricity.

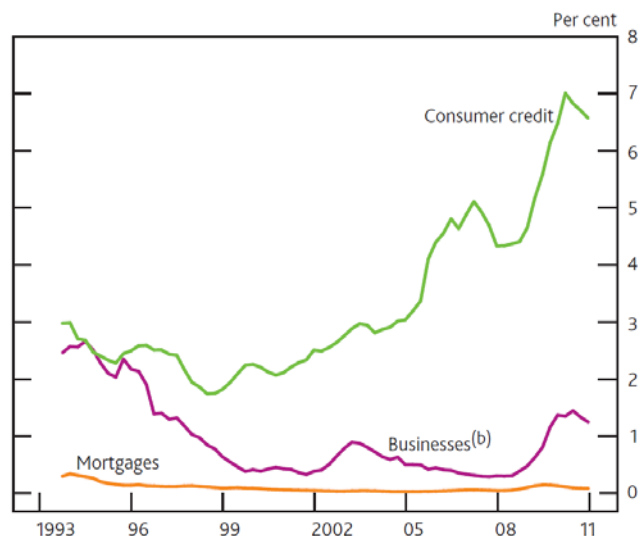
Energy companies have provided information to DECC on energy default records. Whilst payment terms for customers differ between energy companies, recovery rates of late payments and write-offs are in a narrow band. Write-offs are below 2% in the domestic sector, but vary more widely for non-domestic customers. Nevertheless default rates in both the domestic and non-domestic sectors are substantially below those associated with unsecured loans.

The Green Deal would benefit from customers' tendency to prioritise energy payments, as well as the ability of energy companies to secure payment owed through measures such as use pre-payment meters and ultimately disconnection (subject to existing provisions). In the case of partial payment, energy companies would not be able to count the energy debt as senior to the Green Deal, but would instead be required to divide the payment between the Green Deal and energy repayment, in proportion to that owed. This maintains the incentive for energy companies to chase Green Deal payments owed, and keep default rates to a low level. These rates are substantially below those observed for other types of retail lending. The rate of write-offs for unsecured lending to households is currently 6.55%.⁴⁹

⁴⁸ Indeed, findings from DECC's Green Deal Consumer Survey (2011) suggests that may be welcomed by certain specific groups of low income households. The survey found that interest in the Green Deal is particularly high among these households on low incomes (young, male) and those struggling to pay the bills in hard to heat homes (see Annex D).

⁴⁹ Bank of England: Financial Stability Report, June 2011

Figure 11: Write-off rates on lending to UK Businesses and Individuals⁵⁰



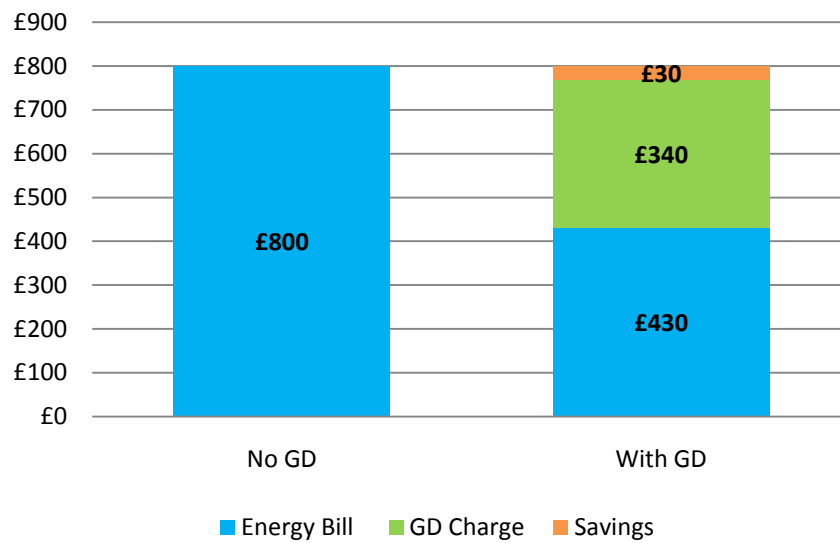
Taking out a Green Deal would not be expected to increase default rates on energy bills. The Green Deal charge is expected to be less than, or equal to, fuel bill savings in year 1. Over the longer term, as nominal energy prices increase, the net savings from taking out a Green Deal would increase. Once the Green Deal has matured, the householder would enjoy the benefits of reduced fuel bills in full. A Green Deal therefore does not increase a householder's expected outgoings in year 1 and reduces expected outgoings in the longer term.

There would be, however, a low probability of a householder's energy bill outgoings (including the charge) increasing in the short term after taking out a Green Deal. For these householders, although outgoings increase, payment of the energy bill would remain a necessity which would be prioritised against other household expenditures. The impact on energy bill default rates from a few households experiencing increases in outgoings would be expected to be very small.

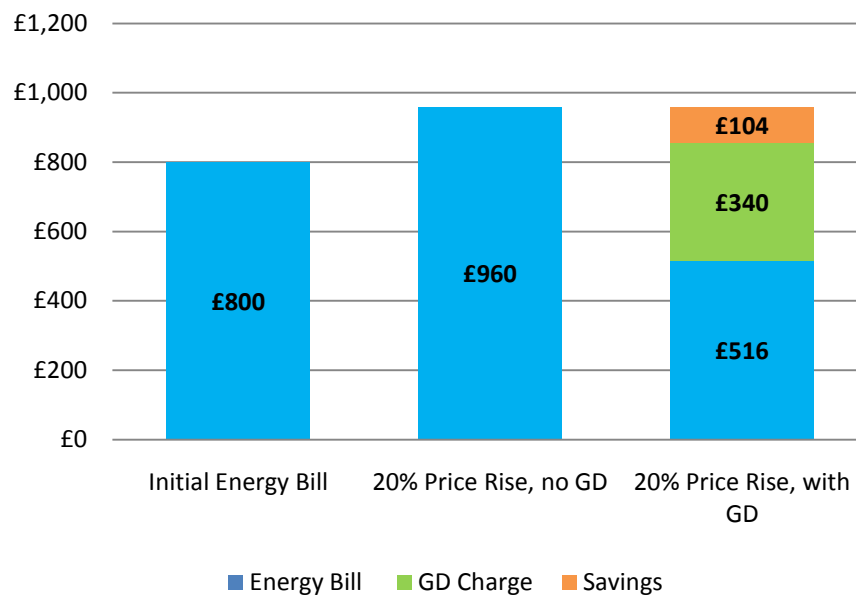
The following charts compare energy bills and Green Deal charges for a couple in a 3 bed semi-detached house in the situation where they have and have not taken out a subsidised Green Deal for the installation of Solid Wall Insulation with a 10 year repayment term. The charts show how the couple's outgoings for energy bills and for the Green Deal change over time, depending on whether energy prices rise or fall. The first chart compares the expected outgoings immediately after taking out the Green Deal package. The second compares the expected outgoings if during the Green Deal period nominal energy prices have increased by 20% – the savings increase where the Green Deal has been taken out. The third chart shows the household's combined outgoings for energy bills and the Green Deal after a 20% fall in energy prices – savings in this case are negative. The final chart shows the expected savings upon repayment of the Green Deal, assuming a 50% nominal energy price rise. This level of increase in nominal energy prices is in line with the DECC central energy price scenario under which the nominal domestic energy retail prices increase by 48% and 45% for gas and electricity respectively between 2011 and 2020.

⁵⁰ Source: *Trends in Lending, July 2011*, Bank of England
(www.bankofengland.co.uk/publications/other/monetary/trendsinlending.htm)

Outgoings with or without a Green Deal...



... assuming fuel prices rise by 20%





Credit risks: There is a theoretical risk of adverse selection, whereby there is a high concentration of customers with a higher than average default risk who take out the Green Deal. Any lending party will wish to monitor the quality of its credit pool and ensure that credit risk does not have unplanned implications for the cost of Green Deal finance.

In order to support responsible lending practices, it is important that the origination of debt is not divorced from the risk of default, thereby providing inbuilt safeguards against inappropriate lending. Although energy companies are responsible for pursuing missed payments on behalf of Green Deal

finance providers, they will not be responsible for making good any loss of repayment income resulting from missing or partial payments. In the case of partial payments, funds received will be shared between the energy supplier and the Green Deal provider on a *pari passu* basis⁵¹, and the finance provider will not enjoy seniority. This means that risk of default on the Green Deal lies with the finance provider, who in turn will wish to bring about arrangements with Green Deal providers so as to ensure the quality of the credit pool is not undermined by irresponsible lending practices.

Time inconsistent private discount rates: Hyperbolic, or time inconsistent, private discount rates may prevent the uptake of energy efficiency measures. High short-run private discount rates⁵², potentially exacerbated by the information problems highlighted below, mean that consumers are likely to value up-front capital costs substantially more highly than future bill savings. This creates a barrier to the uptake of energy efficiency measures and leads to procrastination over decision making. A potential psychological explanation is that immediate costs and benefits of investments are very real and weighted more heavily in a decision than more distant costs and benefits which are more abstract.

The Green Deal finance proposal changes the time profile of the costs and benefits of energy efficiency investments. There would no longer be a large up-front financial cost, and because of the Golden Rule the investment would be expected to show a net benefit, or at least a neutral balance of benefits and costs, in all time periods. By changing the time profile of costs and benefits in this way, an investment that had previously been evaluated negatively by an individual, because it had high net costs in the short term could receive a positive evaluation. This exemplifies the broader behavioural point that the way that energy efficiency investments are framed to energy users can affect whether they are likely to be taken up.

Hedging through energy efficiency investments: Stoft (1993)⁵³ highlights that the uncertain pay off from an investment in energy efficiency is likely to be negatively correlated with uncertain future wealth. Using the Capital Asset Pricing Model this would suggest that individuals should apply a lower discount rate to investments in energy efficiency capital to reflect the hedging benefit achieved through energy efficiency investments. In a future where energy prices are high and individual wealth low, the welfare benefit from an investment in energy efficiency capital in reduced energy cost would be large. Thompson (1997)⁵⁴ suggests that energy efficiency investments should be seen as a decision between uncertain costs associated with future energy consumption and the more certain cost of energy efficiency capital. Rational investment should therefore discount the uncertain costs associated with the future energy consumption at a lower rate. To the extent that individuals do not consider the hedging benefit there could be underinvestment in energy efficiency capital.

4.1.3 Information

Lack of information and information asymmetry: a market failure preventing the take-up of cost effective measures is the lack of trusted information for consumers (including businesses) who do not have easy access to, or a full understanding of, information on the range of energy efficiency

⁵¹ The share of liability will be determined by the original share of the energy bill and Green Deal charge.

⁵² Individuals' discount rates have been observed to be inconsistent over time and can be described by hyperbolic discount functions, where the rate of pure time preference is initially very high but declines over time (Frederick, Loewenstein and O'Donoghue 2002).

⁵³ "Appliance standards and the welfare of poor families". The energy journal 14(4), 123-128

⁵⁴ "Evaluating Energy Efficiency investments: accounting for risk in the discounting process". Energy policy. Vol 25, no.12, pp989-996.

measures available to them^{55 56 57}. Information barriers are likely to be exacerbated where the energy efficiency measure is a relatively new or technical product, and consumers therefore have a low level of trust in providers of goods that are, in many cases, once in a lifetime purchases. Given these characteristics, consumers may not feel confident in assessing the risk of buying a poor quality service and may prefer to withdraw from the market or heavily discount the claimed savings from energy efficiency measures⁵⁸. These problems are addressed via the accreditation of advisors and installers, providing trusted sources of energy efficiency services.⁵⁹ The Green Deal also creates a flexible market framework facilitating branded suppliers with existing customer relationships to come forward and market their services.

Information bias (adverse selection): without controls there is a risk that expert advice would be offered by those with incentives to promote a particular industry or installer.⁶⁰ This market failure can be overcome by the availability of accredited advisors. The accreditation scheme for Green Deal assessments maintains surveillance of advisors accredited under the scheme with the imposition of high penalties for those who fail to provide objective energy-efficiency-advice. With sufficient vigilance, the expected payoff for advisors who break the guidelines of the scheme is lower than their expected payoff when providing impartial advice.

Box 5: Ways of dealing with information failures

Lack of information and information asymmetry are common throughout many markets for goods and services. It is only commodity markets that display little asymmetry, where the buyer knows exactly what they will receive and at what price. This also explains why some brands can have a very high value because of the trust bestowed on them by customers; and explains why prices are different between shops and why consumers can be disappointed with a product or service they have bought.

Consumers often turn to those whose advice they trust: consumer watchdogs, influential journals and family and friends. These can often influence people's major purchases, such as for a car, if a vehicle has a particularly good or bad reputation, for instance.

The market for energy efficiency measures, such as solid wall insulation, is small compared to cavity or loft insulation. Therefore there is a smaller network of trusted advice that consumers can call on. Once take-up of the measures grows, this barrier will become less significant. In the meantime, the consumer protection measures to be offered alongside the Green Deal should help resolve some reluctance of householders to engage in energy efficiency. The Consumer Survey showed that 70%

⁵⁵ Royal Institute for Chartered Surveyors (2010) "Energy Efficiency and Value Project" noted a lack of consistent or easy to access information on energy efficiency and that this influenced a low level of demand for energy efficiency measures.

⁵⁶ DECC's consumer research (2011) shows that after requests for lower costs, having access to convincing information about benefits and information from a trusted source are the main reasons given for what would encourage people to make their homes more energy efficient (see Annex D).

⁵⁷ It is important to note that under the Energy Performance of Building Regulations, there is a duty on estate agents to disclose either the Energy Performance Certificate (EPC) in full or the EPC property asset rating, along with the written particulars of a domestic property which is on the market for sale. This implements the Energy Performance of Buildings Directive. The Department for Communities and Local Government (CLG) is considering proposals to amend the regulations to remove the element of choice (creating an obligation on agents to produce the EPC at the same time as the written particulars). CLG is also considering proposals to extend the regulations to cover the non-domestic and rental sectors. These proposals would improve the information available to consumers and support Green Deal objectives.

⁵⁸ Akerlof (1970) "The Market for Lemons", Quarterly Journal of Economics

⁵⁹ DECC's consumer research (2011) shows that people place great value on accredited advisors and installers with accreditation having a positive impact on their likelihood to take up the Green Deal (see Annex D).

⁶⁰ Consumers also strongly support the independent nature of assessments (see Annex D)

of respondents said they would be more likely to take out a Green Deal if the installers and assessor were skilled and regulated; while a quarter of respondents said they would be encouraged to make their homes energy efficiency if they had convincing information that energy efficiency measures were effective; and a fifth said they would be encouraged by receiving energy efficiency information from a trusted source.

4.1.4 Positive innovation and 'learning by doing' externalities

A positive externality is a benefit that occurs as a result of actions taken that is received by others than those that undertake the actions and which were not the primary motivation. For instance, by creating a bigger market in the installation of energy efficiency measures, the Green Deal could create the positive externality of reducing costs for future time periods as installers get more proficient through experience and if manufacturers produce equipment that is easier and quicker to install. Because households and organisations do not value these benefits at the point of their own consumption, if left alone the market for energy efficiency measures would deliver a socially sub-optimal outcome with lower deployment and higher costs for these measures. Intervention to promote deployment could address the market failure. This section looks at whether there is likely to be scope for further cost reductions for these measures, or cost reductions associated with any of the other measures that are likely to be installed, such as solid wall insulation.

Loft and cavity wall insulation costs have fallen over the last 12 year period⁶¹. This is attributable to a number of elements, such as the growth in the market increasing the number of installations that can be completed in a day and therefore reducing labour overheads. There has also been the potential for increased specialisation for those undertaking the work. The market for these measures is mature, however, and therefore there is probably limited scope for further cost reductions.

Table 4 highlights areas where there may be potential cost savings within the solid wall insulation market as deployment grows over time. It shows that, in contrast to cavity wall and loft insulation, there are a number of areas where installation costs could fall in the SWI market. Cost savings as deployment increases are included in the impacts modelling used in this Impact Assessment (see Annex A for further details).

Table 4: Likely Areas for Cost Reduction in Installing Solid Wall Insulation

	External Solid Wall Insulation	Internal Solid Wall Insulation
Increasing Deployment of SWI	Installing SWI to multiple properties at the same time can reduce the costs associated with an individual property by up to 20% or more ⁶² . Cost savings include sharing scaffolding and other equipment,	Installing SWI to multiple properties at the same time can reduce the costs associated with an individual property by up to 20-25% ⁶³ . Cost savings include better use of labour on site, sharing equipment, developing solutions to

⁶¹ Source: Household Energy Management Impact Assessment (http://www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/household%20energy%20management/1_20100302221225_e_@@_20100302heminitialassessmentofimpacts1.pdf)

⁶² Solid Wall Insulation Supply Chain Review, Purple Market Research, May 2009

⁶³ Ibid.

	better use of labour on site, developing solutions to common installation problems, etc.	common installation problems, etc.
	As the market for SWI grows, there would be more teams specialising in its installation throughout the country. This increased specialisation is likely to bring costs down as installers learn how to complete jobs more swiftly.	As the market for SWI grows, there would be more teams specialising in its installation throughout the country. This increased specialisation is likely to bring costs down as installers learn how to complete jobs more swiftly.
	Economies of scale in producing and purchasing SWI would lower costs.	Economies of scale in producing and purchasing SWI would lower costs.
Product Innovation	Currently the market supplies a variety of SWI systems for which installers need to be trained for each variant. Innovation that increases standardisation and de-skills installation would reduce training and installation costs.	Currently the market supplies different SWI systems for which installers need to be trained. Greater standardisation/de-skilling installation would reduce training and installation costs.
	Dry rendered panels cut installation time and are less susceptible to wet weather disruption than wet rendered panels.	Innovations in surveying premises can reduce the time taken to install panels if they have been pre-cut to fit the required space.

4.1.5 Social and Psychological Inertia

Consumer inertia: Energy consumers may be slow to change behaviour or adopt energy efficiency technologies even when from an objective viewpoint they offer benefits to the consumer⁶⁴.

The concept of bounded rationality explains some of this inertia, i.e. that consumers can only cope with a limited amount of information at any one time. However, cultural and other psychological factors are also likely to have a role to play, such as aversion to a perceived debt. Information campaigns from trusted sources help to nudge consumers towards some behavioural change. Increasing take-up of measures leads to some positive reinforcement or momentum to overcome inertia. Many consumers obtain their most trusted information from others in their circle of friends, family and local community who will increasingly have installed energy efficiency measures.⁶⁵

⁶⁴ 19% of people that have not installed basic, low cost, insulation measures are completely unengaged with the issue. Defra (2009) Public Attitudes and Behaviours Towards the Environment Survey 2009 and Energy Saving Trust (2009) Qualitative Research.

⁶⁵ Cabinet Office and Institute of Government (2010) "MINDSPACE influencing behaviour through public policy", cites a range of studies that describe situations where people tend to stick to default behaviours, adhere to "norms" of behaviour and respond differently to information that comes from different sources.

The presence of real, but “hidden” costs, for example the real costs of devoting the time required to assess potential investment options, will also explain some inaction. This is true for households and particularly for organisations, for whom management time and attention is a more closely monitored scarce resource. Simplified processes for accessing Green Deal investments (from accredited assessment and installation through to simple and cost-competitive finance packages) reduces these hidden costs to households and organisations.

4.1.6 Incentive Incompatibility

Mismatch of tenure/repayment period: A number of years’ worth of bill savings are often needed to cover the capital costs of an energy efficiency investment. Occupants may not expect to remain in a property for the duration of that period (households move every twelve years, on average⁶⁶) and also may not expect to be able to fully capitalise the benefits of their investment into the property’s market value.

In principle, in a well functioning market, the property price should change to reflect at least the expected bill savings. There is some evidence from the Netherlands⁶⁷, Australia⁶⁸ and the USA⁶⁹ that found that improved energy efficiency was associated with higher property prices. For example, installing ceiling insulation at an approximate cost of AUD\$1,200 will, on average, improve the energy performance of a poorly insulated home by at least 1 “star”. A one star improvement in energy rating was associated with an additional AUD\$8,979 on the selling price of detached houses. However, currently there is no evidence to suggest that the same effect exists in the UK. The Royal Institution of Chartered Surveyors suggested that there is currently little demand for energy efficiency from UK home buyers and as such market participants do not assign value to it⁷⁰. This suggests that there is an apparent failure in the property market to fully capitalise the expected bill savings from energy efficiency improvements in house prices.

Without capitalisation of energy efficiency there will be a barrier for an individual who is self-financing energy efficiency measures. When they move out of the property they would neither benefit from the energy bill savings from the remaining lifetime of the measures nor a higher sale price for their home. However they would have paid the full cost of installation. Faced with this barrier individuals are encouraged to only consider the investment case for energy efficiency measures for the length of their own expected tenure. This barrier can be partially overcome by attaching the finance of measures to the property such that if the house is sold, then so is the charge, meaning that the costs of installation are paid for by whoever is benefiting from the energy efficiency improvement.

Box 6: Discount rates and duration of tenure

Discount rates are used to capture the relationship between the value that individuals or businesses

⁶⁶ English Housing Survey, Table 7: Length of residence in current home by tenure, median length of occupation for owner occupiers.

⁶⁷ Brounen and Kok (2010), RICS, “On the economics of EU energy labels in the housing market”.

⁶⁸ Department of the Environment, Water, Heritage and the Arts (2008), “Energy Efficiency Rating and House Price in the ACT”

⁶⁹ Nevin, R. and Watson, G., “Evidence of Rational Market Valuations for Home Energy Efficiency”, The Appraisal Journal,

1989; and Longstreth, M., Coveney, A. R., Bowers, J. S., “The Effects of Changes in Implicit Energy Costs on Housing Prices”, The Journal of Consumer Affairs, Vol. 19, No. 1, 1985

⁷⁰ Royal Institution of Chartered Surveyors (2010) “Energy Efficiency and Value project”

attach to something received now compared to some time in the future. Individuals typically discount benefits occurring later, for example, someone could prefer to receive £100 now compared to £200 in five years time.

In the property market, there will be a number of factors that influence the discount rates shown towards energy efficiency investments. One of the key factors is the expected period of tenure for an owner occupier: there is little value to the occupier from the savings from energy efficiency measures if they have moved on (unless energy efficiency performance is reflected in the capital value of the property when they sell it). As there is often little certainty over the period of tenure, and expected tenure will typically exceed the payback period for the higher cost measures applied to hard to treat homes, a rational response would be to apply high discount rates.

Energy efficiency investments typically incur an upfront cost with a stream of benefits (avoided energy costs) stretching into the future. Applying high discount rates diminishes the value placed on this stream of reduced energy expenditure, with the private investment decision discounting future energy savings faster than would be the case using a social discount rate. This leads to underinvestment in energy efficiency measures.

Evidence from the Consumer Survey shows 18 per cent of households surveyed liked the Green Deal's ability to spread payments over time, and that 53% said that attaching the charge to the property would make them more likely to take up the Green Deal.

Misaligned incentives: Rental values may be largely determined by factors such as location and number of bedrooms, and may not reflect the energy efficiency of the property. Where this is the case the landlord has little incentive to invest in energy efficiency improvements because only the tenants receive the benefit of lower fuel bills. This is borne out by the data on take-up of measures under previous Supplier Obligations. Wall cavities in the private rented sector have been filled at a particularly low rate over the Energy Efficiency Commitment and Carbon Emissions Reduction Target years (2001-2008). The proportion that were filled only rose from 28.4% filled in 2001 to 31.8% in 2008. The increase in the proportion filled in the owner-occupied sector was significantly greater with filled cavities rising from 35.3% to 48.5%⁷¹. The introduction of the Green Deal goes some way to overcoming this problem, by routing charges through tenants' bills so that landlords do not have to bear the direct costs.

4.2 Distributional Rationale for Green Deal and the Energy Company Obligation

The Green Deal and Energy Company Obligation policies have an explicitly distributional objective in addition to helping reduce energy demand and emissions. The policies are designed to ensure that vulnerable and low income groups in the population receive improvements to their heating systems and the thermal efficiency of their property. The rationale behind the focus on low income and vulnerable households is founded in equity considerations and to ensure that measures are put in place in order to make progress towards the Government's statutory fuel poverty target.

Energy prices are expected to continue to rise in real terms over the next decade. This is partly due to an increase in wholesale prices and distribution/transmission charges but also due to the impact of Government policies (including ECO), which will place a disproportionate burden on lower-income

⁷¹ English Housing Condition Survey, 2007, English Housing Survey, 2008

households (for whom energy costs will make up a larger overall share of consumption). Affordable warmth assistance would help to mitigate the risk of negative distributional impacts of the scheme and will be important for the wider credibility of the policy.

Through the Affordable Warmth component of the ECO, minimum improvements in the energy efficiency of low income households could be guaranteed. Furthermore, the Green Deal also has an important role to play. It will increase the proportion of the costs of measures that are paid for at the point of benefit by able to pay households. The more that the Green Deal mobilises finance from beneficiary households the less ECO subsidy cost which will be smeared onto all households' energy bills, reducing the ECO costs paid for by all households. However, it is expected that some of the lowest income households would not benefit from the Green Deal mechanism themselves. This could be because they under-heat their property and thus would see limited bill savings to help repay the charge, even without the impact of taking more comfort (increasing the heat in the home). In addition, a higher proportion of lower income homes are averse to financial products such as the Green Deal.

4.3 Alternative Policy Options

Alternative options to implementing the Green Deal and the ECO package were considered prior to the introduction of the primary legislation which created the parent powers for the secondary legislation now being considered in this Impact Assessment. The UK Government must meet its statutory obligations under the Climate Change Act to reduce UK greenhouse gas emissions (GHG) and its statutory obligations to reduce fuel poverty. A viable alternative proposal must achieve deployment at scale of cost-effective energy efficiency measures - otherwise the costs to the UK of meeting carbon budgets would be substantially increased. It would also have to achieve improvements to the thermal efficiency of low income and vulnerable households to contribute to the Government's fuel poverty obligations.

ECO Only

An alternative option where the Green Deal was not implemented but the objectives were met only through the ECO was considered. However, with no Green Deal mechanism, credit constraints would not be alleviated. In addition, any self-finance of installation costs would be paid for by the individual rather than tied to the benefitting property. Because of these two effects, there would be an increased role for ECO subsidy. The proportion of the costs of installation of measures paid for by the beneficiaries of the measures would be reduced with greater pass through of (the higher) subsidy costs onto all energy consumers bills. This is less desirable outcome, in terms of the distributional impacts of the policy, than where a higher proportion of the installation costs are paid for by the beneficiary, although the impact could be partially offset through other aspects of the policy design (i.e., through ensuring that a greater proportion of measures were delivered to lower income households).

No ECO

The option of implementing only the Green Deal was also considered. However, without partial upfront subsidy, many socially cost-effective energy efficiency measures would not meet the Golden Rule. Without the availability of partial subsidies, take up would be low, and below the level required to meet the UK's legally binding carbon budgets cost-effectively. If cost-effective energy

efficiency measures are not deployed then other, less cost-effective abatement options would have to be used – increasing the overall cost to the UK of meeting carbon budgets.

Alternative Funding Mechanisms

Subsidies could be provided through a variety of mechanisms. The ECO is one of these, but in principle subsidies could be funded through general taxation, or could take a different form such as a stream of subsidy payments over the lifetime of the energy efficiency measure (i.e. an energy efficiency 'Feed-in-Tariff'). This stream of payments could again be paid for either through general taxation or through a levy on energy companies.

There are benefits to using the ECO to provide the required subsidy. Solid Wall insulation is a key pathway technology for the UK towards meeting its 2050 GHG reduction target. Through the ECO there is a strong signal of forthcoming demand for the supply chain to respond to – bringing forward investment from installers to increase their capacity and train additional installers. Through deployment at scale, the costs of solid wall insulation would be expected to fall through 'learning by doing'.

Under the proposals in this impact assessment, the ECO would be used to achieve delivery of heating and energy efficiency measures to low income and vulnerable households through an Affordable Warmth obligation. Post the closure of Warm Front in 2013, ECO would be the primary mechanism through which Government is ensuring the delivering support with measures to low income and vulnerable households. Relative to delivering these measures through a publically funded programme, the competitive pressures in the energy supply market provide an incentive for energy companies to drive down the costs of installation. These pressures may allow for more low income and vulnerable households to benefit from measures for a given level of spend.

Voluntary Approach

A voluntary approach working with energy companies would not provide the same confidence of future demand for solid wall insulation or that similar numbers of low income and vulnerable households would benefit from measures. Energy companies would not have an incentive, in the absence of the penalties for failing to meet their obligation, to provide upfront subsidy or promote solid wall insulation. Installers would have reduced confidence in future demand, slowing investment in the supply chain.

4.4 Strategic fit

In the domestic sector, the current major schemes to improve energy efficiency and support low income and vulnerable households to heat their homes will end within the next 18 months. CERT ends in December 2012, and Warm Front ends in March 2013. There are substantial market failures and barriers that are preventing household take-up of cost-effective energy efficiency measures. The Government's objectives to reduce fuel poverty and improve health outcomes for low income and vulnerable households require intervention.

In the non-domestic sector, the current major schemes to improve the energy efficiency of the non-domestic building stock, such as the CRC energy efficiency scheme, would continue after the proposed start date for the Green Deal. However these non-domestic schemes have incomplete

coverage and incompletely address barriers and market failures which reduce take-up of cost-effective energy efficiency measures in the non-domestic sector.

5 Aggregate impacts methodology

This section presents the methodology used to estimate the aggregate impacts of the Green Deal and the ECO. It covers the potential for improvements in the energy efficiency of the building stock and the approach used to estimate uptake in the domestic and non-domestic sectors. The impacts of the take-up of energy-efficiency measures are quantified according to Green Book⁷² guidelines and supplementary guidance.⁷³ Section 7 below sets out the results of this analysis. The aims of the analysis are:

- To understand the likely take-up of energy-efficiency opportunities as a result of the policy packages, and due to other underlying drivers of demand operating in the sectors;
- To assess the impacts on society as a result of the take-up of energy-efficiency opportunities, through abated carbon emissions, air quality, and financial costs and benefits;
- To estimate the likely size of the Green Deal Finance requirements, and of the ECO; and
- To estimate the likely impacts on consumer bills, and the distribution of such impacts.

5.1 Potential for energy efficiency improvements in UK housing stock

The starting point for the analysis is an assessment of the technical potential for improvements in the energy efficiency of the building stock. For the domestic sector the estimated potential is based on results from the English House Condition Survey⁷⁴, adjusted to account for the impact of existing government policies which will be operating until December 2012.⁷⁵ This provides an estimate of the remaining technical potential for energy efficiency improvements from the start of 2013.

Table 5 presents the technical potential for measures **included** in the analysis. The decision to include measures was based on a number of criteria including the energy savings they deliver, their cost-effectiveness and the extent to which their uptake is attributable to existing policies. A number of these measures could be installed along side each other as part of a package of Green Deal measures (for example, SWI could be installed alongside a replacement boiler, a loft insulation top up and floor insulation).

Table 5: Domestic sector technical potential for energy efficiency measures included in analysis

Measure	Technical Potential (GB)
CWI (easy to treat)	1.4m households
CWI (hard to treat)	4.9m households ⁷⁶

⁷² http://www.hm-treasury.gov.uk/data_greenbook_index.htm HMT Green Book: Appraisal and Evaluation in Central Government

⁷³ http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx

⁷⁴ English House Condition Survey (2008)

⁷⁵ CERT and CESP. Estimates of the impact of these policies is taken from their respective impact assessments and the HEED database for year where data is available. There may be a small level of uptake outside of these policies, but this is not considered significant enough to be included in the analysis.

⁷⁶ This IA uses an estimate of numbers of hard to fill cavities from DECC's 2009 report on the subject. Since then, DECC has become aware of new unpublished work for the Energy Saving Trust done by one of the 2009

Internal SWI	6.9m households
External SWI	
Loft insulation (top up)	6m households
Non condensing gas boiler to condensing gas boiler	16.4 non – condensing boilers
Condensing oil boiler	
Floor insulation	10m households
Flue gas heat recovery (condensing boiler)	There are roughly 22m gas boilers
Hot water cylinder insulation (top up)	11.5m household have less than 50mm
Double Glazing	6 million household do not have double glazing in all windows ⁷⁷
Secondary glazing	Can be adopted in place of double glazing (in a listed building, for example)

Much of the technical potential is socially cost effective (the benefit to society of installing the measures are estimated to be greater than the costs). The marginal abatement cost curves (MACCs) below (Figure 12 and Figure 13) show the cost-effectiveness of major insulation measures in 2013 and 2020. Using a static comparison, around 3.6MtCO₂e is cost effective in 2013. By 2020 this is expected to have increase to around 4.7 MtCO₂e as a consequence of falling installation costs owing to learning and economies of scale, and the expected increase in fossil fuel prices. A small proportion of this potential might be expected to be delivered without any further government intervention (see discussion of the Business As Usual scenario in the following section). To analyse the impact of the Green Deal and the ECO, an estimate is required of the additional uptake of these measures that they would achieve over the period to 2022.

report's contractors. New sources of evidence have suggested that some cavities currently classified as hard to treat could instead be classified as easy to treat, which would alter the share of hard- and easy to treat cavity wall potential. The final IA will take account of this new evidence.

http://www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/saving_energy/analysis/788-hard-to-fill-cavity-walls-domestic.pdf

⁷⁷ The EHS shows that 73% of English homes are fully double-glazed, 13% are at least half double-glazed, while 9% have no double glazing. This double glazing is predominantly PVC-U, which gives lower U-values (thermal performance) than most metal or wooden frames. Building Regulations have generally required replacement glazing to be of at least E-rating since 2002, and C-rating since 2010. The ultimate technical potential for double-glazing would be that all GB homes have A-rated double glazing.

Figure 12 and Figure 13 show that the most cost effective insulation measures in both 2013 and 2020 are cavity wall and loft insulation. They also show that the cost effectiveness of Solid Wall Insulation, proposed as the main focus of ECO, varies substantially depending on the house type it is being installed in and whether the insulation is applied internally or externally. Under the ECO, suppliers would seek to minimise their costs of meeting their obligation which would largely be determined by the subsidy to householders. It could be expected that to drive demand for measures, the subsidy per ECO point generated would be lower for more cost-effective solid wall insulation measures ensuring that the ECO would drive the installation of the more cost-effective opportunities. Further work will be carried out regarding the cost effectiveness of the total amount of Solid Wall Installations that would be required to meet the carbon requirements in the ECO.

A static comparison to DECC/HMG carbon values⁷⁸, particularly in 2013, shows that a substantial proportion of the Solid Wall insulation potential is cost-ineffective. This is a change from previous analysis carried out by Government and the Committee on Climate Change which suggested that almost all solid wall insulation was statically cost-effective. The reasons for the change are a more complex treatment of the housing stock (where previous analysis has used only a representative 3 bed semi-detached house) and higher estimates for installation costs (including hidden costs).

The static comparison of cost-effectiveness should be complemented by dynamic considerations and awareness of how the cost-effective benchmarks for Government appraisal were generated. could be expected to improve the cost-effectiveness of solid wall insulation in future time periods through learning by doing and induced innovation (see section 4.1.4). The MACCs shown in Figure 12 and Figure 13 show that by 2020 more solid wall insulation are cost-effective – this is partly a result of an assumption of higher energy prices in 2020, but also the modelling which endogenously reduces the cost of solid wall insulation over time in response to the scale of deployment in previous time periods.

In addition, the carbon values were derived using a target consistent approach in 2009. This target consistent approach used MACCs developed by the Committee on Climate Change to estimate the marginal cost of meeting the UK's carbon budgets. The MACCs included a substantial abatement potential from Solid Wall Insulation which was below the marginal cost. Updating our view of the cost-effectiveness of Solid Wall Insulation, increasing the cost per tonne, would increase the estimate of the marginal cost of meeting carbon budgets were the target consistent analysis revisited. The relative cost-effectiveness of solid wall insulation should be considered with respect to contemporaneous evidence on the cost-effectiveness of measures across the economy.

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http://www.decc.gov.uk/assets/decc/what%20we%20do/a%20low%20carbon%20uk/carbon%20valuation/1_20090715105804_e_@@_carbonvaluationinukpolicyappraisal.pdf

Figure 12: Marginal abatement costs for major insulation measures in UK dwellings in 2013

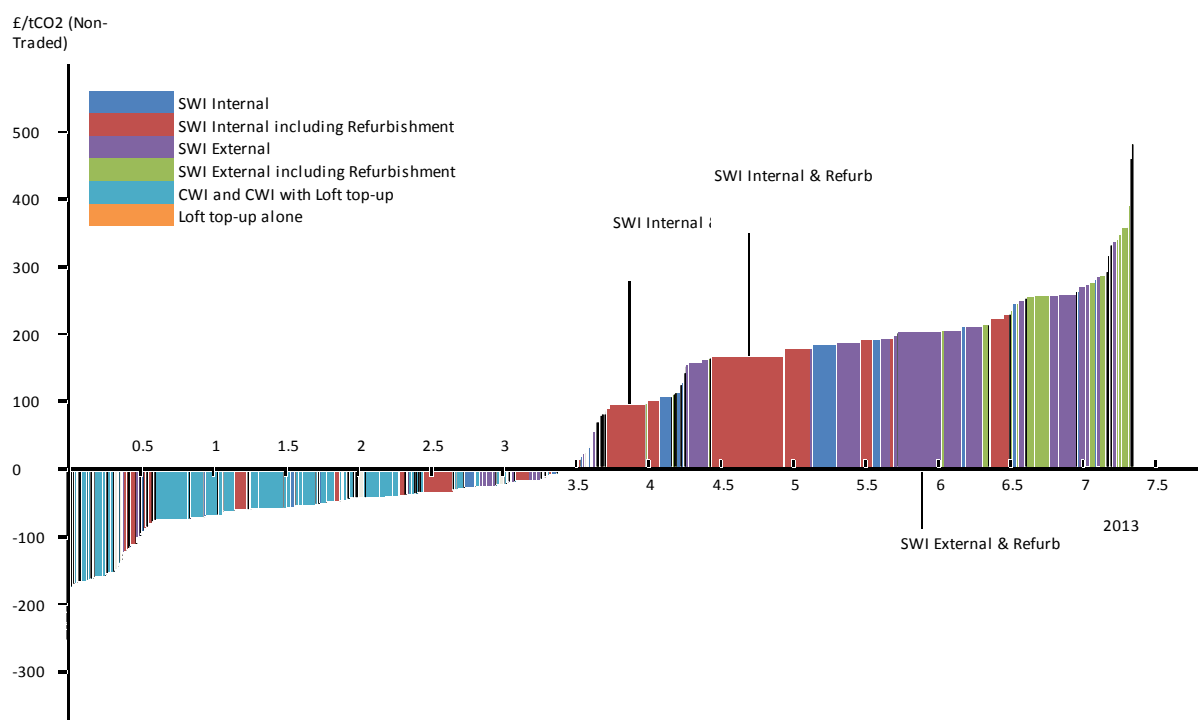
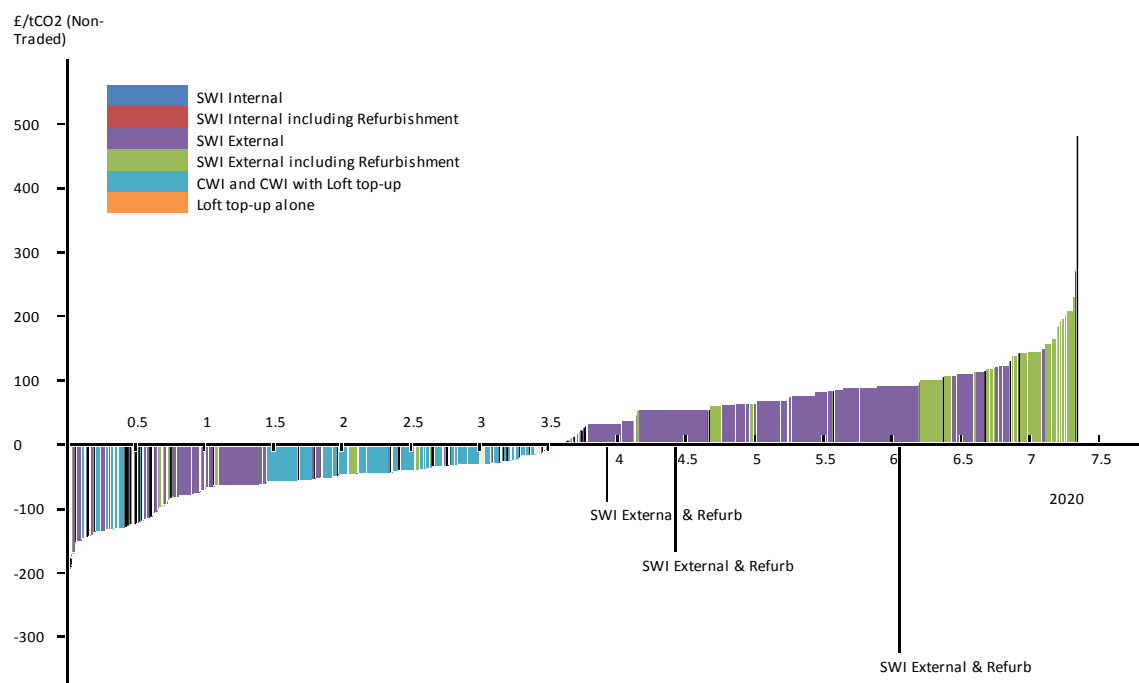


Figure 13: Marginal abatement costs for major insulation measures in UK dwellings in 2020, after assumed learning by doing and increased fossil fuel prices



A number of measures that would be eligible for Green Deal finance have not been included in the analysis due to uncertainty around their ability to deliver significant savings at current costs. Many of

these measures could be included in Green Deal plans as they may prove cost effective when financed as part of a wider package. In addition it is possible that innovation could improve the performance or lower the costs of some of these measures, in which case their potential to deliver larger carbon and energy savings cost-effectively would increase. A full list of measures that would qualify for Green Deal finance in the domestic sector can be found in Annex G. **DECC is keen to obtain any further evidence on the potential for these measures to contribute to further energy and emissions savings.**

5.2 Potential for energy efficiency improvements in non-domestic sector

Estimating the impacts of the Green Deal and supporting policy in the non-domestic sector also requires an assessment of the technical potential available for energy savings, and the associated costs. Estimates of technical potential have been adapted from the Non-Domestic Buildings Energy and Emissions Model (N-DEEM), and are given in Table 6. The N-DEEM model incorporates detailed energy use data from a survey of around 700 buildings⁷⁹. Only those measures that can be financed fully with a Green Deal have been included. The methodology of the N-DEEM modelling does not allow this abatement potential to be presented in terms of the number of instances of the measures. Furthermore, due to the uneven distribution of the potential across the stock, it is also not possible to produce such estimates without conducting substantial extra research.

The most significant measures that could be financed with a Green Deal are roof insulation, timers and more efficient lighting, although there are several others that are eligible. As shown in Table 6 the potential total market size for the measures is around £4.5bn, although it is highly unlikely that the Green Deal and supporting policy package would cover the full extent of this. It is possible, however, that there are other measures not contained within N-DEEM that meet the eligibility criteria, although no analysis has been undertaken of these measures owing to lack of additional data.

Table 6: Potential for energy savings in the non-domestic sector in 2011

2011 abatement potential	Capital (£m)	Energy savings potential (GWh pa)				
		Electricity	Gas	Coal	Oil	Energy Total Saving
SWI	£16	5	17	0	0	22
CWI	£204	491	220	0	1	713
Roof insulation	£3,154	2,336	5861	0	30	8,227
More EE Lights	£304	3,543	0	0	0	3,543
LEDs	£89	698	0	0	0	698
Timers	£57	7,904	0	0	0	7,904

⁷⁹ Sheffield Hallam University, Energy use in the non-domestic building stock: 2000 catalogue of results, Draft report no. SCP 4/12

Presence detectors	£436	1,645	0	0	0	1,645
Double Glazing	£105	35	116	0	0	152
Motors	£1	11	0	0	0	11
HF Ballast (Lighting)	£63	449	0	0	0	449
TRVs⁸⁰ (Heating)	£14	0	3628	0	34	3662
Programmable thermostats	£39	2418	13579	0	39	16035
Other	£1	1585	32	0	0	1617
Total	£4,483	21121	23452	0	105	44678

The uptake of energy efficiency measure could be constrained by either supply capacity or the ability of policies to drive demand. The remainder of this section focuses on how these will affect uptake.

5.3 Supply constraints

5.3.1 Summary of the Current Levels of Supply

During the year to April 2011, there were over a million cavity wall and over half a million loft insulation installations undertaken in homes (see section 2.3.1, above). The existing level of supply has been driven by obliging energy companies to improve the energy efficiency of domestic properties by delivering energy efficiency measures to those households – a policy originating back to the Energy Efficiency Commitment in 2002. Over this time, the supply chain has been able to build up capacity to ensure that over half the country's households now have loft insulation, and over half those with cavity walls have them filled them with insulation.

Installation of solid wall insulation was much lower to April 2011, mainly due to its high cost per unit of energy saved compared to other insulation options (which has resulted in suppliers focussing their subsidies on the more cost-effective loft and cavity wall insulation) and additional hidden costs from installing the measure. As a result, the supply chain capacity is much smaller than for lofts and cavity walls, and there is less standardisation in the way solid wall systems are installed.

Skills are spread throughout the construction industry and often deployed to different areas of energy efficiency measures as part of larger projects. Boiler replacement or micro-generation systems, for instance, require the skills of plumbers and electricians, and possibly roofers. These are all skills for which the construction industry is likely to be able to deploy quickly, given there are currently around 170,000 plumbing and heating and ventilation engineers, 200,000 electricians, and 40,000 roofers in the country.

⁸⁰ Thermostatic Radiator Valves

5.3.2 The Industry's Capacity to Expand

The construction industry is used to adapting to peaks and troughs in workloads. Labour shortages can, to some extent, be filled by workforces being redeployed from elsewhere or by retraining the existing workforce. Difficulties mainly arise when specialist training is required and demand outstrips the ability of the workforce to adapt. Whilst we do not believe that there will be a supply side constraint in the medium term, a significant ramp up of Solid Wall Insulation delivery could be a challenge in the first few years of the ECO. This is potentially a concern in the solid wall insulation market.

Discussions with stakeholders (including the National Insulation Association (NIA) and the Insulated Render and Cladding Association (INCA)) suggest that the market for solid wall insulation can safely be expanded to meet substantially higher demand levels than at present. The provisos being that work is carried out under appropriate technical controls and that the correct investment signals are given to provide industry with the confidence to invest in training installers and advisors. While there is confidence that the supply chain can respond in the medium term, further analysis is needed on how quickly the number of suitably trained and accredited installers could ramp up to meet demand within the first year or two of the ECO. For this Impact Assessment no supply chain constraints have been assumed. **DECC are keen to receive evidence on the speed with which installation rates for solid wall insulation could ramp up** and are working with the NIA, INCA and others to ensure that, when interim obligations are set for the ECO, they are achievable.

Other measures likely to be financed through the Green Deal would call on a large existing skills base, which should be able to adapt relatively quickly to higher demand. Given there are approximately 1.6 million boilers replaced each year, for instance, there should be ample capacity to respond to higher levels of demand for these types of measures. The additional skills required to supply an energy efficiency solution would depend on the nature of the measures, but – solid walls aside - there is little to suggest that there would be problems for the installation industry to meet higher levels of demand for most energy efficiency measures. Availability of products is not a concern as higher demand levels should be able to be met by a combination of domestic and imported goods. Experience from Australia suggests that the quality of products could be compromised if there is rapid growth in the market, although there is no evidence to suggest this might be an issue with the Green Deal.

Analysis suggests that the level of demand for the Green Deal is likely to be the binding constraint on the uptake of energy efficiency measures. For this reason supply side constraints are not incorporated into the modelling of uptake. However, we are seeking evidence on the potential for the installation industry to ramp up capacity and this evidence will be reflected in the final Impact Assessment.

5.4 Demand for energy efficiency measures under the policy package

Demand for energy efficiency measures under the Green Deal would be driven by a number of factors:

- The ECO Carbon Reduction and Affordable Warmth targets. Higher targets would require energy companies to spend more subsidising and marketing measures. Higher subsidies

would make Green Deal plans more attractive to consumers, increasing demand. Conversely, lower targets and subsidies would reduce demand.

- Level of supporting policy: The implementation of stronger supporting policies such as the regulation of the PRS would increase demand for energy efficiency measures
- Energy prices: Higher energy prices would increase the bill savings from energy efficiency measures and mean more properties would meet the Golden Rule.
- Interest rates: Higher interest rates would increase the costs of Green Deal finance. Fewer households would meet the Golden Rule and demand would be lower.
- Costs of energy efficiency measures: Reductions in installation costs would reduce Green Deal repayments and lead to more measures meeting the Golden Rule. Costs reductions could be caused by product or process innovations, or economies of scale
- Consumer preferences: Consumer attitudes to energy efficiency products, including their perceptions of future bill savings, will also affect demand.
- The availability of other forms of credit (for example, mortgages) which could be used to finance measure installations.

5.4.1 Modelling demand in the domestic sector

The main tool used to analyse domestic sector demand is the Green Deal Household Model (GDHM). This combines the house condition surveys with the Green Deal survey to simulate the uptake of Green Deal plans. The house condition surveys are used to classify the building stock into 1582 household types using variables such as size, tenure and wall type. The Green Deal survey is used to determine the value consumers place on different aspects of the Green Deal plans, such as net bill saving or type of measure (see Box 7 below for more detail on the Green Deal Consumer Survey and Green Deal Household Model). Take up of measures under the Affordable Warmth obligation is modelled separately, and is consistent with demand levels observed for previous schemes where heating and insulation measures were 100% subsidised, such as Warm Front.

The GDHM uses consumer preferences, derived from the Green Deal survey, to estimate the uptake of Green Deal plans for a given set of other inputs (level of ECO subsidy, interest rate, energy prices, measure costs). The consumer preferences incorporate the additional 'hidden' costs associated with energy efficiency measures such as the hassle cost of householders having to spend time working with Green Deal assessor and installers, and the value of floor space lost as a result of installing internal SWI.⁸¹ Green Deal survey participants were also given a description of the key elements of the Green Deal Mechanism (energy efficiency measures would be installed at no upfront cost and repayments would be attached to the properties energy meter). The consumer preference therefore also reflect consumer attitude to the new finance mechanism.

The impact of other supporting policies has been modelled by adjusting key input parameters such as decision frequency (see annex B for more detail). The analysis is based on the assumption that energy companies optimize their subsidy spending to meet their carbon target at lowest cost. The total level of costs passed through to consumers is based on the marginal subsidy cost of the last measure required to meet the target multiplied by the size of the obligation (see section 9 for a discussion). The Carbon Target is modelled with interim targets covering the periods 2013-2015,

⁸¹ More detail on the consumer preference can be found in section 15.3.4.

2016-2018 and 2019-2022. Subsidy for measures provided to households eligible for assistance under the Affordable Warmth target is assumed to be 100%.

The GDHM has been used to estimate the aggregate impact of the three high level policy options summarised below in Table 7. The size of the carbon target and the affordable warmth obligations are specified in terms of metrics based on the CO₂ and heating aspects of a property's EPC assessment. These metrics can be specified in either annualised (first year only) terms or the total over the lifetime of the measure installed. At present one is not preferred over the other, but for the purposes of this IA the carbon target is expressed as the sum of the assessed CO₂ savings in the first year from the installation of measures over the 10 years of the obligation, and the Affordable Warmth target this is the sum of the assessed lifetime bill savings from the installation of measures in eligible households (see section 9.1.5.1 for a discussion of options for setting the target metrics of the obligation).

The results presented in this impact assessment are based on a modelling of the ECO to 2022. However, the consultation proposal is that the ECO targets are initially set for the period to March 2015. Pro-rating the 2013-2015 interim target results gives a Carbon Savings target of 0.52MtCO₂/yr by March 2015, and an Affordable Warmth target set at a level of £3.4billion reduction in notional lifetime costs of heating for low income and vulnerable households by 2015. These figures will be refined following evidence from the consultation.

There are risks and uncertainties associated with setting a level for the carbon and Affordable Warmth targets. The results for each of the policy options have been tested using a number of different assumptions for interest rates, energy prices and SWI costs. They have also been tested against a range of consumer demand assumptions, which include a low scenario where no marketing and promotional activity takes place and a high scenario where consumers' aversion to SWI is lower relative to the survey due to consumer becoming familiar with the products available. This provides a range of costs and benefits for each policy option, and illustrates how ECO spending could vary for each target (see section 7.3)

Table 7: High level policy options

	Carbon Saving Target (annual CO₂ savings)	Affordable Warmth Target (total lifetime bill savings)
Option 1	No ECO. Green Deal only	
Option 2	1.95 MtCO ₂	£13.5bn
Option 3	2.05 MtCO ₂	£14.7bn

The modelling focuses on those energy efficiency measures within the scope of the Green Deal and ECO which are likely to deliver a significant proportion of the energy and carbon savings (CWI, SWI, Loft insulation and replacement boilers). These measures are estimated to deliver over 95% of the total lifetime non-traded carbon savings achieved by the Green Deal and the ECO. A number of other measures will have a small additional impact and have been analysed separately.

Box 7: The Green Deal Consumer Survey and the Green Deal Household Model

In early 2011 DECC commissioned a survey of a representative sample of 2,023 homeowners and

private tenants in Great Britain. The survey aimed to explore how consumer preference could impact on demand for the Green Deal. A choice based conjoint methodology was adopted and respondents were asked to make a choice between a number of Green Deal packages, with varying attributes. The attributes that were varied included types of energy efficiency measures, the cost of an assessment, upfront payment, net savings, terms of payment and type of interest rate. Respondents traded off these attributes against each other, and indicated their preference. From this information, it was possible to establish the relative importance of each of the attributes which fed into the development of DECCs modelling and uptake levels. More detail on the findings from the survey and other research are provided in annex D.

Element Energy and Cambridge Architectural Research were subsequently commissioned to produce a model of household uptake under the Green Deal, based on the survey results⁸². The DECC Green Deal Household Model is designed to predict the uptake of various energy efficiency measures in the UK domestic sector, under different Green Deal policy configurations. It allows the user to vary the offer to the consumer for different technologies, by modifying the upfront cost contribution, the assessment cost to the householder, the repayment term for the Green Deal finance and the contribution from the Energy Company Obligation.

The model includes 1582 typical GB house types (determined from a breakdown of the GB Housing Condition Surveys) and outputs from the SAP 2005 energy model to predict a reduction in energy requirements from the application of Green Deal measures to individual homes. The model can then calculate the corresponding annual fuel bill savings and social benefits.

The model uses a Logit-based methodology to allow consumers in each house type to make a choice between measures which are suitable in a given house type and which meet the Green Deal “Golden Rule” (i.e. fuel bill savings exceed the repayments). The consumer behaviour in the model is based on the results of the choice experiment within the Green Deal consumer survey and reflects the financial benefits of the packages of measures but also consumers’ perceptions of hidden costs and aversion to particular measures. The outputs of the choice modelling are used to predict the uptake from competing technologies under a range of Green Deal configurations.

Analysis of the survey suggested that two distinct up-take models for the affordable warmth and other groups provided the best balance between fit of the model and power to identify the response to the measures characteristics. Hence one model is used to determine take-up for all house types within the “affordable warmth group” and the other model is used to determine take-up for the other household types.

More comprehensive details on the GDHM can be found in Annex B and details on the specific assumptions that have been used can be found in Annex A.

5.4.2 Modelling demand in the non-domestic sector

Two modelling tools have been adopted in the non-domestic sector to analyse the impacts of the Green Deal and the potential savings from supporting policy in the Private Rented Sector (PRS)

⁸² http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx

respectively. More comprehensive details on the modelling undertaken in the non-domestic sector may be found in Annex C.

For the Green Deal, a stock of energy efficiency options has been identified using information from the Non-Domestic Buildings Energy and Emissions Model (N-DEEM). This has been supplemented with insights on possible options for bundles of Green Deal measures that can be installed in specific building types. This additional information has been adapted from work undertaken by the Carbon Trust/AEA as described in Annex C. The take-up of these bundles is assessed based on a consideration of the decision-making process that a potential Green Deal consumer might go through. Combining the decision-making analysis with the stock of energy-efficiency measures available in the cross-section of non-domestic buildings it is possible to obtain projections of the take-up as a result of the Green Deal.

The impact of supporting policy in the PRS has been assessed in the context of lifting all buildings with an F or G- rating on their Energy Performance Certificate (EPC) to an E-rating, whilst accounting for the barriers that may prevent this being universally successful. The Carbon Trust's analysis presented in the report *Building the Future Today*⁸³ forms the basis of the assessment of these impacts. The analysis has been extended by considering the take-up as a result of existing policy (to avoid double-counting), and the proportion of this potential that would not be deliverable, be it as a result of exemptions or other limiting factors. The take-up profile has been linked to the distribution of lease periods in the PRS. This approach assumes that the signing of new leases forms the primary determinant of when measures are installed.

In line with the domestic sector, three scenarios are modelled, which are characterised as follows:

- The **low** scenario assumes that there are preferences for quick pay-back bundles whenever these are available. If there are bundles that deliver greater savings over time, but do not pay back as quickly as a less extensive bundles, then these are not taken up in the low scenario. It is also assumed in this scenario that there is some supporting policy in the private rented sector (PRS), but that a significant proportion of savings covered by this policy would not be deliverable in practice.
- The **central** scenario represents our best estimate of the impact of the Green Deal and supporting policies. There is a tendency for consumers of Green Deals to have varied preferences when it comes to payback periods, but with a general tendency towards quick payback options, reflecting observations from firms specializing in energy management services. In this scenario, it is also assumed that there is some supporting policy in the PRS targeting F and G EPC-rated buildings, although there are limitations regarding the deliverability of this. These limitations relate to the number of exempted buildings, the number of buildings with long leases, and the level of non-compliance with the regulations.
- The **high** scenario is characterized by consumers preferring more comprehensive bundles, regardless of payback period, so long as the bundles pay back at some stage. This delivers a much higher level of savings, but requires a much bigger commitment from consumers. The scenario also assumes that there is good supporting policy in the PRS, requiring that all F and G EPC-rated buildings are required to improve their rating to at least an E whenever it is

⁸³ <http://www.carbontrust.co.uk/Publications/pages/publicationdetail.aspx?id=CTC766>

cost-effective to do so. Within this, it is assumed that a significant proportion of this is paid for with Green Deal finance, and that there are few buildings that the policy will not have an impact on.

6 'Do Nothing' Counterfactual

In order to assess the likely impacts of the Green Deal and Energy Company Obligation (ECO) it is necessary to first make an assessment of what would most likely occur in the absence of the policies, but with all other relevant factors present. This counterfactual or Business As Usual (BAU) scenario forms the starting point for analysis of the impacts, as it is this that the policies build upon. More detail on the methodological approach is included in Annex A.

For the purposes of the analysis, this BAU is characterised by three elements: the take-up of energy efficiency opportunities, changing demand for energy services and the changing carbon intensity of energy consumption.

6.1 Take-up of energy efficiency potential

6.1.1 Domestic sector BAU take-up

The BAU take-up of energy efficiency opportunities is driven by:

- policy that would be present in the absence of the Green Deal and ECO;
- potential remaining after the impacts of current energy efficiency policies (CERT and CESP) ending in 2012
- behaviour trends and changes in awareness;
- technological progress, with new energy efficiency products available, and changing costs of measures; and
- energy prices, which are expected to rise over the period in real terms.

Sales of domestic sector energy efficiency measures in the counterfactual are projected to be much lower than historic sales. For the past decade the market has been driven by high levels of subsidy provided through the CERT, CESP and EEC policy interventions. By comparison, the BAU scenario is based on a market in which these policies end, and no further policies are implemented to replace them.

Table 8: Modelled counterfactual take-up of measures in the Green Deal Household Model

Measure/package of measures	Cumulative Sales to 2022
SWI	1,400
CWI	350,000
Loft top up only	175,000

Table 9: Counterfactual take up of measures not included in the GDHM

Measure/package of measures	Sales per annum
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Double Glazing (upgrade C to A) and Insulated Doors	5,794,000 ⁸⁴ (approximately 1.25m Dwellings)
Floor insulation	15,000 ⁸⁵

6.1.2 Non-Domestic Sector BAU take-up

The modelling of the Green Deal in the non-domestic sector uses models which estimate take-up of the potential stock of energy efficiency opportunities. These models provide an assessment of the total energy efficiency potential, this potential can then be reduced to account for the impact of the policies and other underlying factors. This delivers an estimate of the remaining energy efficiency savings that could potentially be delivered by the Green Deal.

BAU take-up rates will depend on the amount of abatement opportunities remaining, underlying market-driven take-up, and the effect of other policy interventions. The methodology for this is described in more detail in Annex C. The BAU take-up of opportunities is accounted for in two steps: First, account is taken of the take-up achieved under a pre-Energy White Paper (EWP) 2007⁸⁶ policy mix; and second adjustments are made for policy that has been implemented since then.

6.2 Demand for Energy Services

The savings that energy efficiency measures achieve depend on the demand for energy services in the property that they are being installed in. For instance, installing a more efficient boiler will save less energy if the occupiers choose to heat their home to a low rather than high temperature. Account must be taken of any projected change in demand for energy services over the appraisal period.

6.3 Carbon intensity of energy consumption in the BAU

There will also be changes to the carbon intensity of the supply of energy in the counterfactual. It is important to account for this in the analysis, where appropriate, as this can affect the potential savings that could be deliverable through the Green Deal and ECO.

⁸⁴ "Implementation Stage Impact Assessment of Revisions to Parts F and L of the Building Regulations from 2010" by DCLG – obtained by Market research 2007

⁸⁵ Source: "Implementation Stage Impact Assessment of Revisions to Parts F and L of the Building Regulations from 2010" by DCLG

⁸⁶ http://www.decc.gov.uk/en/content/cms/legislation/white_papers/white_paper_07/white_paper_07.aspx

7 Aggregate impacts of the Green Deal and ECO

This section presents the aggregate impacts of the three high level options described above (see Table 7). The section also provides a more detailed sensitivity analysis of option 2 to illustrate some of the risks and uncertainties associated with setting ECO targets. The aggregate impacts aim to represent the impact of the central working options for the Green Deal and the ECO (see section 3). Many of the elements of the Central Working options are under discussion and being consulted upon. For more detail on the options under consideration for the Green Deal and ECO see section 8.

Table 10 below sets out the high level impacts associated with meeting the different policy options. The net present value (NPV) ranges from £3bn in option 1 to £8.7bn in option 2. Lifetime non-traded carbon savings range from 34 to 114 MtCO₂e. As expected, the majority of the costs go towards installing energy efficiency measures, which account for between 52% and 68% of the total costs. The hidden costs⁸⁷ are the second most significant element of the total costs; they account for between 19% and 28% of the total costs.

Table 10: Headline social impacts of the Green Deal policy package

		Option 1	Option 2	Option 3
Costs (£m)	Installation costs	£3,219	£13,764	£14,479
	Hidden costs ⁸⁸	£1,760	£4,113	£4,079
	Assessment costs	£434	£912	£928
	Finance costs	£673	£1,540	£1,525
	GD mechanism costs	£151	£222	£224
	Total costs (£m)	£6,237	£20,550	£21,234
Benefits (£m)	Energy savings (Variable element)	£5,526	£16,841	£17,174
	Comfort benefits	£993	£3,760	£3,854
	Air quality benefits	£360	£1,313	£1,323
	Lifetime non-traded carbon savings	£1,607	£5,377	£5,385
	Lifetime EU Allowance savings	£851	£1,917	£1,996
	Total benefits (£m)	£9,337	£29,209	£29,731
Total (£m)	Net Present Value (£m)	£3,099	£8,659	£8,497
	Equity-weighted NPV	£3,771	£10,986	£9,864
Carbon & Energy savings	2020 Non-traded carbon savings (MtCO ₂ pa)	1.26	2.11	2.02
	- Domestic GD and CT measures	0.36	2.49	2.53
	- Domestic AW measures	0.00	-1.28	-1.41
	- Non domestic sector	0.90	0.90	0.90
	2020 Traded carbon savings	1.29	3.77	3.96

⁸⁷ Such as the value of consumers time spent working with assessors and installers, and the value of floor space lost as a result of installing internal SWI.

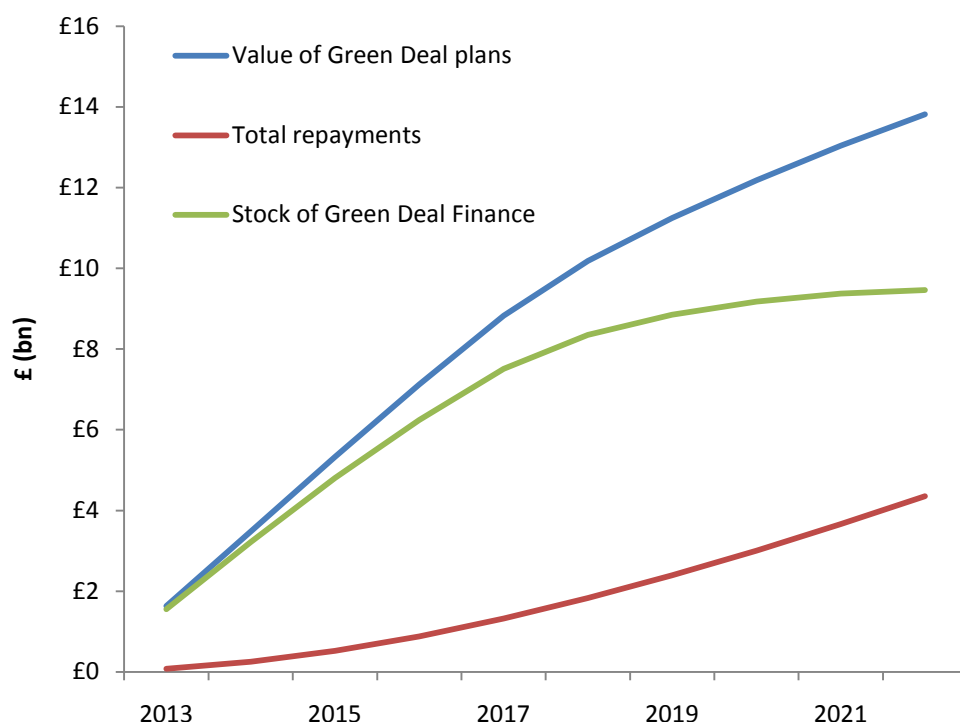
⁸⁸ Additional costs include the loss of internal living space, and hassle and disruption costs (the cost assumptions used are based on published guidance). These costs are largely driven by the installation of internal SWI, but are not fully reflected in the consumer preference coefficients. These costs fall between options 2 and 3 because a number of households switch from installing internal to installing external SWI. This is because as the subsidy is increased external SWI meets the Golden Rule in a larger number of cases, and the consumer choice coefficients lead some households to switch measure.

(MtCO ₂ pa)			
2020 Energy savings (TWh)	11.42	21.22	21.24
Life time non-traded carbon savings (MtCO ₂)	34	114	114
Life time traded carbon savings (MtCO ₂)	22	53	56
Average cost effectiveness £/non-traded tCO ₂	-£43	-£29	-£27

Note: The monetary impacts are expressed in net present value (NPV) terms, in 2011 prices.

As households and businesses take up Green Deal plans, the stock of Green Deal Finance rises. This would be offset by repayments from customers, which would reduce the outstanding stock of finance. As the increase in Green Deal Finance is expected to be larger than the repayments, the stock of finance is expected to rise over the appraisal period, reaching £9.5bn by 2022 in option 2. However, it is unlikely that all the costs to households and businesses of installing energy efficiency measures would be covered by Green Deal Finance. For example, some households may choose to fund installation using alternative forms of finance once the Green Deal assessment has been done, such as using savings or mortgage finance. Figure 14 illustrates the estimated size of the domestic sector Green Deal Finance market over the period to 2022 for option 2. In total under option 2, the Green Deal and ECO would drive around £21bn of capital spending on energy efficiency measure by 2022.

Figure 14: Domestic sector Green Deal Finance between 2013 and 2022 in option 2



The majority of the energy savings resulting from the policy package are in the domestic sector, which accounts for 80% of the total. The rest of this section presents the detailed results for the domestic and non-domestic sectors.

7.1.1 Uptake in the domestic sector

For the preferred policy options (option 2), the estimate of domestic sector Green Deal sales is 3.6m households by 2022. This compares to 530,000 households installing at least one measure in the business as usual (BAU) scenario.

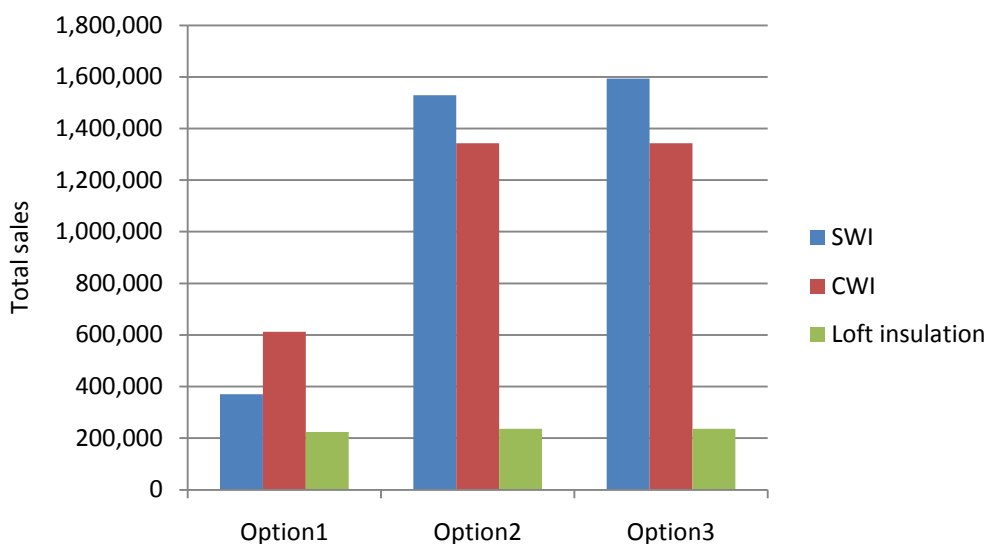
7.1.1.1 Uptake by measure

The uptake of different measures is driven by their relative attractiveness to households (including the net savings each provides and subsidies where appropriate) but is also constrained by the technical potential for improvement to the housing stock. Figure 15 shows the modelled uptake of the three main insulation measures for different policy options (solid wall insulation (SWI), cavity wall insulation (CWI) and loft insulation installations).

SWI sales are expected to rise as higher levels of ECO subsidy are provided - Option 1 does not include any ECO support, so SWI sales are significantly lower. There is less difference in CWI sales between the three scenarios. This is partly owing to a larger number of the easy to treat CWI installations meeting the Golden Rule with no ECO subsidy. In addition, there are only 1.4 million “easy to treat” cavity walls available. The remaining “hard to treat” CWI potential is less cost effective relative to SWI. CWI sales drop off from around 2017, therefore, when the “easy to treat” cavity walls have been exhausted.

In some cases a number of measures would be installed alongside cavity or solid wall insulation. The total sales of CWI and SWI in Figure 15 include some household that also have loft insulation or floor insulation installed.

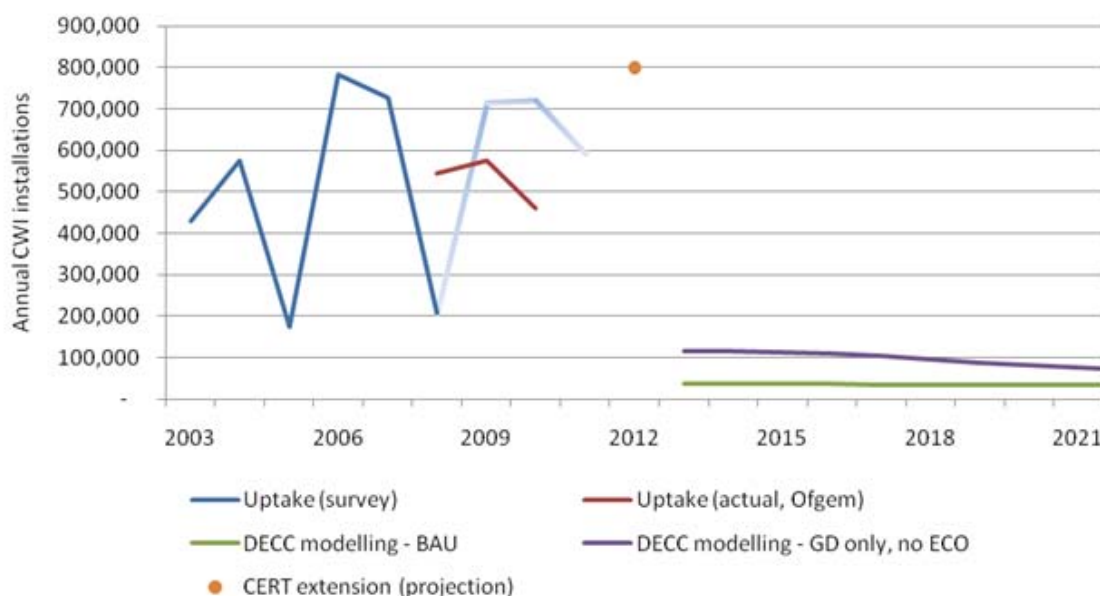
Figure 15: Uptake by measure in the central scenario by 2022, above BAU.



The annual uptake of CWI driven by the Green Deal is higher than the business as usual scenario, but significantly lower than current uptake rates. This is mainly because CWI has been subsidised over the past decade as a result of policy interventions (ECC, CERT and CESP). Under the Green Deal, subsidies for CWI will be removed, and so demand is expected to be lower, as illustrated in Figure 16. Demand will still be higher than BAU if the Green Deal is implemented because of the Green Deal

finance mechanism removing upfront costs, reducing the opportunity cost of paying for energy efficiency measures for some households and the Green Deal providing increased consumer confidence in the supply chain and effectiveness of measures.

Figure 16: Historic and projected CWI installations – installation rate under option 1 significantly lower than historical installation rates.⁸⁹



7.1.1.2 Uptake by tenure

There are significant differences in projected uptake between different tenure groups. Figure 17 shows the uptake of SWI in option 2. The model predicts that in the owner occupied sector, uptake is relatively constant. In the private rented sector, activity increases more rapidly as landlords take steps to meet the private rental sector (PRS) supporting policy that comes into effect in 2018.⁹⁰ Once this regulation has come into effect and the stock of F and G rated properties have been retrofitted, uptake declines. Energy companies find it more cost effective to meet carbon reduction targets by supporting energy efficiency in the social housing sector, meaning uptake in the sector is significantly higher.⁹¹ However, after starting at a higher level, uptake in the social housing sector gradually declines from 2013 as opportunities for energy efficiency improvements are used up.⁹²

There is a considerable level of uncertainty surrounding the estimates presented in this section. The estimates are derived from modelling analysis which required a number of sampling assumptions. These assumption are set out in detail in Annex A: Analytical Assumptions and Annex B: The

⁸⁹ Survey data from 2009 onwards is based on administrative data of measures installed. The CWI trend is based on a survey that does not accurately identify year on year changes in CWI levels. Sampling error will explain some of the difference. Ofgem's actual uptake data is a more robust picture of the actual uptake rates

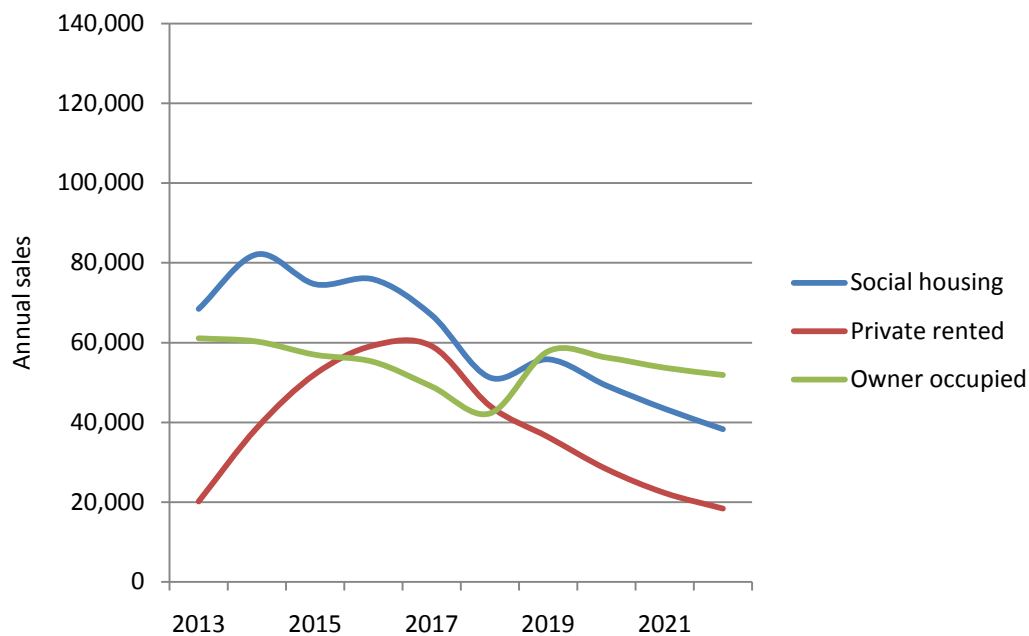
⁹⁰ Based on a 100% compliance assumption

⁹¹ Base on assumed economies scale in the SH sector. See Annex A for more details.

⁹² The modelling assumption for decision making frequency in the social housing sector (see section 15.3.3) drives the high rates of take-up in the early part of the obligation period. It is likely that the profile of action in the sector will be flatter than the modelling suggests. This will be looked at further before the final Impact Assessment.

Domestic Green Deal Model, and a detailed sensitivity analysis is set out in section 7.3. However uptake of energy efficiency measures is likely to be affected by a wide range of factors not accurately reflected in the modelling analysis. Further research will be done prior to the final Impact Assessment. Further work will also be required on supply constraints and the feasibility of ramping up delivery of solid wall insulation as set out in section 5.3.2.

Figure 17: Additional SWI sales 2013 – 2022, by tenure



For comparison of uptake of across options the three options, the figures below show the uptake of Solid Wall Insulation in all three options across the social housing, private rented and owner occupied sectors.

Figure 18: Uptake of SWI in the social housing sector

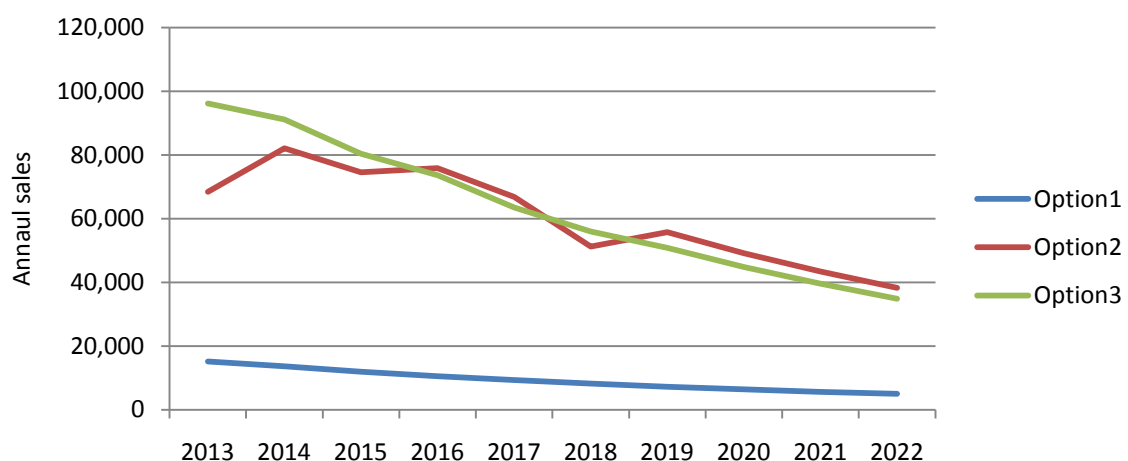
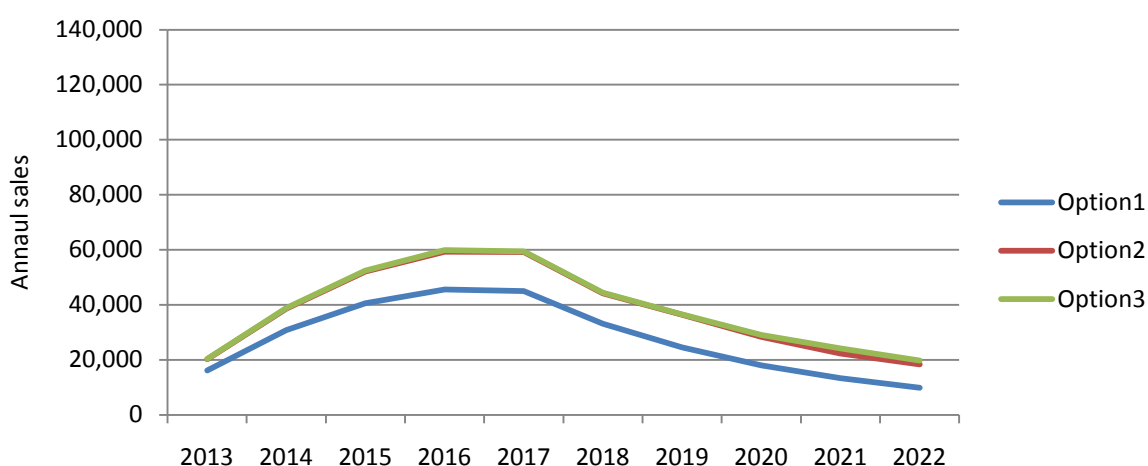
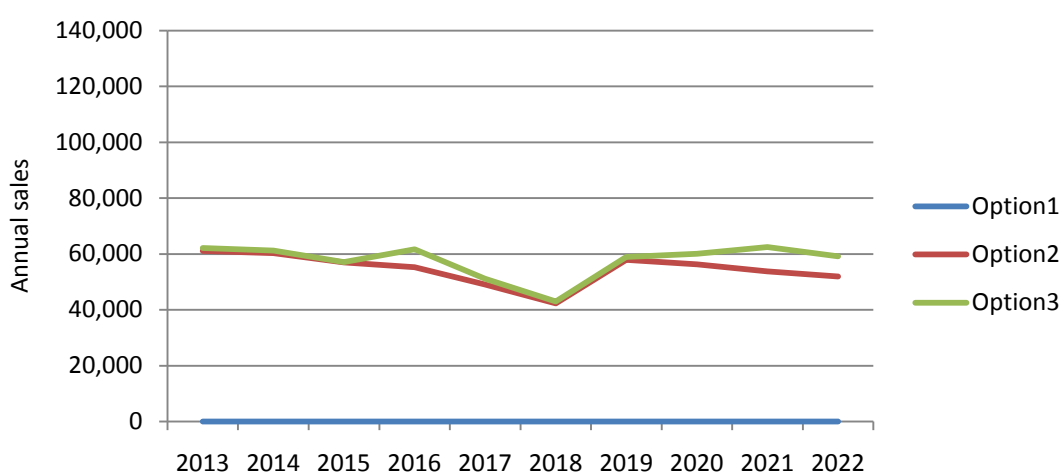


Figure 19: Uptake of SWI plans in the private rented sector

Figure 20: Uptake of SWI plans in the owner occupied sector


7.1.1.3 The impact of energy efficiency measures not include in the GDHM

A number of other insulation and heating measures also contribute to the energy and carbon savings. These are likely to be installed alongside wall insulation as part of a package of measures. Although a wide number of measures could be available under the Green Deal, the analysis has focused on those measures that would be likely to have a significant impact given their current costs and performance (floor insulation, flue gas heat recovery). These deliver around 2% to 4% of the total lifetime carbon savings from domestic insulation. The impact of these measure is presented in Table 11. Further information on how these impacts were estimated can be found in annex B.

Table 11: Carbon savings from measure not included in the Green Deal Housing model

	Lifetime CO ₂ savings
Fabric improvements	0.6 – 2.6 MtCO ₂
Heating systems	0.025 – 0.145 MtCO ₂

It is likely that the increase in demand driven by the policy package would increase innovation in the market. This could improve the performance and/or drive down the cost of existing measures, or lead to new measures being developed. This would result in more measure meeting the Golden Rule and lead to higher energy and carbon savings than presented in this assessment. Box 8, below, highlights such a scenario, along with tighter enforcement, to assess the market's potential.

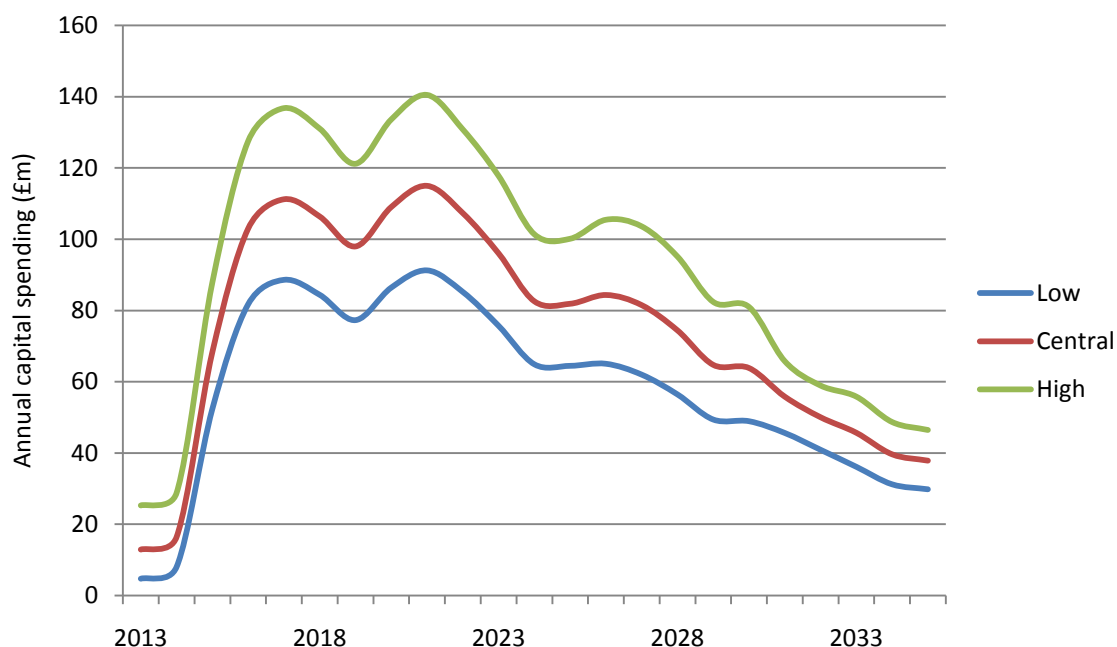
7.1.2 Uptake in the non-domestic sector

The estimated impacts of the non-domestic Green Deal and associated supporting policy vary depending on the assumptions made. The majority of the variation derives from the assumptions surrounding the analysis of the supporting policy in the PRS. This reflects not only the likely scale of the policy relative to the non-domestic Green Deal, but also the uncertainty surrounding the precise nature of the policy and how its implemented.

Figure 21 presents the expected take-up of measures as a result of the policies, which peaks between 2015 and the early 2020s. Annual installation rates in the central scenario vary between £100m pa and £115m pa during this period. Take-up resulting directly from the Green Deal peaks in the early years of the policy, and declines over time as more and more abatement opportunities are exhausted.

For the purposes of the analysis, take-up as a result of the supporting policy in the PRS peaks in the year the policy enters into force, with installations occurring up to four years in advance of the policy as a result of market anticipation. Take-up is closely related to the lease period, and reflects the number of properties that begin a new lease in a particular year.

Figure 21: Green Deal take-up in the non-domestic sector (Green Deal and supporting policy in the PRS)



7.2 Aggregate impact on domestic and non-domestic CO₂ emissions

The Green Deal and the ECO would reduce energy consumption by households and businesses, which would lead to a corresponding reduction in carbon emissions. Carbon emissions are divided into the traded (those covered by the EU Emission Trading Scheme (ETS)) and non-traded sectors. The ETS covers electricity generation and some industrial processes. Reductions in energy consumption in properties with an electric heating system would therefore lead to reduced traded carbon emissions. The benefits of this reduction would flow from the lower number of European Union Allowances that energy companies would have to purchase. For properties with gas, coal or oil heating systems, the reductions in energy consumption will lead to lower non-traded carbon emissions. These are valued using DECC's carbon values.⁹³

Figure 22 presents the projected impact on carbon dioxide emissions in the non-traded sector as a result of the policy package. In the central working option (option 2) these non-traded savings contribute 29.5MtCO₂ to Carbon Budgets 2, 3, and 4.

There are two factors that drive these results: the first is as households and businesses install insulation measures, carbon savings would rise relative to the BAU scenario, and then gradually decline as measures reach the end of their lifetime. The second is additional heating measures installed under the Affordable Warmth target, which is likely to lead to higher energy consumption, as low income and vulnerable groups benefit from homes that cost less to heat. This leads to a reduction in the level of non-traded carbon savings. These two factors work against each other to produce the profile of non-traded carbon saving show in Figure 22. The dashed line shows the non-traded savings excluding the impact of the Affordable Warmth heating measures. These rise until the end of the policy period (2022) and then start to fall as measures reach the end of their lifetime. The actual profile of non-traded savings is lower during the period when heating measures are being installed, but as they have a shorter lifetime (12 years) net non-traded savings would rise again from 2024.

⁹³ *Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal and Evaluation*; DECC/HMT; June 2010
http://www.decc.gov.uk/assets/decc/statistics/analysis_group/122-valuationenergyuseggemissions.pdf

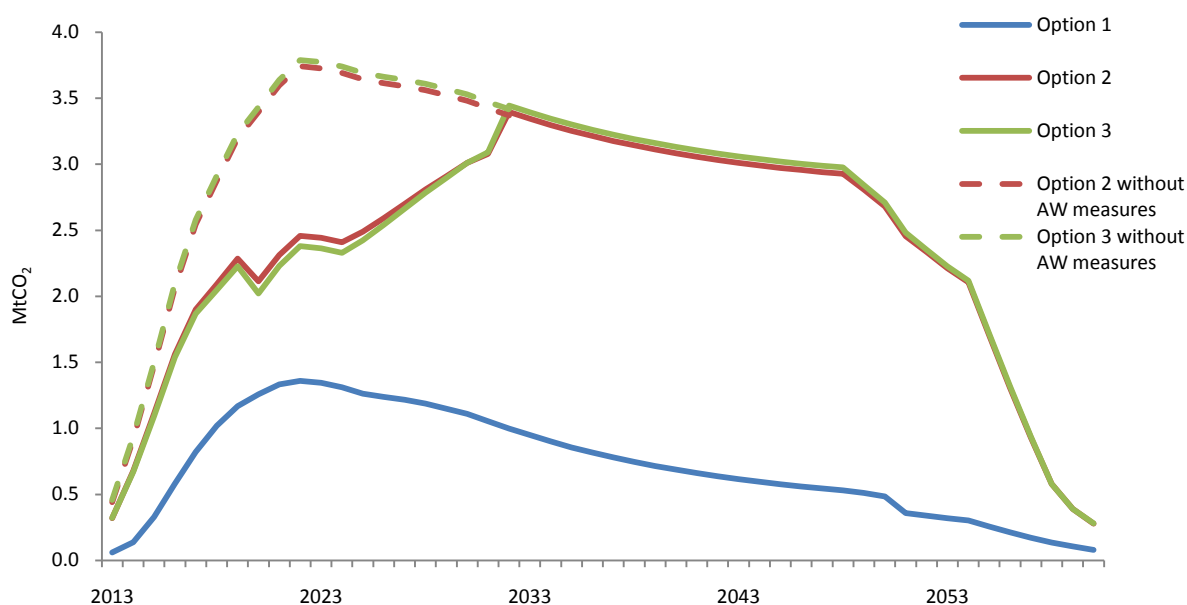
Figure 22: Lifetime non-traded emissions reductions for different policy options


Table 12 presents the impact on carbon and energy savings in 2020 for option 2. As the majority of household receiving heating measures are assumed to have been using electric heating systems, and then switch to gas heating, the Affordable Warmth target would lead to a reduction in traded carbon emission. Lifetime traded carbon emission savings peak in 2025 at 3.9 MtCO₂/pa.

Table 12: Carbon impacts of the Green Deal and the ECO in domestic and non-domestic sectors

	Domestic		Non-domestic	Total (Both sectors)
	Insulation	AW heating measures		
2020 Non-traded carbon savings (MtCO₂ pa)	2.49	-1.28	0.90	2.11
2020 Traded carbon savings (MtCO₂ pa)	0.72	2.12	0.92	3.77
2020 Energy savings (TWh)	14.21	-1.74	8.75	21.22

Table 13 shows the impact on non-traded carbon emission of domestic insulation measures, Affordable warmth heating measures and measure installed in the non-domestic sector, by carbon budget

Table 13: Breakdown on non-traded carbon emissions for the different options

	Option 1	Option 2	Option 3
Carbon Budget 2			
Total Non-traded carbon savings (MtCO ₂ pa)	1.93	5.57	5.49
- From domestic insulation measures (MtCO ₂ pa)	0.77	6.29	6.42
- From domestic AW heating measures (MtCO ₂ pa)	0.00	-2.08	0.00
- From non-domestic sector (MtCO ₂ pa)	1.16	1.16	1.16
Carbon Budget 3			

Total Non-traded carbon savings (MtCO ₂ pa)	6.14	11.26	10.91
- From domestic insulation measures (MtCO ₂ pa)	1.77	12.44	12.64
- From domestic AW heating measures (MtCO ₂ pa)	0.00	-6.10	0.00
- From non-domestic sector (MtCO ₂ pa)	4.37	4.37	4.37
Carbon Budget 4			
Total Non-traded carbon savings (MtCO ₂ pa)	6.37	12.63	12.32
- From domestic insulation measures (MtCO ₂ pa)	2.02	13.91	14.15
- From domestic AW heating measures (MtCO ₂ pa)	0.00	-6.18	0.00
- From non-domestic sector (MtCO ₂ pa)	4.35	4.35	4.35

7.3 Risks

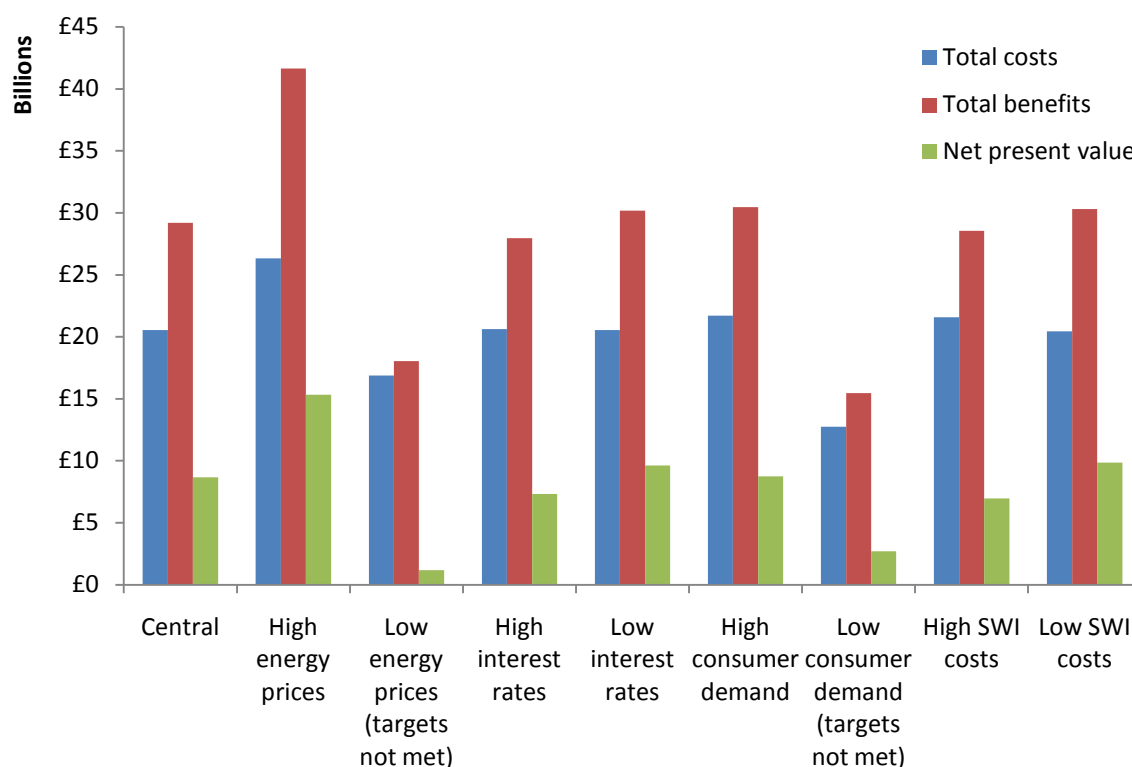
There is considerable uncertainty around both the costs and benefits of the policy package. The benefits are dependent on society incurring considerable costs during the first 10 years of the policy, which then pay back in the form of energy and carbon savings over a 52 year period. The installation costs are dependent on a number of uncertain factors such as the cost of fitting, repairing and maintaining measures, and the costs of returning properties to their original state (make good costs). Hidden costs⁹⁴ make up between 19% and 28% of the total costs, but by their nature are highly uncertain. The benefits of the policy package are heavily dependent on energy prices and consumer preferences, which are both highly uncertain. The risks are exacerbated by the long period over which benefits accrue.

To illustrate the risks associated with the policy package the estimated NPV has been tested using a number of sensitivities. These include high and low interest rates, energy prices, SWI costs and consumer preferences. Figure 23 shows the variation in costs, benefits and NPV for the preferred option under different assumptions. The most significant driver of NPV is the energy price assumption. Higher energy prices would lead to more households taking up Green Deal plans without ECO support, so energy and carbon savings would be higher. In addition, the value of energy saving (which is based on the energy price) is higher in the high price scenario. Low energy prices would have the opposite effect: fewer measures would meet the Golden rule and energy and carbon saving would be lower. The sensitivity analysis illustrates that the NPV of the Green Deal and ECO policy intervention is 77% higher in a world of high energy prices but 86% lower with low energy prices. NPV is also considerably lower (69%) in the low consumer demand scenario. By comparison, the high and low SWI costs scenarios⁹⁵ lead to 19% fall and 14% increase in NPV respectively.

⁹⁴ Such as the value of consumers time spent working with assessors and installers, and the value of floor space lost as a result of installing internal SWI.

⁹⁵ Represented by a 25% increase or reduction in estimated costs

Figure 23: Sensitivity analysis (Option 2)⁹⁶



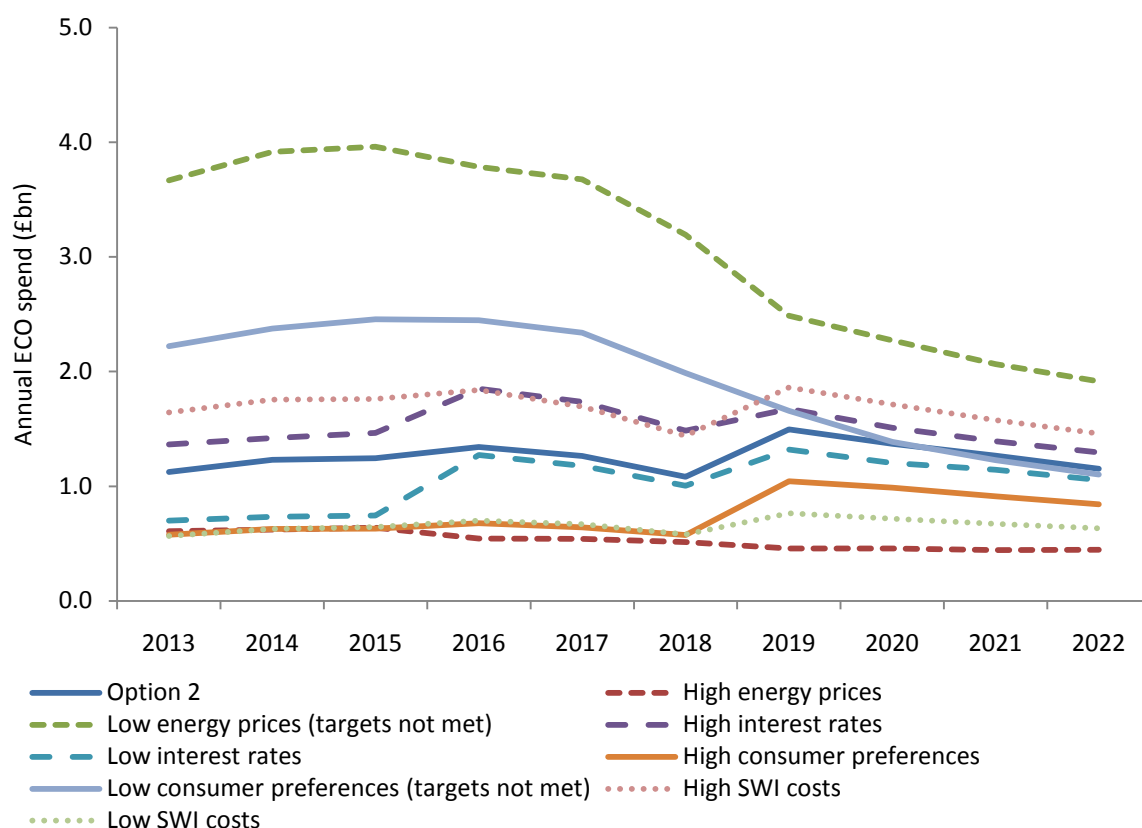
The sensitivity analysis also provides an estimate of how the cost of meeting a fixed ECO target could vary. For example, if energy prices turn out higher than in the central scenario energy companies would need to spend less to meet their carbon target. This is partly because energy efficiency measures would lead to higher energy bill saving if energy prices are higher and are therefore be more attractive to consumers, and partly because more measures would meet the Golden Rule without the need for ECO subsidy. Figure 24 shows the variation in ECO spending in option 2 for eight different scenarios. In the low consumer preference scenario, the carbon targets are not met despite high levels of spending. This suggests that at least some energy company marketing activity will be needed to ensure energy companies meet their obligations. The carbon targets are also not met in the low energy prices scenario. The government will monitor the success of the scheme, both in terms of measures delivered, costs of delivery and equity. A formal review of the ECO will be held in 2014.

The analysis is based on a maximum subsidy rate of 100% of installation costs.⁹⁷ Energy companies would still be able to meet their targets if they offers subsidies higher than this but the GDHM is not able to appropriately reflect this.

⁹⁶ High consumer demand is modelled as a reduced consumer aversion to SWI. In the low consumer demand scenario households are myopic (they do not consider the impact of future energy prices when deciding whether to take up a Green Deal plan) and there is no marketing activity by Green Deal providers.

⁹⁷ These result are partly driven by the model used to estimate demand under different conditions. The consumer preferences are based on a survey of consumers in which respondents were not presented with a subsidy rate of more than 80%. Results at higher levels of subsidy are therefore based on extrapolation of consumer preferences beyond the boundaries of the survey.

Figure 24: Sensitivity analysis for level of ECO spending



Box 8: The impact of higher consumer demand and further supporting policies

Introducing effective supporting policies to incentivise the take up of energy efficiency measures should enable more measures to be installed without increasing costs passed through onto energy consumers bills. There is also considerable uncertainty around the consumer preference reported in the Green Deal consumer survey, especially the level of consumer demand for SWI, which is still an unfamiliar technology to most consumers.

To provide an illustration of what additional effective supporting policies could achieve, the Green Deal Household Model was used to develop a scenario with significant additional supporting policies. This scenario also uses the high consumer demand assumption detailed in Table 40, to provide an illustration of the impact of consumers becoming familiar with SWI technology. The outcomes suggested by this scenario depends on the introduction of further effective supporting policies which could influence consumer decision making. The central NPV figures and other sensitivities presented elsewhere in this IA do not assume these supporting policies are in place.

The results from the Green Deal Household model provide an indication of the scale of impact that could be achieved through the introduction of further supporting policies. For instance, the cumulative deployment of Solid Wall Insulation by 2022 could be 570,000 higher.

Headline social impacts of the Green Deal policy package

Option 2: £1.3bn ECO	Central scenario	Illustrative scenario
CWI installations (m)	1.7	1.76

SWI installations (m)	1.53	2.1
2020 Non-traded CO ₂ savings (MtCO ₂)	2.11	2.74
Gross capital spending (£bn)	28	34



In this illustrative scenario, options 2 and 3 lead to a total of 2.1m and 2.25m SWI installations respectively.

7.4 Distributional impacts

The impact of the Green Deal and ECO is likely to vary between different groups within society, as the policies both impact on the consumer price of energy and energy consumption. The energy savings and comfort benefits from warmer homes would be concentrated in households and properties that receive energy efficiency measures. ECO would pass costs onto the bills for all domestic energy consumers. There would, therefore, be some households whose bills would be lower following the introduction of the policies and some households whose bills would be increased.

For households and businesses that take out a Green Deal plan, the benefits of reduced energy consumption would be partially offset by the Green Deal repayments needed to cover the installation and assessment costs. For those who take out the maximum amount of Green Deal finance permitted under the Golden Rule, there would be no expected net bill savings in the first year. Over time, because energy prices are expected to rise, they would be expected to benefit from increasingly large energy bill savings.

The ECO would be expected to have a more significant distributional impact. See section 9 for more details on the ECO's subsidy costs. A number of policy options considered in the option appraisal

section aim to ensure that all households have equitable access to measures and that adverse distributional impacts are limited (see sections on the Distributional Safeguard, 9.1.4 and the Affordable Warmth target, 9.1.2.2).

7.4.1 Average impact on households

Figure 25 shows the potential average impact of the Green deal and ECO on households for Option 2, relative to the BAU scenario. The installation of energy efficiency measures would have a negative impact on energy bills. Once the Green Deal repayments have been included in the bill, the average impact is smaller, but still negative. This is because the Golden Rule means Green Deal repayments have to be equal to or lower than the bill savings delivered, and nominal energy prices are projected to rise over time. Households would also be likely to face the costs of ECO as they are passed on by energy companies as higher energy prices. Figure 25 shows that the pass through of ECO costs is likely to dominate during the period to 2022. However, once the ECO policy ends, the net impact would be a reduction in the household energy bill.

Figure 25: Average impact on domestic household energy bills

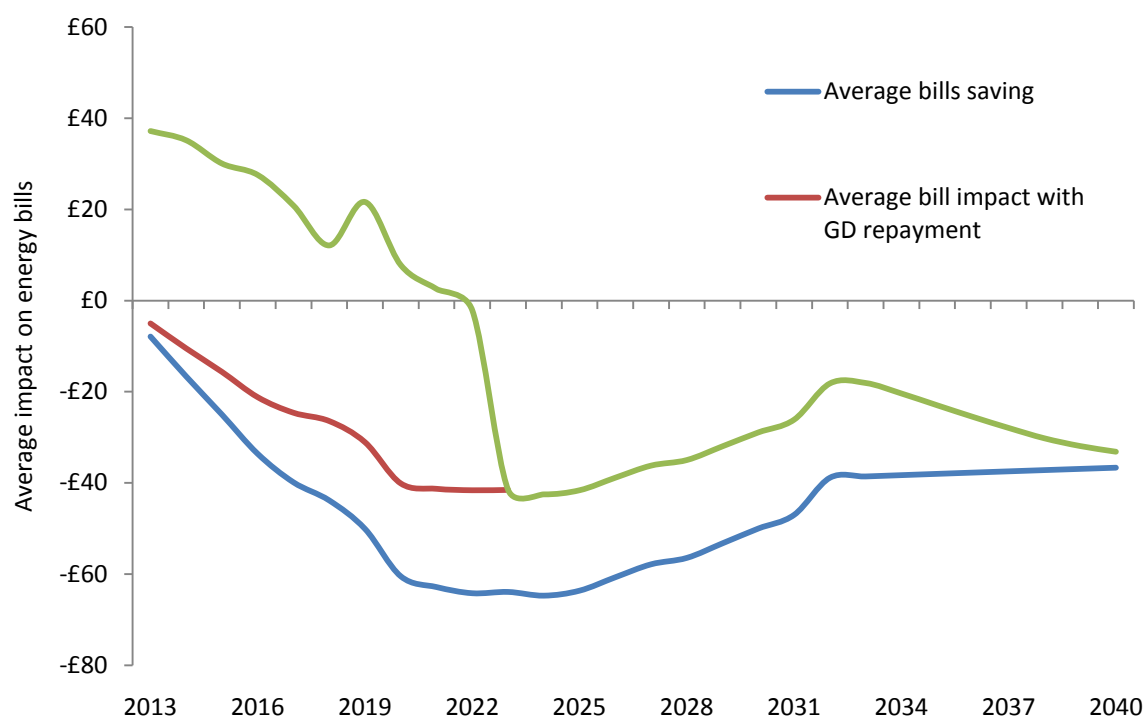
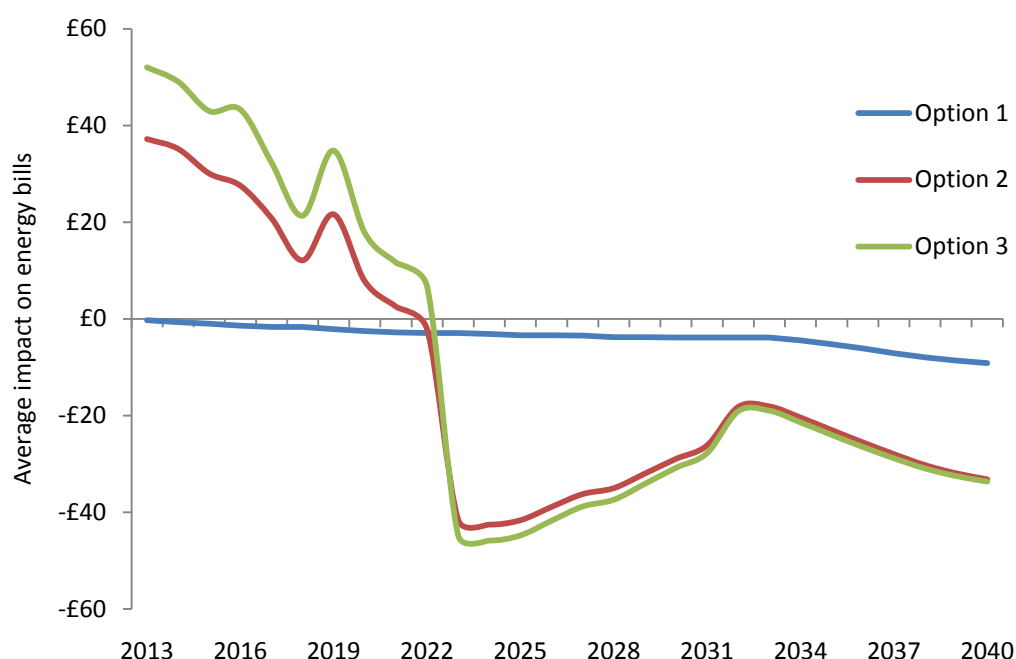


Figure 26 shows the average net impact across all domestic households of the different policy options. It shows that higher levels of ECO spending will lead to higher energy bills in the short run (to 2022), but lower energy bills in the long run (after the ECO obligation period). In the Green Deal only case, Option 1, the impact on household bills is negative throughout the period, but the lower uptake of measures in this option compared to Options 2 and 3 means energy savings means that bills savings in Option 1 are relatively small in the long run. These estimates are based on averaging the costs and benefits of Green Deal and ECO insulation measures across all domestic households.

Figure 26: Average impact on domestic energy bills for the different policy options



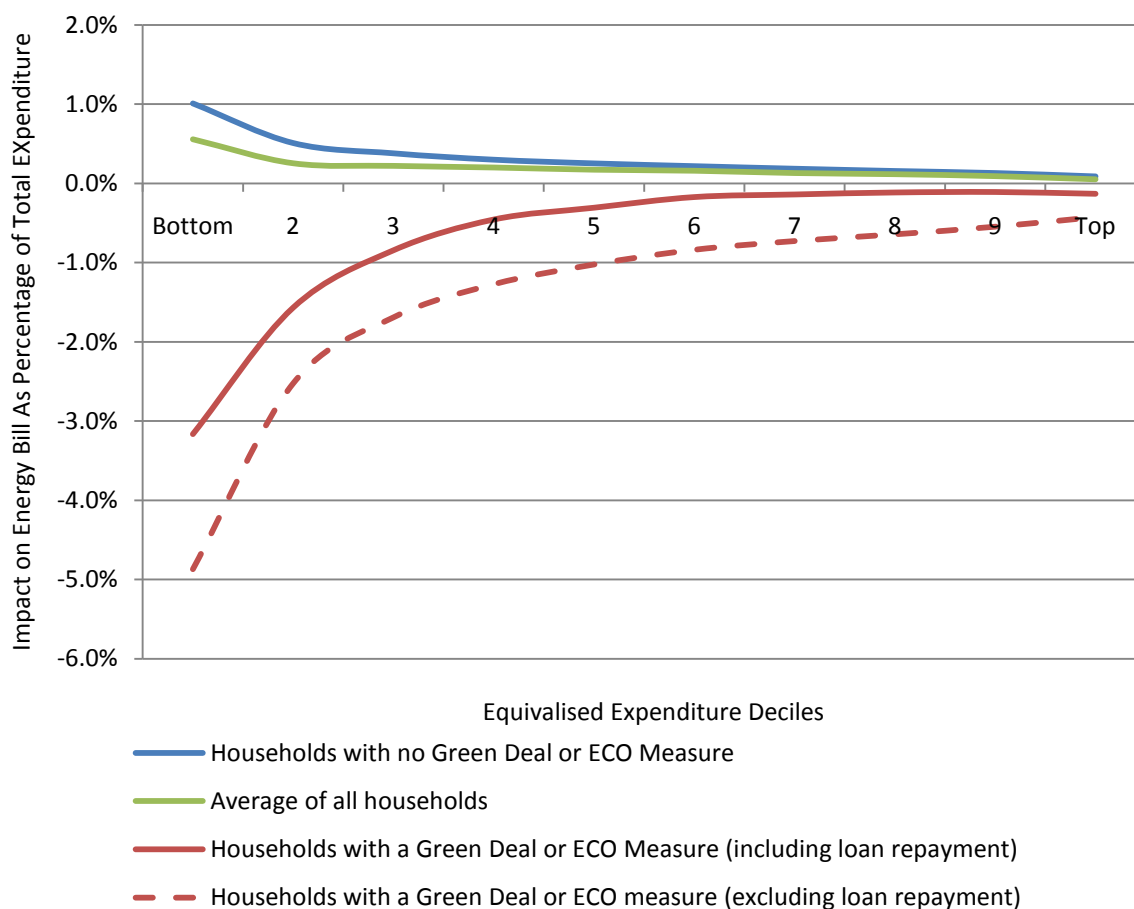
7.4.2 Distribution of changes in energy bills

The impact of the policy package on a household energy bill would vary depending on whether they install a measure under ECO. Those households that receive subsidised energy efficiency measures under the ECO will benefit from lower energy bills, but the cost of the subsidy would be spread across all energy consumers. There will also be a distributional impact if energy companies pass on the costs to households evenly⁹⁸; the increase in energy bills will be a higher proportion of low income household's income as they tend to spend a higher share of their income on energy bills in the first place.

Figure 27 shows the increase in energy bills as a percentage of income for different income groups in 2020 for option 2. The results are split between households that take out a Green Deal (or take up a heating or insulation measure under the Affordable Warmth target of the ECO) and those that don't. Based on take up of insulation measures, the lowest three income deciles see the greatest impact on their energy bills as a proportion of their expenditure. However, for those that take up an energy efficiency or heating measure, the lowest income groups benefit from lower energy bills. This is because low income groups are more likely to receive ECO support. Figure 27 also shows the change in energy bills for those households that take up a Green Deal plan when the Green Deal repayment charge has been excluded.

⁹⁸ As a uniform increase in £/MWh sold. See section 9 for discussion of how energy companies might pass through ECO costs

Figure 27: Impact on average energy bills by income decile as a proportion of total expenditure in 2020, for households with and without a Green Deal plan (Option 2)



7.4.3 Impact on the number of households in fuel poverty

Similar to the distribution of changes in energy bills, the fuel poverty implications for households will depend on whether they receive a measure under the ECO. Households that see their thermal performance improve as a result of an ECO subsidised measure will see their risk of being fuel poverty reduced. As it is anticipated that the cost of the ECO will be spread across all household energy bills, those households that do not receive a measure will see their bills increase, and their risk of being in fuel poverty increase in turn.

Initial estimates of the impact of an ECO worth £1.3bn per year suggest that, by the end of 2022 when the costs of ECO are no longer spread across all bills, there will be a reduction in the number of households in fuel poverty of between 350,000 and 550,000, compared to how many households could have been in fuel poverty at the end of 2022 without the ECO. This estimate and the profile of changes in fuel poverty across the lifetime of the policy are being refined as policy options are further developed, and will be updated in the final stage impact assessment.

7.4.4 Impact on non-domestic sector energy bills

Non-domestic customers should not see an impact from suppliers passing on ECO costs as the obligation would cover domestic customers only. There is likely to be a one-off impact on bills from

energy suppliers setting up payments systems for the Green Deal, which is likely to be spread across all bill payers. This cost has not been estimated.

Table 14 shows the total estimated bill savings in the non-domestic sector from implementing Green Deal measures once the charge has been paid off.

Table 14: Aggregate bill impacts in the non-domestic sector once Green Deal charge is repaid (£m)

Scenario	2020
High	-315
Central	-270
Low	-157

8 Options for the Green Deal Mechanism

The previous sections have outlined the central working option for the Green Deal mechanism and how it could increase the uptake of energy efficiency measures. The mechanism could increase take-up by easing credit constraints for some households or businesses, by providing tailored advice and increasing confidence in the quality and effectiveness of energy efficiency measures, and by allowing the financing of measures to be tied to the meter of the benefitting property rather than an individual or business. Acting together with the Energy Company Obligation the Green Deal could achieve distributional benefits by increasing the proportion of the costs of installing energy efficiency measures that is paid for by the beneficiary.

The consultation is seeking responses on the detail of the secondary legislation which is used to implement the Green Deal mechanism. Annex F provides a detailed consideration of 30 decisions relating to the draft statutory instruments. Each decision concerns an element of the Green Deal mechanism.

The annex on Green Deal mechanism decisions is structured as follows:

- Assessments: ensuring the correct recommendations are made.
- The Golden Rule: ensuring expected bill savings outweigh the Green Deal charge.
- Green Deal Measures: ensuring the measures delivered are appropriate and perform as expected.
- Customer Protection: ensuring customers are sufficiently protected from sub-standard offerings.
- Institutional Arrangements: ensuring the organisational infrastructure is in place to handle the Green Deal and the collection of the Green Deal charge.

It is essential that in combination these decisions lead to a Green Deal mechanism that inspires confidence. There must be confidence both for those installing measures, and for finance providers that the collection mechanism for the Green Deal charge is robust.

Customer confidence in the quality of the installations delivered through the Green Deal will be paramount for there to be demand in the Green Deal market. Confidence requires oversight of the Green Deal value chain, ensuring high standards for Green Deal Providers, installers, and manufacturers of the products and systems that are installed. The Australian Home Insulation Programme provides a real world example of what could go wrong without regulatory oversight of the Green Deal value chain (see Box 9 below). Without confidence for finance providers that the collection mechanism is robust finance would not be provided in the first place.

The Golden Rule effectively caps the amount of Green Deal finance that can be raised to support a given set of measures in a dwelling or business premises. The more conservative the calculation of expected energy bill savings from installing measures, the greater the confidence that the Golden Rule would be met in practice but the lower the level of Green Deal finance that could be raised. Less access to Green Deal finance acts against the aim of increasing the uptake of energy efficiency measures while simultaneously getting the beneficiaries of the measures to bear more of the installation costs. There is therefore a balance to strike between confidence that realised energy bill

savings will exceed the Green Deal charge and allowing sufficient Green Deal finance to be raised for the installation of energy efficiency measures.

Table 15 summarises the monetised costs of the Green Deal Finance mechanism for each of the high level policy options. There are also a number of non-monetised costs and benefits resulting from the different options set out in Annex F. The text below provides a brief summary of the assumptions and data underpinning these costs as well as pointers to the more detailed analysis in Annex F.

DECC is keen to obtain any further evidence on the costs and benefit of the options presented in this section.

Table 15: Summary of monetised costs of Green Deal Mechanism

£m	Option 1	Option 2	Option 3
Assessments			
Cost of assessment	£434	£927	£928
Consumer protection			
Accreditation of advisers	£1.40	£3.33	£3.36
Adviser training	£0.56	£1.33	£1.35
Manufacturers product testing	£6.70	£6.70	£6.70
Spot testing of compliance	£0.25	£0.25	£0.25
Manufacturers - registration of products	£5.00	£5.00	£5.00
Installers - acquiring certificates	£1.40	£1.40	£1.40
Institutional Arrangements			
Energy company collection and payment systems	£17.60	£17.84	£17.84
Energy companies ongoing costs of facilitating Green deal	£60	£128	£130
Oversight	£58	£58	£58
Total	£586	£1,148	£1,152

Cost of assessment

The analysis of the impacts of the GD and the ECO assume that the cost of a Green Deal fabric assessment is £75. This level represents a mark-up to recent research suggesting an average cost of £50.⁹⁹ The additional effort required to make an assessment based on occupancy has been assumed to add some 25-35% to the cost an EPC, though DECC would welcome views to help refine this estimate. The overall cost per assessment is assumed to be £100. See section 19.1.1 for further detail on assessments.

The aggregate assessment cost is derived from the modelling results, indicating the number of Green Deal plans taken out under each policy option, with an assumed conversion rate of 1 in 3 assessments resulting in a Green Deal plan.

⁹⁹ EPC prices are set by the market and depend on the size and location of the property. The original impact assessment for the EPB Regulations suggested a figure close to £100. However, further research for the EPC Review and previously by DCLG suggests an average cost of around £50.

Accreditation of advisors

The consultation will be used to seek further evidence of the costs of accrediting advisors. Workers most likely to take up these roles are those that are already employed as EPC assessors.

The cost is calculated as the product of the number of advisors needed to carry out the number of assessments multiplied by an estimated cost of £1,000 per advisor. This calculation assumes an advisor can carry out 3 assessments in a day if full time or 2 if part time, 50%¹⁰⁰ of the workforce is part time, each employee works 235 days a year, only 1 in 3 assessments result in a Green Deal being taken out.¹⁰¹ See section 19.1.5.2 for more detail.

Advisor training

This cost is calculated as the cost per advisor multiplied by the number of advisors required to meet demand under each of the options. The Building research establishment has estimated a cost of £400 per advisor (see section 19.1.4.1 “Certifying Green Deal advisors”).

Manufacturers product testing

Product testing is described in more detail in section 19.1.4.3. The preferred option is to rely on existing product standards but to fill gaps where their coverage is incomplete. In particular it is proposed that measures which are considered to be systems, consisting of more than one component product, should be system tested. The calculation of the aggregate costs of system testing uses the following assumptions:

- There are 32 qualifying measures for Green Deal finance (see Annex G);
- assumes that 25% of the measures would need system testing;
- that there are 30 products in each measures category;
- Around 15 external wall systems have already been tested and approved in Great Britain; and
- the cost is on average £30,000 per product tested.

Spot testing of compliance

Assuming a random sample of 50 products per year are checked, and it takes two days for each product at a cost of £600 (manufacturer’s time plus auditor’s time), the annual cost would be

¹⁰⁰ 50% is a fair way above the UK economy percentage of part-time employment and is thus a conservative assumption – In the three months to August 2011, 27% of the UK work force were employed part-time. Source: Labour market statistics: October 2011” ONS, 12/10/2011
http://www.ons.gov.uk/ons/dcp171778_237932.pdf

¹⁰¹ In the PAYS pilot 55% of householders who had an assessment proceeded to have measures installed. This is therefore a conservative estimate source: DECC and EST - Home Energy Pay As You Save Pilot Review-
<http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/microgeneration/2670-home-energy-pay-as-you-save-pilot-review.pdf>

£30,000.¹⁰² The present value is calculated by applying the social discount rate to the costs over 10 years.

Manufacturers - registration of products

It is proposed that manufacturers would have to register their product and declare that they comply with the Green Deal code of practice. It is estimated that manufacturers' registration costs are around £600k per year (£5m PV over ten years). DECC would welcome further evidence on the costs to manufacturers of registering products.

Installers - acquiring certificates

It is proposed that installers of measures under the Green Deal should be accredited. The estimate of the aggregate costs is based 35 certification bodies seeking accreditation¹⁰³. It is estimated that it will cost on average, each certification body, £10,000 initially and the £3,500 annually for each subsequent year (see section 19.1.4.4 "Accredit Installers" in "Customer Protection").

Energy company collection and payment systems

Energy companies would be required to administer the collection of the Green Deal charge and route payments to Green Deal providers. The estimate for aggregate cost includes Billing requirements (see 19.1.5.6.1 19.1.5.6 "System Costs" in "Collection of the Green Deal charge"), Data sharing requirements (see section 19.1.5.6.2 on "Data Infrastructure Costs" in "Collection of the Green Deal charge") and the ECO administrative burden.

This ECO administrative costs consists of various reports for each energy company to compile and submit to provide Government the information required to monitor their progress towards the obligations under the ECO.

Energy companies ongoing costs of facilitating Green deal

Energy companies ongoing costs are estimated based on the figures provided in section 19.1.5.6 "Collection of the Green Deal charge". It is estimated that the ongoing costs are £2.30 per Green Deal plan, per year. In addition to this cost, energy companies would also incur a cost in initiating and creating new data records of between £2 and £12 per green deal.

Oversight

The cost of oversight is to be split across some 35 installer certification bodies, 15 assessor certification bodies and Green Deal provider companies and is estimated as £6m set up costs in 2012 followed by £6m per annum (see section 19.1.5 "Institutional Arrangements").

¹⁰² The cost of checking and inputting data for a 1,000 products per year is assumed to be £600,000, therefore 50 products would cost £30,000. This would be split between the Oversight Body (physically registering the products) and industry checking and verifying compliance with the Code. This assumes 1 day's work for the company and 1 day for the Oversight Body. In reality the cost may be much lower. Any data to improve this assumption is welcomed in the consultation.

¹⁰³ Based on insight from UK Accreditation Service workshops on Green Deal

Box 9: The Australian Home Insulation Programme

In 2009 the Australian Home Insulation Programme (HIP), a component of the Energy Efficient Homes Package took over from, and expanded, an existing energy efficiency programme. In addition to improving energy efficiency, the policy had an additional aim of generating an economic stimulus to support jobs and small businesses.¹⁰⁴ Programme managers were aware of potential risks and took preventive measures, such as a fraud and compliance programme, a registration regime, and a national training programme.

The programme had funded the installation of insulation in over one million homes in less than a year of the full scheme being in place. It was terminated in February 2010 amidst concerns regarding poor quality workmanship and materials, fraud perpetrated by unscrupulous operators, and reports linking over 100 house fires and four deaths to the installation of insulation.

The Hawke report identified a number of key issues with the HIP and its implementation:

- A strong and consistent regulatory framework is important to minimize risks and safety issues in relation to installation of insulation;
- Rapidly scaling up delivery meant relying on untested new entrants to the industry, which had consequences for the possibility of fraud and low quality work;
- Shortages in the supply chain led to the use of new or imported products which some have claimed were inferior;
- Householders incentive for vigilance was reduced due to the lack of an upfront payment and no requirement for multiple quotes (between June and November 2009);
- There were short timelines for implementation of the compliance and audit regime; and
- Compliance and audit processes that were in place were overwhelmed by unforeseen levels of activity under the HIP.

¹⁰⁴ Home Insulation Program. Department of the Environment, Water, Heritage and the Arts. Department of Climate Change and Energy Efficiency Medicare Australia; Hawke (2010), "Review of the Administration of the Home Insulation Programme"
<http://www.climatechange.gov.au/~media/publications/energy-efficiency/Home-Insulation-Hawke-Report.ashx>

9 Options for the Energy Company Obligation

Summary

The technical potential for highly cost-effective energy efficiency measures, such as loft and cavity wall insulation is diminishing because of the impact of existing and previous supplier obligations.¹⁰⁵ These obligations have delivered large volumes of loft and cavity wall insulation. The Government recognises that the next most cost-effective measures would not meet the Golden Rule on their own but that there are strong arguments for their promotion. It is proposed that the carbon target element of the Energy Company Obligation (ECO) will be the key mechanism for supporting the deployment of these measures.

In addition, the Affordable Warmth element of ECO is designed to assist the very poorest and most vulnerable households by providing the measures needed to enable them to heat their homes to a healthy level affordably. Improving the energy efficiency and heating systems in these homes would heat them to a healthier level without increasing bills, bringing potential health and social benefits. This is on the rationale that households on very low incomes tend to under-heat their homes significantly and often lack the financial means to improve the thermal performance of their homes. Homes which are under-heated would experience significantly lower reductions in energy bills following the installation of measures because:

- lower internal temperatures imply less avoided heat loss from efficiency measures; and
- a higher degree of comfort taking could be expected.

Lower savings reduces the level of Green Deal finance that could be raised without expecting the Golden Rule to be broken.

It is proposed that the Affordable Warmth part of ECO would focus on upfront funding of thermal performance measures targeted at those that need help most. Setting an Affordable Warmth target alongside the Green Deal will help achieve the distributional goal of enabling low income and vulnerable householders to heat their home to a healthier level without increasing their bills.

It is therefore proposed that the ECO will be very different from existing obligations such as CERT. The design of the ECO has focussed on:

Saving Carbon – by delivering energy efficiency measures to harder to treat properties

Providing Affordable Warmth – by delivering (primarily) heating systems and insulation to the low income and most vulnerable households who lack the means to fund the work needed to heat their homes affordably.

The principal objective of the ECO carbon target is to work alongside the Green Deal in ensuring that, as a nation, we save as much carbon and mitigate fuel poverty as cost-effectively as possible. However, given that ECO delivery costs are likely to be passed on to all domestic energy consumers

¹⁰⁵ Current DECC statistics suggest that of the 6.3million unfilled cavities that will remain after the CERT extension period, 4.9million are hard to fill, however there is unpublished evidence currently under consideration that this might be an overestimate of the proportion that are hard to fill.

through their bills, the Government must consider carefully the distributional impacts of the policy to ensure that the benefits are equitably distributed, and in particular that the poorest, who are hit hardest by rising energy costs, stand to benefit. This is discussed further in section 9.1.4.

This section provides an options assessment for the key design elements of the ECO. The decisions under consideration aim to ensure that the ECO meets the above objectives in the most efficient way possible and to complement the development of the Green Deal market.

The Energy Company Obligation (ECO) model

An ECO policy places one or more obligations on energy companies (depending on the number of separate objectives being delivered through the policy), requiring a certain number of credits to be generated (measured by a specified metric) through the installation of energy efficiency measures before a particular deadline. Energy companies would then be responsible for all decisions and actions as to how their obligation was met.

Energy companies have a number of options for how they act to ensure they meet their obligation by the deadline. The ECO itself will of course be a very major driver in encouraging the exploration of all possible routes to market. ECO companies will face inescapable, legally-binding targets which they would have to meet, and would want to meet at the least possible cost to themselves. Unlike current schemes (where there are only limited opportunities for matched-funding to offset their own subsidy), under the Green Deal they are likely to want to work alongside organisations offering Green Deal finance, and have an interest in the Green Deal market exploiting all possible consumer opportunities. They might also wish to hedge their risks by partnering with a variety of Green Deal partners, each adopting different consumer strategies.

Energy companies could:

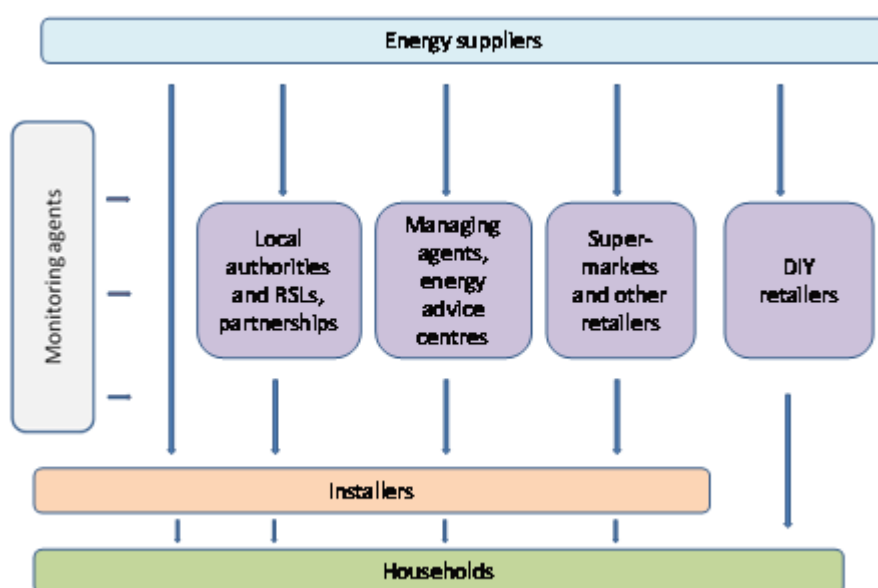
- subsidise the cost of improvements, either by reducing the costs of their own consumer offers or by providing funding to delivery companies so that those companies can create reduced price offers.
- focus their efforts on marketing to consumers (including social housing providers), increasing the demand for energy efficiency measures
- develop in house delivery capability to be better placed to meet consumer demand, possibly generated by their own marketing
- partner with external companies who can market and deliver on their behalf

DECC's evaluation of energy efficiency supplier policies (see section 2.2.1) found that any cost to energy companies of compliance with supplier obligations and the nature of the pass-through of these costs are difficult to assess due to data limitations. In general, such data is unlikely to be published by suppliers due to commercial sensitivities. Nevertheless, the competitive nature of the energy supply market suggest that any costs borne by energy companies will be passed on through to energy consumers. It is in the nature of an energy company obligation that companies would be incentivised to meet their obligation at the lowest cost to themselves, thus minimising pass-through costs to their customers and maximising their chance of retaining or attracting customers (for the supply of energy). Because the costs to suppliers are passed through to energy consumers they do

not carry an opportunity cost in the form of alternative investments that could have been made by suppliers.

Under CERT, delivery of insulation and heating measures has involved a wide range of other stakeholders, in addition to the energy suppliers. Complex, multi-layered and diverse arrangements have evolved over the period covered by CERT and its predecessors (the Energy Efficiency Commitment 1 (EEC1), and Energy Efficiency Commitment 2 (EEC2)). Figure 28 illustrates some of the intermediaries that can be involved between an energy supplier (who holds the CERT obligation to save carbon) and a household (which has energy efficiency measures installed, subsidised or paid for by an energy supplier under CERT).

Figure 28: Energy Intermediary Supply Chain



In the main, relationships have been driven and initiated by energy suppliers. For example, all the energy companies contract to buy insulation jobs (and associated carbon savings) directly from installers. Under CERT, effectively a market price is generated for a unit of progress towards meeting a company's obligation. Actions or partnerships which deliver progress at or below the market price are the ones which companies pursue. They are therefore willing to subsidise at the market price or contract with other delivery agents at the same price.

Under the ECO similar behaviour would be expected with a market price for delivering a unit of ECO credit becoming apparent, and then companies being willing to support any activity which generates credit for them at or below the market price.

To have greater certainty about the achievement of its objectives, Government is minded to introduce a limited set of additional rules, which act as constraints to what exactly the companies could deliver, who they could deliver to, and how they must deliver. These additional constraints would be designed to target key market failures.

The objectives

The Government is clear that (unlike past obligations such as CERT), the ECO needs to complement the Green Deal; addressing market failures that are likely to still exist with Green Deal and driving take-up to an optimal level. There are two fundamental legal objectives: to save carbon; and to make it easier for the low income and vulnerable households, who cannot gain from Green Deal alone, to heat their homes more affordably. These objectives are enshrined in the primary legislation in the Energy Act 2011.

Section 7 considers the overall impact of Green Deal and ECO as opposed to a 'do nothing' world. This section on options appraisal focuses on the decisions that need to be taken in designing an ECO that best meets the statutory objectives now agreed, and which would be set out in detailed secondary legislation. Because the ECO is a scheme created by regulation, every aspect of it (each detailed provision of the secondary legislation) in effect represents a decision which needs to be taken, for which alternative options often exist. This Impact Assessment concentrates on the decisions and options which the Government believes are likely to have the most material impact on the costs of the scheme, or on its ability to meet its objectives.

The economic theory of cost pass through

Although evened out somewhat over the time it operates, the ECO would have significant distributional impacts with the transfer of resources from those that do not receive a measure (but their bills go up) to those that do receive a measure. This transfer would cover a proportion of the installation cost of the measures that are installed with the rest of the installation cost covered by Green Deal finance or self finance. In addition, the market for ECO points should generate economic rents that could be captured by either households receiving the measure or the Green Deal/ ECO provider or installer.

The market price for ECO credits should reflect the marginal cost to installers of driving demand for the installation of measures – or the marginal level of subsidy per ECO point generated. The market price represents either a direct cost to energy companies (they have to purchase ECO points to meet their obligation) or an opportunity cost (they generate ECO credits through their own installation activity but using them to meet their obligation foregoes the opportunity to sell the ECO point at the market price). Profit maximising energy companies should in principle pass through the marginal cost of meeting their obligation multiplied by the size of their obligation.

Figure 29: ECO credit supply curve and the possibility of rents



It would be possible to generate demand for some measures at a lower subsidy cost per ECO credit than the market price. This generates the possibility of rent. The size of the rent is illustrated as the shaded yellow area on the diagram above. It would be captured either by householders who bargain hard for high subsidies (above their 'reservation' subsidy), installers, or energy companies (who would be expected to undertake some installation of their own).

In the absence of evidence on the share of the rents that would be captured the calculation of the costs to business of the ECO (see section 10.4) assumes that 50% of the rents are captured by households and 50% by installers.

The higher the carbon target under the ECO the greater the marginal subsidy cost, increasing the total size of the pass through cost of the ECO and the level of economic rent. All things being equal, the level of economic rent would also increase where a range of different cost options for generating ECO points exists. Conversely, where all of the options for generating points have similar costs, then the average cost of a measure would be close to the marginal cost and the level of rent generated would be low. An increase in the level of economic rent would increase the amount of cost passed through to energy bills and, in the absence of offsetting action (e.g., in terms of the distribution of measures), could result in a negative distributional outcome.

It should be possible to reduce the level of economic rent through the design of the obligation. For example it is proposed to break up the ten year ECO into a series of shorter obligation periods (with some fungibility of compliance between periods). This should reduce the difference between the average and marginal cost of measures within each of the periods. Furthermore, economic rent or transfer could also be reduced through supporting policies, triggers and nudges which reduce the marginal subsidy level needed to motivate the take up of the marginal measures. Finally, competition between energy companies creates the incentive to push the ECO credit supply curve down – either through marketing or pressure on installers, to reduce costs and rents.

The pass through by suppliers of the marginal cost of meeting their obligation is likely to have been followed under previous obligations. However, the marginal cost is thought to have been much

lower than it would be under the ECO with limited variation. The marginal cost under CERT is thought to be close to the average cost as the focus was on the most cost-effective measures. However, there was much less transparency of the trading of subsidy previously which could allow for some level of price discrimination by energy companies. The proposed trading in ECO credits through a brokerage system (see section 9.1.5.5) would increase the level of transparency in the market for ECO credits and therefore there would be a clearer signal of the marginal cost. This transparency should encourage more efficient delivery of the obligation, with installers reacting to a clearer signal of demand for ECO credits. It should also help to address some geographical distribution issues of past schemes.

How energy companies might pass these costs onto consumers is discussed section 9.1.6.3.

9.1.1 Scale and scope of the Energy Company Obligation

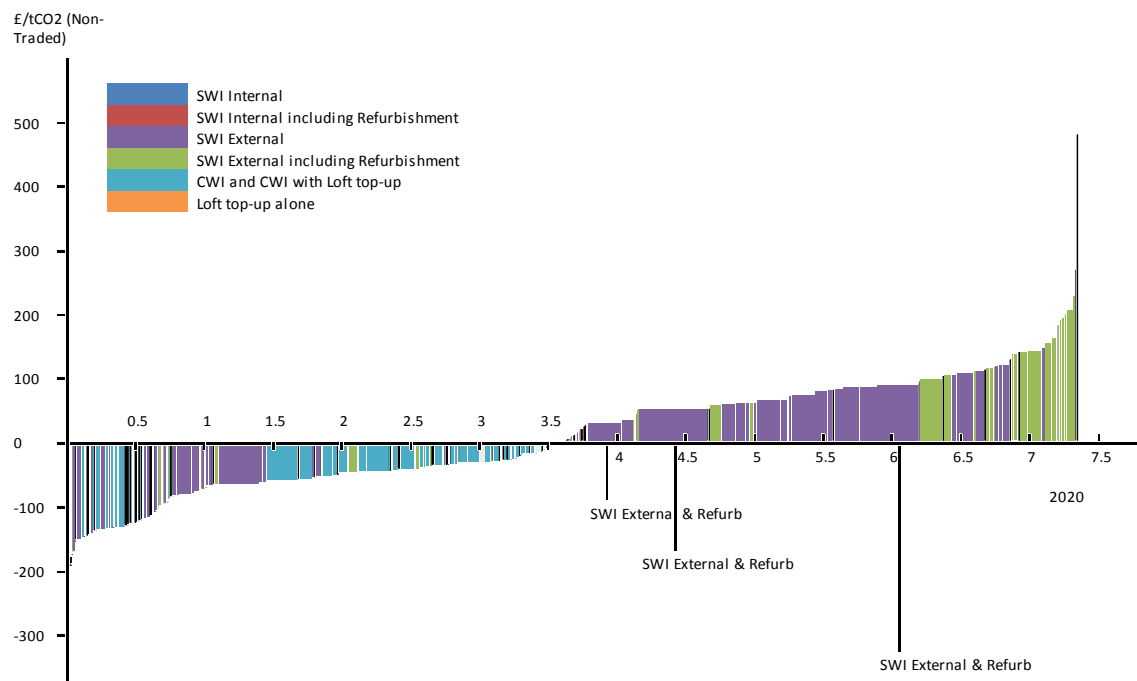
Domestic retrofit is one of the most cost effective approaches to meeting legally-binding carbon budgets, and heating and insulation measures together are the most cost-effective means of improving households' ability to heat their homes affordably – thereby addressing fuel poverty – on a sustainable basis. The scale and scope of the ECO is dependent on the scope for Green Deal finance alone, on the level of potential carbon saving and feasibility of delivery, and the level and feasibility of delivering affordable warmth improvements. A key constraint is the level of pass through cost onto consumer bills. Therefore the distributional impacts need to be considered and are covered later in this chapter (see section 9.1.4). The sections below discuss possible options for the scale and scope of the ECO and present estimates of the costs and benefits to society and specific groups within society.

Feasible and cost-effective level for the ECO target

Under the assumption that the penalty for non-compliance with the ECO is strong enough, carbon savings and affordable warmth improvements within the ECO would be equal to the level the target is set at. The appropriate level of the target is constrained by concern for value for money and limits on the level of subsidy provided by energy companies to motivate uptake of measures.

The key question for value for money considerations is: 'is it *feasible* to install sufficient socially cost-effective potential in the time frame?' A target that is set higher than the value for money frontier would cause cost-ineffective measures to be installed. In the case of the Carbon Saving target, the benefits of reducing emissions are valued using DECC/HMG carbon values. These values either represent the marginal cost of meeting UK emissions targets using domestic policy (non-traded), or the cost of buying (or benefits of selling) international carbon units (traded). If energy efficiency measures could reduce emissions for less than the carbon value (around £50/tCO₂e) then they are cost-effective (represent value for money). This is illustrated in Figure 30.

Figure 30: Marginal abatement costs for major insulation measures in UK dwellings in 2020, after assumed learning by doing and increased fossil fuel prices



It is notable in Figure 30 that a high proportion of the solid wall insulation potential costs more per tonne of carbon dioxide abated than the DECC/HMG carbon value. The ECO mechanism which incentivises suppliers to seek out the lowest cost measures will encourage take up of the most cost-effective solid wall potential first. In addition there are arguments why it would be socially beneficial to push into solid wall potential that costs more the carbon values:

- Dynamic optimization rather than static comparison; and
- Avoided costs of renewables.

Solid wall insulation has been identified by the Committee on Climate Change as an important technology for the pathway to the UK's long term emissions reduction targets. The dynamic argument for deploying solid wall insulation are that this would drive down the costs of solid wall insulation in future time periods through learning by doing and induced innovation. This benefit of reducing costs for future time periods is not captured in a static comparison with the DECC carbon values.

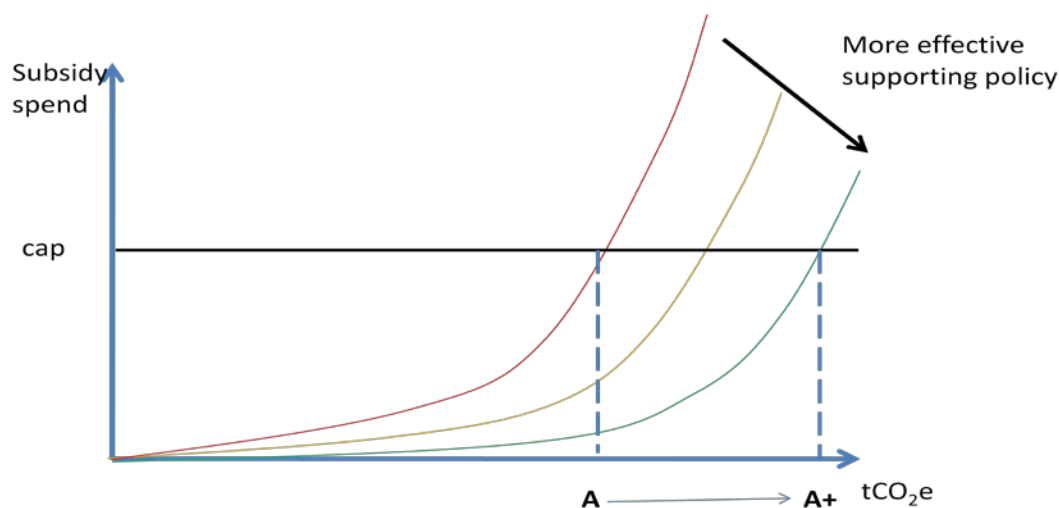
The renewable energy directive provides a justification for pushing the value for money frontier further out for energy efficiency measures. By reducing final energy consumption, energy efficiency measures reduce the level of renewable energy deployment that would be required under the directive. Because the marginal cost of deploying renewables is considered to be very expensive this additional benefit of energy efficiency measures is substantial.

The judgement of the feasible level of installation also depends on the demand for measures. While measures might be socially cost-effective this does not imply that individuals would demand their installation. Some of the benefits might not accrue to the individual, or there might be barriers or market failures which dampen demand.

Demand for measures would depend on a number of factors. Future energy prices and costs for measures would have an important influence as would supporting regulation (such as consequential works under building regulations and regulation of the Private Rented Sector). Demand could of course be synthesised through generous subsidies from energy companies and the attractiveness of the Green Deal and effectiveness with which it is marketed would also impact.

It is likely that the binding constraint on the level of cost-effective potential that is considered to be feasible to deliver in a particular period would be a judgement of the appropriate level of subsidy spend that energy companies could make to synthesise demand. If supporting policies could reduce the spend needed to motivate the take-up of some measures then this constraint would be relaxed and a more ambitious ECO target would be able to be set with the confidence that the subsidy spend would remain within the cap. This is demonstrated by the scenarios in the aggregate impact section (section 7).

Figure 31: Demonstration of impact of supporting policies on ECO



In Figure 31, the curves represent the relationship between the level of the ECO target and the level of subsidy spend that would be required from energy companies under different supporting policy regimes. Abatement could increase from A to A+ when moving to a more effective supporting policy regime while subsidy spend could remain within the subsidy cap.

9.1.1.1 Scale

There are a number of trade-offs to be made. Clearly, greater levels of ambition on carbon savings or affordable warmth, and numbers of measures installed lead to greater costs to energy companies, which would be passed on to consumers' bills. While lofts and cavity walls insulated under the affordable warmth target would contribute to the carbon savings, heating systems installed into low income and vulnerable homes are likely to be mainly run on gas, which could in some cases increase emissions for the lifetime of the boiler (depending on the prior heating source). In addition, it is in the nature of an energy company obligation delivering major energy performance measures that, while all consumers would pay through their energy bills, only a proportion would benefit from measures. Consumers who do not benefit from measures will still pay the costs through their energy bills and may face a higher risk of fuel poverty as a result.

Taking into consideration these issues two options (these options are also presented in section 7) for the scale of ECO are considered. These options are presented below:

Option 2: Non-traded Carbon Target of 1.95 MtCO₂ pa and an Affordable Warmth Target of £13.5bn total lifetime bill savings resulting in:

- A total annual average spend of £1.3bn
- estimated equity weighted NPV of £10,986m

Option 3: Non-traded Carbon Target of 2.05 MtCO₂ pa and an Affordable Warmth Target of £14.7bn total lifetime bill savings, resulting in:

- A total annual average spend of £1.57bn
- estimated equity weighted NPV of £9,864m

Table 10 on page 73 presents the high level results for options 2 and 3, for the level of ECO spend/target used in the Green Deal impact assessment. It should be noted that this table also includes non-domestic numbers so that the aggregate impact of the policy can be illustrated. In each of the options, around 25% of the total annual average spend is spent on the affordable warmth target. Increasing the overall level of ECO from option 2 to option 3 reduces the overall NPV marginally. A higher level of ECO ambition delivers a higher number of measures installed, but also results in a higher marginal cost per measure due to larger economic rents.

Varying the split between the affordable warmth and carbon saving targets, while keeping the total level of ambition fixed, will alter the overall impacts and ambitions of the ECO. For example, while a higher relative proportion of spend on the affordable warmth target would be likely to lead to a higher NPV, it would also be likely to lead to lower overall non-traded carbon savings (for the reasons explained at the beginning of this section). Conversely, if projected spend on the affordable warmth target were to drop below 25% of the total ECO, this would allow an increase in the overall carbon ambition of the scheme, but would likely see a lower NPV.

Varying the proportion of total spend between the two targets (carbon saving and affordable warmth) would also affect the aggregate distributional impacts of the policy, as well as the impacts on fuel poverty (explained earlier). A reduction in focus on low income households without an equivalent reduction in overall spend could risk increasing the negative distributional impacts of the policy and the impacts on fuel poverty numbers. Section 9.1.4 discusses distributional equity within ECO and a potential 'distributional safeguard' policy which would ensure a minimum proportion of the carbon reduction target is reserved for households on low incomes. In combination, the distributional safeguard and affordable warmth target would help to mitigate negative distributional impacts of the policy.

A shift of focus from carbon saving to affordable warmth within a given level of spend would, however, also be likely to lead to fewer solid wall insulation installations overall, which would reduce the impact of ECO on driving the solid wall market, and could have an impact on market certainty within the Green Deal.

The level of spend required to reach any given carbon savings target will be sensitive to various consumer demand attributes. Section 7.3 considers the sensitivity of spend required for the options

based on a range of input assumptions. The total pass through cost of the ECO on consumer bills is also dependent on the level of economic rent generated in the market for ECO points (as discussed in section 9). Greater pass through costs would have an impact on the number of households in fuel poverty in the short-term (if they have not received a measure).

Both options would contribute to meeting the second and third carbon budgets (2013-2017 and 2018-2022 respectively) by reducing UK greenhouse gas emissions. Given that there are significant uncertainties for UK emissions projections, option 3, which increases the scale of the ECO would help to give greater confidence of meeting the carbon budgets even if some other policies do not deliver the savings expected or if predicted emissions trends are not played out in reality. Beyond the third carbon budget, emissions reduction targets become tougher. Again, increasing the scale (and cost) of ECO beyond Option 2 now would improve confidence that increasingly large carbon savings in the household sector could be achieved in carbon budget 4 (2023 – 2027) and beyond. Again, high ambition on household retrofit should be seen in the context of cost-effectiveness compared to other carbon reduction measures.

The following sections set out in more detail the considerations that inform the level of ECO and how it is administered.

9.1.2 What should be delivered?

Historically, previous carbon-saving schemes have often operated on the basis that all, or almost all, measures which save carbon are eligible for delivery. More recently, the Government has taken steps to limit or focus the range of measures which could be delivered under schemes such as CERT and CESP so that there is more assurance of additional carbon reduction benefits for residential properties. The rationale for this increasingly restricted focus has been discussed in various consultations, most recently in the consultation on the role of products and appliances under CERT¹⁰⁶. Government has also moved to restrict the use of measures where the level of carbon saving is less assured, e.g., Compact Fluorescent Lamps (CFLs).

Previous carbon-saving schemes have not included any strict legal objective to provide “affordable warmth” to households at risk of fuel poverty, but the Government has borne increasingly in mind the distributional impacts of schemes paid for and delivered by energy companies, evidenced for example by the addition of a Super Priority Group within the CERT extension targeted at low income vulnerable households through the benefits system.

9.1.2.1 What should be delivered through the carbon target?

The domestic sector represents a substantial opportunity to reduce UK energy use and carbon emissions cost effectively. There are many different energy efficiency technologies which can reduce energy use and emissions when retrofitted to homes. However, as stated in the CERT extension IA¹⁰⁷ there is a high level of deadweight and overlap with other policies in areas such as electrical appliances.

¹⁰⁶ <http://www.decc.gov.uk/assets/decc/Consultations/appliances-cert/899-ia-cert-role-appliances-consumer-electroni.pdf>

¹⁰⁷ *ibid*

As can be seen from the Marginal Abatement Cost Curve above, insulating homes is one of the most cost effective ways to reduce emissions and there are many homes which are not fully insulated. Also the evidence suggests that there is little deadweight in insulation delivery and few, and relatively straight forward overlaps with other policies.

Previous government programmes have driven significant delivery of the cheaper insulation measure like loft and cavity wall insulation, while opportunities are diminishing for further installations, opportunities do still remain for these extremely cost effective technologies. In addition there are still significant numbers of more challenging to treat cavity wall properties, which are more expensive to improve but which still represent cost effective carbon saving potential. Solid wall insulation (SWI) has a very different history in Great Britain. Almost a quarter of GB homes are suitable for SWI¹⁰⁸ and this technology could help reduce UK emissions considerably. However uptake has been very low as a result of the much higher upfront costs, including non-financial 'hassle' costs, and only limited support from Government programmes.

When a household takes out Green Deal finance to cover the costs of making their home more energy efficient, the costs and benefits of the technologies stay with the occupiers of the home, while subsidy provided for measures under ECO is likely to be funded through a cost passed on to all bill payers. Therefore there are distributional and efficiency arguments to minimise deadweight by designing ECO in such a way that the role of Green Deal finance is maximised, with ECO subsidy being focused on those measures and situations where Green Deal finance alone will not deliver. Overall value for money of the ECO will be maximised by balancing this consideration against ensuring that ECO support is directed towards the most cost-effective measures that would not have been carried out without it. When designing the carbon saving target within ECO three options have so far been considered for determining which measures the obligation supports:

- **Option 1: All cost effective carbon saving measures;**
- **Option 2: Socially cost-effective measures which cannot meet the Golden Rule without additional subsidy; and**
- **Option 3: Packages of measures which include a major improvement which is socially cost-effective but which cannot meet the Golden Rule without additional subsidy.**

Option 1: The ECO supports all cost effective carbon saving measures

The first option would ensure that ECO support drives delivery of the most cost effective carbon saving measures. However the introduction of Green Deal finance, able to cover the full cost of many of the most cost effective measures, will mean that ECO delivery would not always be additional. Measures such as 'easy' to install Cavity wall and loft insulation meet the Golden Rule without any subsidy and should be attractive to consumers without requiring ECO support. They would generate substantial bill savings even after repayment of Green Deal finance charges. Allowing ECO companies to generate ECO points from the installation of these measures would allow potentially very large economic rents to be generated, either captured by installers or householders (see section 9 for discussion of economic rents). If the deadweight of subsidising those measures that households would have done anyway through the Green Deal outweighed any

¹⁰⁸ There are over 6.9m households that are eligible for SWI

benefit from supporting the installation of more cost-effective new measures than would happen under other options, then this approach would offer lower value for money.

Option 2: The ECO supports socially cost-effective measures which cannot meet the Golden Rule without additional subsidy

This option would focus the ECO on measures that are unlikely to be installed under a “Green Deal finance only” world. SWI is the main measure in this category. As mentioned above, there are significant barriers to the widespread delivery of SWI and historically delivery has been very low. Even with Green Deal finance part funding SWI, it is still very likely that only a small number of homes would be insulated without ECO support. With ECO support, over the IA period, installation cost would fall through economies of scale, learning and innovation, thereby reducing the level of subsidy necessary in later years of the obligation.

Although the most expensive ‘hard to treat’ CWI might also be included in this category, without a clear definition of a ‘hard to treat’ cavity there is clear potential for strategic behaviour with cavities being considered very difficult to treat so that they can attract ECO subsidy when in reality they could be fully funded by Green Deal finance.

Option 3: The ECO supports packages of measures which include a major improvement which is socially cost-effective but which cannot meet the Golden Rule without additional subsidy.

Under this option ECO is still focused on only supporting those measures like SWI, which are unlikely to be installed under a “Green Deal finance only” world. However this option would encourage the energy companies to promote multiple measures and deliver them together. Fixed costs associated with visiting the household would then be shared between the measures being installed leading to more cost effective delivery overall. Also delivering measures in more comprehensive packages maximises the impact of each time a household decides to make energy efficiency improvements, maximising the benefits of trigger points and nudges. A package approach might also allow low cost measures, which might not justify a Green Deal on their own, to be installed alongside other measures.

However additionality is a consideration as under option 1 above. Green Deal finance arrangements allow cross subsidisation between measures which are installed together so a package of measures could use cross subsidisation to reduce the level of subsidy required for measures like SWI to be installed. Providing ECO credit for the carbon savings of the whole package rather than just the SWI is a further incentive for energy companies to promote measures to be delivered in packages.

Option 3 could be considered in a variety of ways:

- i. Allow energy companies to promote, deliver and get ECO credit for all other measures packaged up with solid wall insulation;
- ii. Allow energy companies to promote, deliver and get ECO credit for insulation measures packaged up with solid wall insulation

Sub option (i) above allows products with less assured carbon savings to be included in packages while sub-option (ii) provides more certainty that the ECO will deliver tangible and long lasting carbon savings.

Option 3 is the lead option for this consultation. We would, however, welcome evidence on the cost-effectiveness of alternatives and will be analysing further options before setting targets. There is in particular a link to consideration of the supply chain capacity to scale up delivery of solid wall insulation and the case for any transitional arrangements.

9.1.2.2 Which measures should be delivered through the Affordable Warmth obligation?

The evidence base surrounding measures which reduce the amount households need to spend to heat their homes is well-developed. Cavity wall and loft insulation and central heating measures are generally the most cost-effective home improvement measures for reducing the cost of adequately warming a home, both in terms of energy bill savings observed by the household (private cost-effectiveness) and the wider benefits to society (social cost effectiveness – impacts on greenhouse gases, air quality, and fuel resource use). In addition, the supply chain for these measures is already strong, so there is less need to restrict measures eligible under the Affordable Warmth obligation than for the Carbon Saving obligation.

There are two options under consideration:

- **Unconstrained – energy companies are permitted to deliver any measures which could be shown to reduce the costs of heating homes to an acceptable level, using the chosen metric, without constraint.¹⁰⁹**
- **Constrained – DECC stipulates which measures should be included in the Affordable Warmth target.**

The benefit of an unconstrained approach is energy companies are able to meet their target using the most cost-effective measures available to them. In practice, this is likely to drive cavity wall and loft insulation measures (where opportunities remain in households in the eligible group) and central heating systems. Figure 32 and Figure 33 show the relative cost-effectiveness of different interventions in typical cavity and solid-wall houses that are connected to the gas grid - they show how the SAP rating¹¹⁰ of the dwellings increase as measures are installed in order of cost effectiveness.

¹⁰⁹ as long as they meet the Green Deal condition that they cannot be removed from the property – as such, lighting products are not included.

¹¹⁰ The SAP rating is an indicator of the thermal efficiency of a dwelling. For a particular house type, a higher SAP implies a lower household energy bill. See section 1.1.6.1 for further discussion of how the target metrics for the carbon and affordable warmth obligations could be set.

Figure 32: Cumulative cost of upgrading the SAP rating of a standard semi-detached cavity wall house

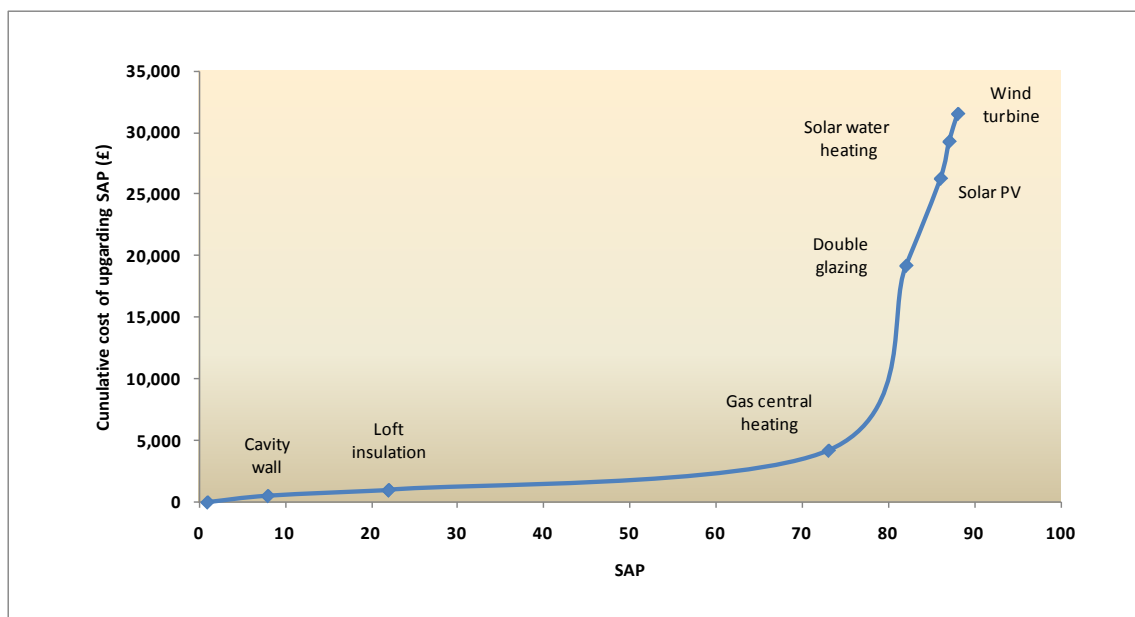
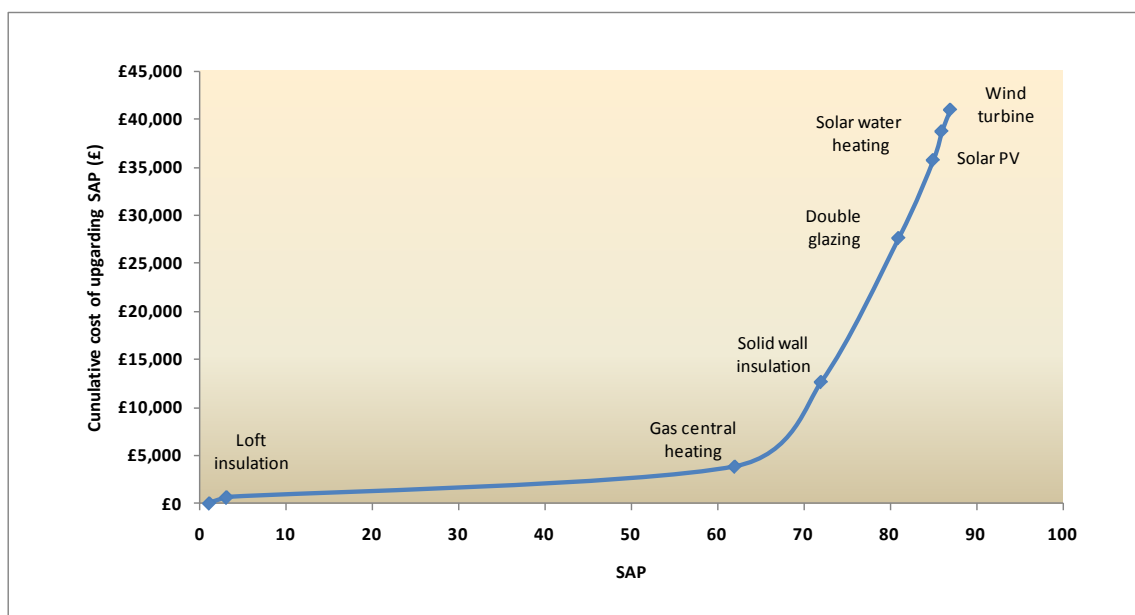


Figure 33: Cumulative cost of upgrading the SAP rating of a standard semi-detached solid wall house

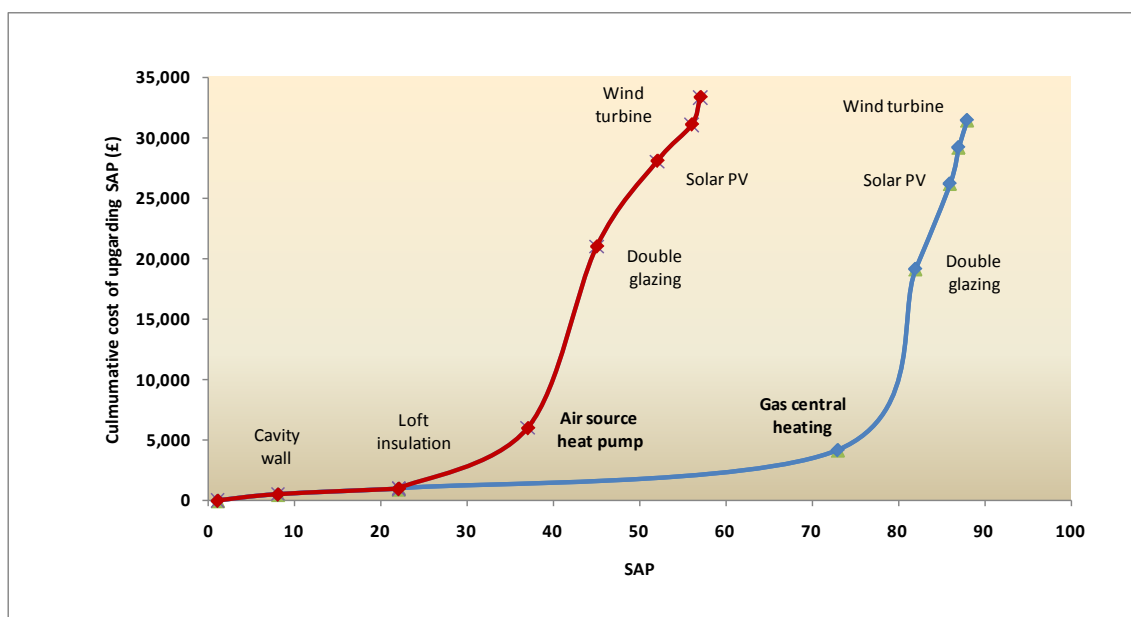


Natural market incentives mean that energy companies would look to deliver the most cost-effective measures. Implementing additional constraints on the types of measures that could be used under Affordable Warmth would increase the costs associated with delivering a given level of the obligation.

For example, a potential constraint would be to require the delivery of air or ground-source heat pumps as an alternative to more traditional fossil fuel heating systems (as requiring the delivery of renewable, rather than fossil, heating systems could potentially make a contribution towards carbon, renewable energy and affordable warmth objectives). Figure 34 compares the cumulative cost of improving the SAP rating of an semi-detached cavity wall house using an air source heat pump (red line) and a gas central heating system (blue line). These curves suggest that heat pumps

could reduce the cost of adequately heating a home, however they require a relatively high up-front cost and produce a relatively low improvement in SAP compared to gas central heating. There might be a greater role for heat pumps in households off the gas grid where energy costs for heating are generally higher and the alternatives rely on more carbon intensive fossil fuels. An unconstrained approach to measures would not prevent heat pumps from being delivered, but due to the high upfront costs of the technologies at present and the relatively modest impact that they have on household energy bills, it would seem unlikely that they would be delivered at volume at the outset of the ECO without additional constraints.

Figure 34: Cumulative cost of upgrading the SAP rating of a standard semi-detached cavity wall house using either an Air Source Heat Pump (red line) or gas central heating system (blue line)



Until DECC has better evidence on the effectiveness of heat pumps for vulnerable low income households, and the ability of these measures to actually reduce heating costs, DECC are minded to not put constraints in place to increase the likelihood that these are delivered at volume under the Affordable Warmth obligation. However, **through the consultation DECC would welcome evidence on this point.**

9.1.3 Who should benefit from the Affordable Warmth obligation?

It is an integral part of ECO design that the Affordable Warmth component should be targeted at:

- those homes least able to heat their homes to an adequate standard; and
- those households who are most prone to suffering health or social detriment as a result of failing to heat their homes adequately¹¹¹.

There are inherent difficulties in identifying and targeting support at households that are unable to adequately heat their home and most at risk of suffering the resulting detriment. As a result, in order to find and assist these households it is necessary to use a proxy that is both highly correlated

¹¹¹ such as households containing someone elderly, very young or with a severe disability or illness who would tend to need to spend more time in the home than able-bodied people of working or school age.

with the target household characteristics, and practical in terms of delivery. A good proxy would allow:

- **The identification of low income households** – those on low incomes are most likely to face financial constraints that restrict their use of heating, as well as being least likely to have access to resources to invest in measures to reduce the cost of heating their homes;
- **The identification of households particularly at risk of negative health consequences of cold homes** – a number of recent studies have shown that certain groups are particularly vulnerable to physical and mental health impacts that are exacerbated or caused by living in low temperatures.¹¹² The evidence indicates that the elderly, very young and those with existing physical and mental health conditions are most at risk.
- **Simple verification of eligibility** – in order to ensure that a qualifying proxy is implementable; it should be simple to verify a household's eligibility for support.

Four options have been considered and assessed against these criteria for eligibility criteria:

1. **Council tax band** – households could qualify for assistance based on their council tax band, which to an extent is based on the value of the home, and low income households might be more likely to reside in lower value homes.
2. **Size of home** – households could qualify for assistance based on the size (in m²) of their home. This would again be an indicator of the value of their home, and low income households might be more likely to live in smaller homes.
3. **Receipt of passport benefits** – households could qualify for assistance if they claim certain passport benefits (i.e., the fact that a household is already in receipt of a certain type of benefit will act as a 'passport' for eligibility for the Affordable Warmth obligation). A number of passport benefits are means-tested, which would provide a robust indication of whether a household has a low income. Further, components of certain benefits are linked to the health status of particular householders.
4. **Energy Performance Certificate (EPC) banding** – households could qualify for assistance if they live in a dwelling with a particular energy performance rating.

Table 16: Summary of options against assessment criteria

Option	Identification of low income households	Identification of Vulnerable Groups	Simple verification of eligibility
Council Tax Band	✓	✓✓	✓✓✓
House Size	✓	✓	✓✓
Receipt of Passport Benefits	✓✓✓	✓✓	✓✓✓
EPC Banding	X	X	✓

¹¹² A recent overview of the evidence is given in Liddell and Morris (2010), 'Fuel Poverty and Human Health: A Review of Recent Evidence'; Energy Policy, Vol. 38, Issue 6, p. 2987-2997

The benefits system is the most effective and accurate means of targeting households on low incomes and at risk of the health consequences of living in cold homes, in a way that could be easily verified and regulated. The concentration of low income households in particular council tax bandings and house sizes were found to be low, and EPCs currently provide little indication of whether the occupants of a dwelling are on low incomes or vulnerable to health impacts. The preferred option is therefore to use a proxy based on receipt of passport benefits.

The case for restricting Affordable Warmth eligibility by tenure was also considered. Under previous obligations, social housing has tended to benefit disproportionately from measures, particularly through Priority Groups under CERT and under CESP. Social housing provides natural opportunities to deliver at scale, with the cost-efficiencies that entails. However, 81% of the fuel poor live in private housing tenures (63% owner occupiers and 18% in private rental housing), where standards of energy performance are also significantly lower on average (SAP 50 in private tenures compared with SAP 60 in housing association properties).

Social housing (which makes up 19% of the fuel poor) has benefited from significant investment through the Decent Homes programme. £2.1 billion has been committed to Decent Homes in the current Spending Round, aimed at bringing the tail end of social housing up to the standard, which requires all homes to have a heating system and basic level of insulation. It is expected that social housing would be a key focus of the Carbon Saving target, leveraging in Green Deal finance.

As such, DECC proposes to restrict Affordable Warmth eligibility to private tenures, where the majority of fuel poor live, there are the lowest average standards of energy performance and alternative support is not available.

Three options for targeting low income vulnerable households through the benefits system in private tenures have been analysed, see Table 17 below. These three options were assessed as part of the recent consultation on eligibility criteria for the Warm Front scheme, and detailed overviews of the benefits involved can be found in the accompanying impact assessment.¹¹³

¹¹³ <http://www.decc.gov.uk/assets/decc/Consultations/warm-front-eligibility/1442-ia-warm-front-eligibility.pdf>

Table 17: Eligibility options against assessment criteria¹¹⁴

Policy Option	Size of Group (Private Tenure)	Fuel Poverty Hit Rate	Coverage of Vulnerable Groups	Flexibility and practicability
Cold Weather Payment Group	✓✓ (2.6m)	66%	✓✓	✓✓
CERT Super Priority Group	✓✓✓ (3.3m)	61%	✓✓✓	✓✓
Pension Credit + Child Tax Credit <£16k	✓✓ (2.5m)	67%	✓	✓✓

The current CERT Super Priority Group (SPG) is made up of households who stand to benefit from Cold Weather Payments (which includes those in receipt of Pension Credit and those in receipt of means-tested benefits with a flag denoting disability or a child under 5) plus those households in receipt of Child Tax Credit under a £16,190 income threshold. This combination of benefit groups in private tenure only provides the most effective proxy for identifying households who are both on low income and vulnerable, and lack access to alternative support.

Cold Weather Payment eligibility alone excludes households with children aged between 5 and 16 on very low incomes (under £16,090 pa). While there is an argument that these children are at school and therefore spend less time in the home, there is also evidence (outlined in recent Warm Front IA¹¹⁵) linking low educational achievement with cold, damp housing conditions. On balance, Government believes the benefits of capturing this group in the eligibility criteria for Affordable Warmth outweigh the disbenefits, i.e. a slightly lower rate of fuel poverty in this group (likely to be due to more economic activity in these households). Similarly, the option of targeting Pension Credit and Child Tax Credit households under the same income threshold excludes households containing working age people with disabilities or long term illnesses and as such does not meet the criteria of including all major groups of vulnerable low income households.

There may be a case for making minor amendments under ECO to the Super Priority Group eligibility, for example, as more evidence emerges on the experience of delivering the CERT Super Priority Group.

9.1.4 Distributional issues for carbon target

If companies are given complete flexibility as to which households they could deliver their carbon obligation to, they would be expected to choose those households where they could achieve the greatest credits at the lowest cost. On the whole this is one of the benefits of the ECO model, and a desirable outcome - obliging them to act in a contrary way would load extra costs into the scheme and, in turn, more cost pass through to all energy consumers. However, since the costs of ECO are

¹¹⁴ DECC is currently undertaking new analysis of the size and characteristics of groups identified under different possible eligibility criteria.

¹¹⁵ Ibid

likely to be spread across all energy bills, which has a disproportionate impact on low income households for whom spending on fuel makes up a greater proportion of their total income, it is important for the credibility of the scheme to ensure that all households have fair access to the benefits, safeguarding distributional equity.

Distributional issues – income

The key issue here is whether ECO's carbon requirement, left to the market, would systematically skew away from lower income groups in favour of the more affluent.

On the one hand, regulation on the private rented sector, which has higher than average concentration of low income households, will drive uptake of measures through ECO. In addition, compared to previous obligations, Green Deal finance will increase the opportunities for many households to install measures, as upfront payments by the household are not needed and the costs of measures can instead be spread using savings on energy consumption. With Green Deal finance available to part-fund measures, and an expectation that in many cases the household will not expect to pay anything up front, it may well be that some low income households are in a better position to benefit than under previous schemes. Indeed, earlier in the IA, it is stated that there is an expectation that some lower income groups will tend to be more likely to benefit from Green Deal and ECO (see section 4.1.2).

On the other hand, the same research suggests that vulnerable households on low incomes, particularly the elderly and disabled who tend to under heat, will be unlikely to be able to access the benefits of Green Deal. These types of households also face social barriers to engagement with the Green Deal, such as low literacy, lack of exposure to conventional marketing and lack of trust in external agents particularly outside social housing where landlords facilitate engagement. Such households are also likely to discount heavily future streams of benefits – so may not be attracted to an offer where bill savings are not realised until some point in the future.

Evidence suggests that low income households are more likely to under-heat their homes than more affluent households¹¹⁶, meaning they are likely to require higher levels of subsidy to make Green Deal finance viable. This too may mean that these households will be less likely to be offered, or to be able to take up, large Green Deal finance packages. Where ECO offers are packaged together with a significant Green Deal finance component – as will frequently be the case under the carbon saving obligation - these low income households may therefore still miss out on opportunities to receive ECO funded measures.

Social housing (where there is a high concentration of low income households) is expected to be a major beneficiary of Green Deal and the carbon saving ECO, particularly in the early years. However, from the factors discussed above, low income households in private tenure, who make up the majority of the fuel poor, are least likely to benefit from measures under the carbon saving element of ECO unless provisions are in place.

The Government therefore needs to consider whether more should be done to protect the interests of low income households, who are highly likely to under heat, within the scheme.

¹¹⁶ See p. 31 of: <http://www.decc.gov.uk/assets/decc/11/stats/energy/energy-efficiency/2078-need-data-framework-report.pdf>

In the consultation document, we are therefore inviting views on the need for and structure of any such “distributional safeguard”. Even taking into account the presence of the Affordable Warmth obligation, there may still be negative distributional effects of the ECO, given that the Carbon saving obligation accounts for the majority of the policy’s costs and benefits.

The following section considers the policy options for a distributional safeguard which could be implemented if, following consultation, Government determines that further intervention is necessary to promote distributional equity within the scheme.

Three options for delivering an equitable distribution of benefits through the Carbon Saving target have been analysed:

1. *No regulatory intervention* – **leave it to the market to distribute the benefits of ECO equitably without any specific provision in the regulations.**
2. *Distributional safeguard mechanism* – **minimum proportion of total activity to be delivered in a defined group of eligible households.**
3. *Scoring up-lifts* – **offer higher scores or bonus points where measures are delivered in a defined group of eligible households.**

Leaving the delivery pattern to the market and not introducing further regulation would present the fewest barriers to cost-effective CO₂ reduction and the development of the GD finance market as suppliers would be able to take up the cheapest opportunities to install ECO carbon measures. This option would not provide a guarantee that low income households would benefit or that a whole house approaches would be taken for households eligible for affordable warmth measures.

While a scoring up-lift system would be more likely to provide a guarantee of an equitable distribution than no incentive at all, only a minimum target would provide full certainty that lower income households would receive at least a proportionate share of the benefits of the policy. In addition, a scoring up-lift system would create greater uncertainty over the actual carbon impact of the policy. Thus it would be difficult to calculate the level at which scores should be set to strike a balance between incentivising activity without unduly skewing the policy.

Energy companies have experience of delivering minimum targets through previous obligations, and a minimum target would not detract from delivery through a combination of financing sources including Green Deal finance for measures eligible for the Carbon Saving obligation. There is also experience in regulating such an approach. Assuming similar eligibility to the Affordable Warmth obligation, this approach would promote a whole house approach for eligible households who stand to benefit from measures under both obligations at once.

DECC are consulting on whether any distributional safeguard is necessary within the Carbon Saving obligation.

If it is decided that some form of correctional mechanism is needed to safeguard the position, then we will need to address who exactly should be eligible, and how great a proportion of the obligation should be reserved in this way .

Distributional safeguard - eligibility

There are principled and operational grounds for aligning the target group for any distributional safeguard with the Affordable Warmth eligibility criteria. Principled grounds are described in depth in the eligibility section for Affordable Warmth (see section 9.1.3). Operationally, aligning the criteria would: promote whole house packages that cut across both obligations (e.g. full support for a heating system alongside a combination of subsidy and Green Deal finance for SWI); help reduce the costs of finding eligible households, as those suitable for Carbon Reduction target measures could be identified under the Affordable Warmth obligation (or vice versa); and potentially utilise data held by energy companies on consumers eligible under the Warm Home Discount scheme where possible (since some of the criteria correspond) and for as long as the scheme runs. There would be a case for extending the target group beyond the Affordable Warmth eligibility if evidence suggested the market would not naturally deliver measures to a further group (e.g. by type of tenure or wider benefit groups), and DECC would consider any such evidence provided in response to the consultation.

Distributional safeguard – size

If it was determined that such intervention was necessary, the level at which any distributional safeguard within the carbon obligation could be set would need to take into account impact on costs and the degree of certainty that the objective of distributional equity would be achieved (these factors are affected by the scope and eligibility criteria of the group, and level of opportunities to deliver measures in the group).

9.1.4.1 Regional Distribution

Concerns have also been raised that rural areas and inner cities have not been provided with equivalent levels of access to energy efficiency measures under CERT as other types of settlement, or that different regions within the country have not received a reasonable proportion of the benefits – and that this perceived pattern might be borne out in the ECO without additional constraints being put in place. The design of Green Deal and ECO, plus the credit trading mechanism which is discussed later (see section 9.1.5.5), are more likely to work against this but the issue is explored below.

DECC has undertaken an evaluation of the delivery of CERT, which included an investigation of these concerns. This revealed that, under CERT, activity has by and large been delivered proportionately in geographical terms without active interventions to promote fairness between different areas or types of area; each nation has broadly received its fair share of CERT activity and when GB is considered as a whole, rural areas have also received a proportionate rate of delivery under CERT. There is some variation between regions, for example, 9.9% of homes in North East England but only 2.7% of homes in London received measures under CERT during the period of the analysis. However, it is very difficult to isolate the cause of any under delivery in specific areas as a number of factors are at play, including: previous activity; LA and other potential partner activity or resource; prevalence of different property types (flats, solid wall, etc); expense of activity (could economies of scale be generated); distance from installers; etc.

In those areas where receipt of measures has been consistently low under CERT, particularly London and the Scottish islands, this could be attributed to high access costs and prevalence of hard to treat

housing, amongst other factors. Since the ECO would focus more on hard to treat measures, such areas might be more attractive to energy companies in future, particularly in view of natural incentives within the proposed target metric (see section 9.1.5.2) for companies to improve the lowest performing housing stock as defined by cost of heating. This would create an incentive for energy companies to explore delivery in off-gas grid areas as well as colder areas. The CERT evaluation also found that energy companies had begun to develop innovative delivery routes (e.g. with manufacturers, or new devices) to position them to operate in newer, less well-developed markets in future. It is likely that energy companies would want to continue to use these relationships and innovative routes to deliver SWI to these same markets under the ECO and so benefit those areas that have seen comparatively little supplier activity to date. Also, with providers having ‘brokered’ access to ECO the supply of measures can be driven locally and less dependent on energy company preferences.

In view of the evidence from CERT, and consideration of the shift of focus that the ECO would entail, at this stage DECC does not see a case for introducing further constraints to delivery in geographical terms. There might be a case for reconsidering this position at a review period, when there would be evidence on the patterns of geographical distribution of measures from the new obligations. DECC would welcome further evidence on this issue during consultation.

9.1.5 How ECO is delivered

In this section of the Impact Assessment, options for further rules affecting the ECO are considered.

Target metric

The choice of “currency” for the ECO targets would have an important influence on how the scheme is delivered on the ground. First and foremost, it would establish how the scores for specific measures are calculated, which is a key factor in determining the relative cost-effectiveness of measures – so different metrics could incentivise certain patterns of delivery or some measures over others. The choice of target metric would also affect the overall complexity of the scheme in terms of administration and has implications for how transition arrangements from CERT are handled.

For the ECO, it is necessary to design a metric that best fits the objectives of the scheme whilst delivering through the most socially cost-effective route. Getting it right would be important for ensuring the objectives of the scheme are delivered as expected and in a socially cost-effective manner.

The ideal metric is one that naturally incentivises supplier actions that are in line with the scheme’s policy priorities. The policy priorities for the ECO differ from those of CERT and CESP, not least with the introduction of a separate Affordable Warmth target, so the existing CERT metric might no longer be the best fit.

It could also be argued that as policy priorities evolved under CERT, a relatively complex set of artificial uplifts and incentives became necessary. With the ECO there is an opportunity to go back to the drawing board to see whether alternative metrics might reduce or avoid the need for artificial scoring mechanisms. Evidence from the CESP evaluation suggests that stakeholders appreciate a much simpler scoring system, as a complicated system takes *“a long time to get heads round it, not*

just local authorities and housing associations but energy companies too.”¹¹⁷ The complexity of the scoring system has implications on the partnerships that might be formed under the ECO and Green Deal and could act as a barrier to delivery.

The metric chosen for the ECO would need to provide transparency; administrative simplicity; and to naturally incentivise the key objectives of the scheme with minimum need for additional incentives or uplifts. The two obligations could potentially use different metrics, although from the perspective of simplicity and lower costs, using the same metric (or directly compatible ones) for both would be desirable. The metric should also be conceptually straightforward, so as to boost transparency, make it accessible to smaller industry players and help promote the benefits of the scheme to stakeholders.

These objectives have been used to assess the following options for the target metric:

Option 1: Deemed scores for measures (based on predicted measure performance in typical conditions)

Option 2: SAP¹¹⁸ calculations for reductions in CO2 and Heating costs

Option 3: Number of homes

The ECO administrator would be required to audit the claims obligated energy companies make of progress they have delivered towards their targets. When an energy company claims to have delivered a certain saving by installing a package of measures in a particular property, the administrator would need to be able to check that the measures have been delivered to that property and check that the savings claimed are correct.

Where measures are delivered part funded by Green Deal finance, a Green Deal plan would be registered for the property. We expect the administrator to be able to interrogate the registry of Green Deal plans and confirm that ECO scoring measures were installed. Where no Green Deal finance was attached and no Green Deal plan exists, the administrator would carry out spot checks to verify the claimed measures were delivered.

If a metric based on a SAP calculation is used then we would expect that, in the vast majority of cases, an EPC would be lodged prior to measures being installed. For measures installed in England and Wales the administrator would have access to a tool which would calculate predicted savings for the specific property using information in the EPC database. This would allow the administrator to verify the level of savings claimed by an energy company. We are investigating whether this tool can be extended to work with the Scottish EPC registry, or whether a similar tool for Scotland can be developed and the administrator use this to verify savings. If this tool does not exist for Scottish properties, and in cases where an EPC is not lodged, the administrator would carry out spot checks, using the SAP model to calculate the savings that measures have delivered.

¹¹⁷ Evaluation of the Community Energy Saving Programme, p. 88

http://www.decc.gov.uk/en/content/cms/funding/funding_ops/cesp/cesp.aspx

¹¹⁸ The Standard Assessment Procedure was developed by the Building Research Establishment for use as a compliance tool for new build properties, but is now used for existing buildings through the Energy Performance Certificate.

Option 1: Deemed scores for measures (based on predicted measure performance in typical conditions)

Deemed scores for measures have been used under CERT and CESP, based on the predicted carbon savings measures might generate over their lifetime in a restricted set of typical house types. The design of the ECO would see several key departures from CERT, not least with the introduction of an Affordable Warmth (AW) target, with an objective to deliver measures that reduce the notional cost of heating, rather than reduce CO₂.

AW would share some of the same measures with the CO₂ target, particularly insulation, but would also include measures such as heating system installations, repairs and fuel switching, that do not always save carbon. Some might well increase emissions. In addition, the target audience for AW would be households who tend to under-heat their homes and would therefore be expected to take more comfort, further diminishing the carbon saving potential of measures.

A CO₂-based target metric and scoring system would not seem appropriate for the AW obligation. A new type of currency is needed for AW specified in terms of notional heating cost reductions.

Another significant change from CERT is the intended use of Energy Performance Certificates (EPCs) within Green Deal to explain the possible measures to households. This would provide a much greater level of information to the householder. Consequently a simple deemed approach would not be consistent with the information provided to the customers and would be difficult to link with the Green Deal finance. Also the information generated from a bespoke assessment of the property on the potential savings measures could produce is likely to be much more accurate than a deemed figure.

Option 2: a SAP based metric

A metric based on specific values calculated through the SAP methodology, which supports the EPC. Four sub-options are discussed below, each of which uses values presented on domestic EPCs.

Option 2a: SAP rating improvement

The overall supplier target is set in terms of SAP rating points. The scores earned for measures or packages of measures are determined by the SAP rating improvement they achieve. Improving a property's SAP rating from 20 to 35 would earn the supplier 15 points towards their target.

This metric would cause energy companies to target properties in which SWI measures could be installed at the lowest cost per SAP point improvement. The SAP rating is a measure of intensity, not absolute emissions or heating costs, so it does not account for the size of the property. SWI installations will, in the main, be cheaper for small properties than for large ones, but would achieve the same SAP rating improvement, so energy companies would have a natural incentive to target the smallest properties. However, absolute emissions savings and cost-savings increase in direct proportion to property size, so incentivising smaller properties would therefore cause the supplier to take an option that is significantly less cost-effective in terms of CO₂ reduction or heating cost reduction.

Option 2b: SAP rating improvement scaled by property size

This option considers the SAP rating score of option 2a and scales it by the property size. This aims to ensure that the level of CO₂ and heating savings are better reflected in the scoring system.

The specific calculation would need to be devised, as SAP is logarithmic and rating multiplied by property size is not directly proportional to either the improvement in cost of heating or the reduction in emissions.

The overall cost of scheme delivery is also affected by its degree of simplicity and accessibility. The SAP times property size model would introduce an extra layer of complexity over the SAP only score, and introduce a new and more abstract metric. This would also reduce the transparency of the scheme in terms of the benefits being delivered.

Option 2c: EPC values for CO₂ emissions/ Cost of heating

Option 2c differs from 2a and 2b in that it does not use the SAP rating. Instead, it uses two other values calculated by SAP: the overall CO₂ emissions of the property and overall heating and hot water costs for the property. SAP calculates how these values change if measures are installed, so the score which a measure generates for an ECO company would be the predicted improvement in either CO₂ emissions or heating and hot water cost depending on whether the measures counted towards the AW or CO₂ obligation.

Like 2b, this option takes account of the size of the property and incentivises targeting of the worst performing homes. However these metrics directly reflect the benefit of each measure in reducing emissions and reducing the cost of heating.

This option uses values, expressed in tonnes of CO₂ and £ saved per year – that are straightforward to understand and relate to. They directly represent the specific objectives of the two ECO targets. As both values are derived from the same data and methodology, they should be readily interoperable – i.e. it should be possible to convert directly between them, therefore reducing organisation and running costs. A CO₂ value, which is based on the same underlying BREDEM methodology (used in SAP and used to generate deemed scores under CERT and CESP) should make carry-over simple and transparent to calculate.

Option 2d: EPC values for annual CO₂ emissions/ Cost of heating, multiplied by measure lifetime

One disadvantage of using annual saving figures derived from the SAP calculations is that lifetime savings are not taken into account. This could potentially change the cost effectiveness ordering of measures; some short-lived measures might gain an advantage over long-lived measures that deliver greater overall savings, such as SWI which might typically generate savings for c.30 years.

The advantages of factoring in the expected lifetime of measures are clear, in terms of aligning the scores measures receive as closely as possible to the extent to which these measures contribute to the policy outcome. How important this advantage is depends on the relative difference in lifetimes of the measures promoted by ECO. Under the carbon target, if all the measures promoted have long lifetimes (SWI, other insulation measures, etc) then incorporating lifetimes is unlikely to make a significant difference. However under the AW obligation where core measures may have very different lifetimes, (insulation, replacement boilers and boiler repairs) incorporating lifetimes may make a very significant difference.

It would be possible to multiply the savings calculated by SAP with lifetimes for measures to generate a SAP based lifetime CO2 score. However this is complex for a number of reasons. SAP calculations take into account the current circumstances of the property and give an assessment of costs and emissions in the current circumstances. Simply multiplying the savings expected from a measure by the lifetime of the measure assumes that there are no changes to the property over the lifetime of the measure which would impact on the savings it delivers. This seems very unlikely, for example the expected savings from insulation in a property with an old G-rated boiler would be very high, but at some point during the lifetime of the insulation it is likely that the boiler will be replaced with a more efficient heating system, which would impact on the savings the insulation delivers.

A further advantage of SAP is that it calculates the interactions between measures . A SAP assessment of the impact of insulating and upgrading a boiler will account for the fact that the savings from the package are not the same as the savings from the individual measures added together. Therefore when SAP has calculated the ECO credit for a package of measures, this would require a complex reassessment of the savings that package is expected to deliver as each measure in the package reaches its expected lifetime and so drops out of the package.

Overall conclusions for SAP-based metric

The poor social cost-effectiveness of delivery that would result from Option 2a would make it less favourable than the options that take property size into account. Options 2b does take account of property size, and would drive a more socially cost-effective delivery pattern. However, Option 2c would achieve the same outcomes as 2b, but would use a currency that is far simpler to use and less abstract. Option 2d introduces an extra level of complexity but this may be necessary to align the metrics with the policy intentions – depending on the mix of measures possible under the CO2 and AW obligations.

SAP based metrics, particularly those that take property size into account, would offer relatively high certainty over the real-world delivery of our policy objectives. It uses the same underlying BREDEM methodology as used by the existing CERT metric, but scoring would be far less aggregated, as the score would be calculated for every individual property rather than use standardised property types.

Unlike CERT, all the data necessary to evaluate and verify supplier activity would be accessible from the EPC database.

It is worth noting that it might be necessary to make an additional assessment or deem the scores under the affordable warmth target for the replacement of broken boilers. The EPC assessment assumes that if a property has a boiler that it is in working order, even if it is not. This means that the scores assigned by the EPC would not reflect the actual benefit gained from receiving a new boiler (equivalent to not having a heating system before). This would need to be resolved before the ECO begins.

Option 3: Number of homes

In purest terms this would suffer the same social cost inefficiencies as the SAP only model, as it would incentivise energy companies to target the properties that are cheapest to retrofit. These are likely to be the smallest and therefore the ones that achieve the lowest carbon savings and absolute heating cost reductions.

An extra layer of sophistication could be added, for example setting sub targets for different types or sizes of property. However, adding such delivery constraints would push up costs and energy companies would still target the cheapest properties in each sub category.

Overall recommendation

Overall a metric which takes advantage of the additional accuracy provided by bespoke EPC assessments is preferable and should use the predicted cost and carbon savings of the specific measures (option 2c or option 2d) rather than a proxy based on the SAP rating. Depending on the measures promoted under each of the CO₂ and AW obligations the extra complexity of incorporating expected measure lifetimes into the metric (option 2d) may be appropriate. As such, there is currently no preferred option at this stage. However, for the purposes of this impact assessment a metric for the CO₂ target as described in Option 2c has been applied, and a metric for the Affordable Warmth target has been applied as described in 2d.

9.1.5.1 Target metric

9.1.5.2 Target period

The Government is committed to providing an ambitious level of support over the long term and has committed to the programme through to 2022. This will provide certainty to the industry and to Green Deal providers to invest in long-term supply chains. The Impact Assessment puts forward indicative scenarios for the ECO until 2022 assuming that the average annual cost of the scheme continues at the level it is initially set at; and on the basis of current modelling of the corresponding level of activity that would be delivered. However, the consultation proposal is that ECO targets are initially set for the period to 2015; with targets beyond this being set after the scheme's introduction.

The ECO will run until at least 2022. There are a variety of options for the periods within this over which targets should be set. Setting a target for the ECO over an 8-10 year period would mark a step change from CERT and CESP which have both been set over a maximum of 3 years. There are benefits associated with having a longer period for the obligation. It creates longer term certainty for investment on the supply side and would ensure that growing markets (e.g. SWI) could see the future benefits from investment today. However, there are some costs/risks associated with a longer period obligation:

- There are inherent uncertainties in projecting the costs of a given target over a long period and a structure that allows for staged setting or adjustment of targets allows this uncertainty to be reduced;
- Retaining a degree of flexibility over the level of costs that will be passed on to consumers would allow the balance between costs and benefits to be reviewed as evidence evolves and to reflect the wider policy environment;
- Strategic behaviour by energy companies – there would be an advantage in being a second mover supplier for two reasons; to wait for the cost of SWI to fall and to attract customers with lower prices whilst other energy companies install measures;

Discount rates for energy companies are likely to be higher than for the government and so they might not invest fully to bring down the cost of measure or to increase customer interest in products in the short-term, which might result in a peak in costs near the end of the period;

- Sufficient support might not be provided for the Green Deal in the short run to ensure that this market flourishes and thus reduces ECO costs in the future;
- Action is needed now and continually to ensure that the Government is working to reduce fuel poverty;
- The economic rent associated with the ECO subsidy would be higher as all players would in principle pass through the costs of meeting their target based on the market clearing price for the entire 10 year obligation.

Consequently DECC would suggest putting in place minimum targets, initially within the period to 2015, to ensure a strong start to the Green Deal and maximum targets (with limited scope for banking) to reduce the level of economic rent and provide advance signals to the supply chain of levels of activity.

In each period the energy companies would be required to deliver measures within a set tolerance of their interim obligation (for example 80% to 120%). The first interim target would ensure a strong start to the Green Deal, driving investment from the beginning and encouraging energy companies to act early.

The ECO administrator would have powers to penalise energy companies who fail to meet their targets, and discount any delivery that is over and above the permitted maximum target.

Setting minimum targets at intervals, in other words setting interim targets, would ensure a given level of ECO subsidy is available throughout the duration of the ECO, providing certainty to the supply chain and support for the Green Deal market. The maximum targets would help to minimise the amount of rent that would have been produced under a single long term target.

A separate targeting structure would need to be put in place for the Affordable Warmth target to ensure that a minimum proportion of vulnerable and poor households are receiving measures each year.

The provision of heating systems (mainly gas central heating) and basic insulation is a relatively mature market compared to more novel technologies such as solid wall insulation. Therefore there are unlikely to be the same incentives for energy companies to individually delay efforts to meet their targets in order to benefit from reduced supply chain costs.

Government wishes to ensure that a certain minimum amount of affordable warmth effort is delivered in each year of the scheme for low income and vulnerable consumers, while still providing the energy companies with the flexibility to deliver the target in the most cost effective manner. On this basis, Government proposes that energy companies should be required to provide a minimum of their target in each year of the obligation, within an overarching multi-year obligation. The central working option for ECO in this Impact Assessment therefore includes interim targets.

There is an argument for setting a higher minimum target for this group in earlier years to ensure that vulnerable households would be more secure against possible future price rises. However,

heating measures have a relatively short life time and so the eligible households needing assistance under the affordable Warmth target would be different each year. Consequently it is necessary to ensure a minimum level of delivery for every year of the obligation.

9.1.5.3 Referrals

Energy suppliers are encouraged through their obligations to be proactive in identifying and engaging households eligible for help, which they do through a range of routes including partnerships with community based companies and organisations. The Government is keen to see this form of demand generation continue and improve through ECO, building on the experience of previous obligations. However, there are likely to be additional costs associated with identifying and engaging low income and vulnerable households for this particular targeted support e.g. through the Affordable Warmth obligation due to a variety of social, technical and financial barriers. The data sharing arrangements put in place through links to the Warm Home Discount policy will help in this respect. In addition, the Government is investigating the case for providing energy suppliers with referrals for households potentially eligible for Affordable Warmth measures.

A referrals system that helps identify interested eligible households, and then passes this information on to energy companies, would help reduce the costs involved for energy companies to find these households and would help ensure more households are able to benefit from these measures. Without a referral mechanism, there might not always be a route for some households in need of support to come forward, and certain eligible households are more likely to be overlooked or refused help.

There may be double benefits to providing referrals; they could both help energy suppliers discharge their obligation at a lower cost, and offer a potential “return” for Government, in the form of an undertaking by the companies to deliver a specified minimum standard of service to all those households that they were alerted to. In effect, the companies would waive their right to pick and choose amongst the leads that were being offered to them given the overall value to them of receiving those leads in the first place. However, this does assume this will be a lower cost option than their own selection of recipients and that will need to be tested further during consultation.

Agreement to a referral scheme would mean that the Government would not need to activate primary legislative powers enabling it to stipulate that energy companies must provide a certain level of support to certain persons or categories of persons. The options below propose alternative approaches for managing a potential referrals scheme:

1. Referrals passed on to energy companies for them to act on, or not, as they see fit

Potential ECO customers are passed on by Government through remote advice centre(s) to the suppliers, who could choose whether or how to follow this up without recourse back to Government.

2. A voluntary agreement in which energy companies are provided with referrals on the basis that they must honour each referral up to a minimum level

Potential ECO customers would be passed on by Government through remote advice centre(s) to the energy companies for them to follow up to a minimum level. This would be based on an

agreement between Government and energy companies about where that level is set and how energy companies account for this. This would all sit within a broad framework monitored by the administrator.

3. A referral mechanism that mandates a minimum level of support for households that qualify for Affordable Warmth measures

Potential ECO customers are passed on by Government through remote advice centre(s) to the energy companies for them to follow up to a reasonable minimum level, which is set out in secondary legislation and enforced by the administrator.

All options would help to reduce costs to energy companies by assisting them in identifying eligible households for support under Affordable Warmth. However, the first option enables energy companies to ignore certain referrals passed to them. The third option potentially adds to the regulatory burden. This might be necessary in due course, but a voluntary approach would be preferable, as it reduces the regulatory burdens on all parties whilst providing both energy companies and government assurance that referrals would be provided and acted on to a given level.

It should be noted that these options are contingent on agreeing with energy companies the most sensible and cost-effective way of passing on referrals. In addition, there are other means by which energy companies would be helped to identify eligible households to supplement their own activities, including through links to the Warm Home Discount.

9.1.5.4 Access to ECO subsidy

The ECO and Green Deal finance markets are expected to be closely interlinked as both ECO subsidy and Green Deal finance would be needed to ensure that measures which are socially beneficial but do not meet the golden rule (e.g. solid wall insulation) or package of measures occur.

Therefore it is necessary to design ECO in a way which not only makes sense for the policy in isolation, but contributes to the Government objectives for the new Green Deal landscape overall. The interaction between the Green Deal and ECO should be as cost effective as possible; with energy companies delivering ECO at the lowest possible cost, thereby reducing the impact on customer energy bills. This certainty of cost effectiveness could be gained through:

- Competition – a broad dynamic market for energy efficiency, with a range of Green Deal providers, competing fairly on price to attract ECO support. With a greater number of Green Deal providers the equilibrium cost of delivering a set target should be lower.
- Transparency – an open market that does not present unnecessary barriers to entry for potential Green Deal providers.
- Market efficiency – a market with low transaction costs and admin burdens for all parties.

The potential problem

Given that a large number of hard to treat measures will require ECO subsidy as well as the role of Green Deal finance, the small number of energy companies have the potential to dominate the Green Deal and ECO market. Energy companies could inhibit competition within the Green Deal provider market and create entry barriers by choosing to funnel subsidy through only a few

established delivery routes. This would make it more difficult for newer or smaller players to establish a foothold, given that they might lack access to the ECO subsidy needed to trigger many Green Deal transactions.

While there might be some “natural” limits to the overall range and diversity of the Green Deal provider market, it is desirable that ECO introduces no additional barriers. The emergence of a diverse and competitive Green Deal provider market could in turn lead to cost-efficiencies all round, including ultimately lower costs of delivery for ECO itself. This needs to be weighed against potential higher transaction costs caused by energy companies dealing with a greater number of Green Deal providers.

Options

1. Do nothing. Government has no certainty that the market would be transparent and that new companies would be able to enter the Green Deal and ECO markets.

2. Regulation. The Secretary of State has powers under the Electricity and Gas Acts to describe in a lot of detail what actions are eligible for a company in meeting the obligation, and this flexibility is further enhanced by powers in the Energy Bill. These powers would in theory allow the Secretary of State to force or to incentivise energy companies to discharge all or part of their obligation through specific types of third party delivery agents – for example Green Deal providers, or deliver a percentage of their ECO obligation through third parties.

Overall, in the short term this would help to ensure a diverse market, create competition, and does not involve set up costs. However deciding on the initial numbers/rules would be very complicated. In addition this is likely to increase transaction costs for energy companies, and might result in non-cost effective behaviour.

3. Market based solution. A better outcome would be to ensure energy companies make their ECO subsidy equally available to the Green Deal Providers who could deliver cost effectively.

This could be achieved through a brokerage system that brings together energy companies and Green Deal providers in an open market where ECO “points” that energy companies require to meet their obligation are traded for ECO subsidy.

Accredited Green Deal providers would post “jobs” on the broker’s web based portal listing how many points they could provide for a given price. Energy companies would buy points off the web portal to enable them to meet their obligation. This would reduce the transaction costs associated with working with a greater number of Green Deal providers as well as increasing transparency.

This mechanism would encourage Green Deal providers to compete on price and give energy companies increased certainty of meeting their obligation as cheaply as possible, whilst minimising the impact on consumers energy bills.

With a brokerage system in place DECC could then hold regulatory powers in reserve, for use if it was clear that the market was not working and households were losing out.

Administering and funding a market based solution

Such a scheme could be self financing through collection of transaction fees paid by Green Deal providers/energy companies. Smaller companies might opt for a fixed transaction cost if they could anticipate high certainty of gaining ECO support.

The brokerage could be run by Government, or the administrator. Although the admin costs of the brokerage would be unlikely to be a significant addition relative to the overall administration of the ECO, DECC have no specific provision set aside to pay for it, and no provision for dedicated administration resource.

Alternatively the brokerage could be run and funded by the energy companies themselves. The threat of regulation (if the Government is not satisfied with the liquidity and transparency of the market) might be sufficient to ensure that the energy companies are willing to commit to voluntarily set up and run the scheme. However DECC would need to retain an element of oversight to ensure the brokerage was viewed as credible and independent by Green Deal providers.

9.1.6 Those subject to an Energy Company Obligation

The current obligations which the ECO would succeed, CERT and CESP, operate on the basis of customer numbers. That is to say, companies become party to an obligation once they exceed a certain number of customer accounts and the obligation they receive is proportional to the number of customer accounts that they have. The Government is aware of a number of suggestions that continuing the CERT model going forward might not be the most appropriate arrangement, and would welcome evidence and views on a number of issues, as set out below.

9.1.6.1 Protecting smaller companies from disproportionate burdens - thresholds

CERT and CESP obligations are currently triggered when a supplier exceeds 50,000 customer accounts. The impact of this threshold on competition, along with that of various other environmental regulations, was recently the subject of formal consultation which concluded that the threshold should be raised to 250,000 customers under CERT and CESP¹¹⁹. This change is expected to be given effect through amending regulations later this year. The essential argument in favour of this change was that a threshold as low as 50,000 acted as a disincentive to growth for smaller suppliers, in that an obligation of this nature risked placing disproportionate costs on such energy companies as compared to larger companies (as the average cost per household is likely to fall considerably with scale), and could therefore have adverse implications for the growth of a diverse and competitive supply market.

The ECO is a new policy, and was not therefore formally speaking the subject of this recent consultation. It would be open to Government to opt for an alternative threshold.

The options are:

- **lower thresholds (e.g. the current CERT limit of 50,000)**
- **a 250,000 threshold (i.e. the new CERT threshold, once amended)**

¹¹⁹ <http://www.decc.gov.uk/assets/decc/11/consultation/1850-impact-assessment-ia-for-the-consultation-on-rai.pdf>

- **a higher threshold, e.g. 500,000.**

The Government believes that the arguments made and accepted in the recent consultation would also broadly apply to the future ECO policy, and that a threshold of 250,000 customers represents an appropriate trigger point at which companies could be assumed to be large enough to begin bearing the weight of an obligation of this sort.

A lower threshold would risk catching new energy companies at an early stage in their life, creating unhelpful disincentives to the growth of new players in the supply market.

A higher threshold would be likely to have little practical impact for some years to come, and would need more detailed consideration of the potential distributional effects, given that it would exempt a much larger number of consumers (those not with the 'big 6') from the bill charges associated with the ECO, whilst still allowing them to be eligible for support under the scheme.

9.1.6.2 Protecting smaller companies from smaller burdens – the 'cliff-edge' effect

Although it is likely that few companies would reach the higher threshold for some years, the ECO is due to be in place until at least 2020. There are concerns that setting the threshold at the 250,000 level could result in companies facing a "cliff-edge" for additional customers. Signing up just one additional customer could take a company from having no obligation at all, to having a sizeable obligation based upon 250,001 customers. This could represent a severe disincentive to companies to take on the extra customers which would see them passing the threshold, and might risk perverse effects.

In recognition of this, DECC has considered options for mitigating the cliff-edge effect, as there are several ways in which any given threshold could be implemented.

The options are:

- **Option 1: setting an obligation proportional to customer numbers (i.e. 250,000+X)**
- **Option 2: Setting an obligation proportional to a company's customer numbers over 250,000 (i.e. customer base defined by X)¹²⁰**

The first option would be in line with current practice under CERT and CESP, and it is arguable that growing companies would be well-sighted on the threshold as they approached it. They could begin to factor the costs associated with ECO compliance into their business planning well in advance, thus mitigating some of the most severe implications. However, this approach could provide smaller companies with disincentives to grow beyond 250,000 customer accounts and could therefore have potential negative impacts on competition in the energy supply market. It would also remain the case that a potentially very onerous obligation would crystallise at a single, not entirely predictable, point in the company's growth.

The second option would avoid the worst of these effects, in that the initial obligation as a company passed the threshold would be very small. It would thus be more manageable, and less likely to

¹²⁰ In other words, the first 250,000 customers would be discounted for these purposes. Thus, a company with 1 million customer accounts would have an obligation based on the number 750,000; and a company with 300,000 accounts would have an obligation based on 50,000.

affect the company's normal business planning in the supply market. However, this tapering approach would mean that the obligation would be allocated over fewer customers¹²¹. A higher allocation of the obligation per customer means that the cost of supplying the marginal customer would increase. This higher cost would be passed on to *all* customers (250,000+X) implying higher rents and in turn higher pass-through costs to consumers' energy bills.

The second approach would also not avoid the compliance costs associated with the ECO, which are unlikely to be directly proportional to the size of their obligation – even an obligation based on a handful of customers would trigger the need for some management resource and other overheads. The ability of companies to trade credits amongst themselves, or simply to subcontract to third party delivery agents, means that there is likely to be a market allowing a company to buy-in the fulfilment of its obligation, and they would not necessarily need to invest in their own energy efficiency delivery activity if that was not appropriate given the size of their obligation.

It is likely that option two would have less of an effect on the balance in the obligation between the current big six energy companies if a new company reaches the threshold. Exempting the first 250,000 customers of a company which has just reached the threshold should have a limited impact on the allocation of the obligation between the big six as there would not suddenly be an additional 250,000 consumers covered by the obligation. Nevertheless, there is a potential trade-off between avoiding theoretical negative competition impacts (as in option 1) and potentially significantly higher pass-through costs of the ECO to consumer bills (as in option 2). DECC is seeking views on the trigger point for obligating companies under ECO and will explore alternative approaches to allocating the obligation with an aim to minimise rents as well as impacts on competition.

9.1.6.3 Basis of the allocation – customer accounts or alternative approach

The discussion of thresholds above assumes that companies are obligated in respect of customer numbers, as opposed to some other metric. A number of stakeholders have suggested the allocation affects the costs of supplier obligations are passed on to consumer bills, although we have no basis beyond the economic theory to say what energy companies do.

In recent consultations on the CERT Extension and Warm Home Discount, a number of respondents suggested that the current approach is regressive, and proposed levying obligations in alternative ways. In response, DECC committed to do further work to look into alternative supply-based metrics¹²², particularly in relation to future long term obligations. Recent energy supplier obligations have generally been allocated to participating companies on the basis of their market share. This has been defined by the number of customer accounts held by each supplier on a fixed date each year. Energy companies could recoup the costs of obligations in the way that each company deems most

¹²¹ Further considerations around tapering must be explored if the obligation is not to be allocated on a customer accounts basis.

¹²² Warm Home Discount consultation response, p.37-38:

<http://www.decc.gov.uk/assets/decc/Consultations/warm-home-discount/1307-gov-response-warm-homes-disc-cons.pdf>;

CERT Extension Consultation Response, p. 32- 34:

<http://www.decc.gov.uk/assets/decc/consultations/certextextension/certextgovresponse.pdf>

appropriate, but owing to competition in the market, it is likely that costs would be passed on in the way that they are levied or risk losing customers to competitors¹²³.

However, there is a lack of any real evidence as to the companies' actual behaviour when faced with the CERT and CESP obligations. **DECC are keen to obtain any further evidence on the question of companies' actual pricing behaviour.** In the following discussion, it is assumed that energy companies pass costs on in the way that they are levied.

Despite the current uncertainty, the following 4 options for allocation have been considered :

- **Option 1: Set the ECO on the basis of the number of customer accounts** – this is the historical approach to setting supplier obligations relating to energy efficiency and fuel poverty on the basis of customer accounts (the '*per customer account*' approach).
- **Option 2: Set the ECO on the basis of number of kWh of energy supplied** - for each kWh they supply, an energy supplier would be liable for a greater share of the obligation. As such, it is assumed that the cost of meeting the obligation would be passed on to consumers on a per kWh supplied basis (the '*per kWh*' approach). Higher energy users would pay a greater proportion of the pass through costs than lower users.
- **Option 3: Set the ECO on the basis of a hybrid of customer accounts and number of kWh of energy supplied** – participating suppliers' respective shares of the obligation would be based on number of kWhs supplied, but they would also be required to provide each customer account they hold with a credit first. This would place a greater weight on kWh of energy consumed at higher quantities, and would significantly limit the contribution paid by low energy users – particularly where the cost of low usage is covered by the credit. This approach is essentially the same as the 'per kWh' approach, but with a greater skew towards high energy users paying a greater proportion of the costs of an obligation (the '*Hybrid*' approach).
- **Option 4: Set the ECO on the basis of the number of kWh of gas supplied** - participating suppliers' respective shares of the obligation would be based on the number of kWhs of gas supplied only, and electricity accounts would not be taken into account, therefore spreading the cost of an obligation among only gas consumers. This would mean that those households using more expensive heating fuels (electricity, oil, LPG etc), would not be required to contribute to the obligation (the '*gas kWh*' approach).

Each of the 4 options has been assessed against a number of criteria: incentives to conserve energy, impact on fuel poverty, distributional impact of cost pass-through and administrative complexity. This analysis is set out in Annex H– Analysis of the implications of allocation: customer accounts versus an alternative approach.

Our analysis suggests – if we do assume allocation affects the way in which costs are passed on by energy companies - that a kWh-based approach would have a more desirable distribution of the costs of the obligation for the majority of households, with results suggesting that the 'Hybrid'

¹²³ Suppose that an obligation allocated on the basis of kWh of energy sold but a particular energy supplier instead passed on costs through a fixed charge on each customer account. This would mean that low-use customers would be charged more than the marginal cost of supplying energy to them and it would be possible for other energy suppliers to attract these customers by charging a lower price (whilst still covering their marginal costs).

approach is the most progressive of these approaches. These results are also true for average low income, high use households and those households that use electricity for heating and non-heating purposes. Opting for a kWh-based approach would disproportionately affect the relatively small number of low income households with very high energy usage.

However, of the approaches analysed, no single method of setting the obligation performs strongly against all the objectives. There therefore appears to be no single approach that is clearly the most desirable option. However, DECC are keen to seek evidence of energy company behaviour and advice on the implications of these different approaches.

10 Wider impacts

This section looks at the other impacts that are likely to occur as a result of taking up the Green Deal.

10.1 Health impacts

Living in cold conditions is linked to a number of detrimental physical and mental health impacts. A number of studies have concluded that inadequate levels of heating and other factors associated with fuel poverty are linked, in particular, to respiratory problems in children and an increased risk of mortality in older adults.¹²⁴ Other sources also highlight the risk of respiratory problems among adults and the potential development of influenza, pneumonia and asthma, alongside an increased risk of arthritis and accidents at home linked to poorly heated housing.¹²⁵

However, there has also been some recent discussion suggesting that the reduction in permeability in homes could lead to higher levels of toxic particles in the home.¹²⁶ This could have long term negative health impacts, for example lung cancer (radon), stroke or heart attacks (second hand smoke) and respiratory illness for children (mould). This potential impact on health as a result of energy efficiency measures has had limited discussion to date, but the current evidence suggests that and the majority of the impact can be resolved by ensuring that alternative forms of insulation are installed to create the appropriate level of permeability in the home.

All options considered in this impact assessment are expected to have health benefits. Those options with specific targeting of measures at low income and vulnerable groups would however be expected to have a greater health impact, as these groups are more likely to under-heat their homes and/or be more susceptible to the negative health consequences of living in low temperatures.. The greater ability of households to adequately heat their homes, while also reducing the amount of energy needed to do so, is likely to result in a number of households increasing the average temperature in their homes. It is expected that this would reduce the risk of the health impacts of living in cold homes and poor housing conditions.

Estimating the precise health impact of installing heating and insulation measures is problematic due to uncertainties around which households will receive a measure(s), how their use of energy will change as a result, and the condition of the property they live in. As a result, there is currently no set methodology for estimating and attributing health impacts of the installation of heating and energy efficiency measures, and any resulting increase in indoor temperatures. Consequently, it has not been possible to estimate the impact of the options considered in this IA quantitatively at present.

DECC is currently developing a model which aims to estimate the mortality, morbidity and mental health impacts associated with heating and energy efficiency measures. This area of analysis is still in development and therefore it has not been possible to generate estimates of health impacts of the options at this stage.

¹²⁴ For example, Green, G. and Gilbertson, J. (2008). *Warm Front Better Health: Health Impact Evaluation of the Warm Front Scheme*. CRESR; Wilkinson, P. et al (2001). *Cold Comfort: the social and environmental determinants of excess winter deaths in England, 1986-96*. Policy Press; The Eurowinter Group (1997). Cold exposure and winter mortality from ischaemic heart disease, cerebrovascular disease, respiratory disease, and all causes in warm and cold regions of Europe. *The Lancet*, 349, 1341-1346.

¹²⁵ Liddell, C. and Morris, C. (2010). Fuel Poverty and Human Health: A Review of Recent Evidence'. *Energy Policy*, 38(6), 2987-2997.

¹²⁶ Wilkinson, P. et al (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: household energy. *The Lancet*, 374(9705), 1917-1929.

10.2 Rebound effect

Energy efficiency measures reduce the cost of heating and lighting properties to their desired levels. This reduction in costs has been shown in the past to produce a rebound effect, in which households take comfort benefits in the form of higher temperature levels and leaving lights on for longer. For households outside of the priority group, a reduction of 15% of a household's savings is made in the modelling for this rebound effect. For priority group households a reduction of 40% is made.¹²⁷ No adjustment is made in the non-domestic sector for the rebound effect, as there is no available evidence of the effect.

There is also a possibility of an indirect rebound effect. Improved energy efficiency could reduce expenditures on energy and thereby increase resources expended on other sectors of the economy. This spending could indirectly increase energy use and emissions. There would be increased spending in other sectors if households were, on average, made better off by the policies. Over the timeline for which the policies are active (2012 to 2022), ECO costs, plus the aggregate level of Green Deal charges, are estimated to be greater than the energy bill savings. Over the longer term there will be a net reduction in spending on energy and energy efficiency measures and there could therefore be an indirect rebound effect. A shift of spending from energy to other sectors would change the sectoral growth rates. The indirect rebound effect would be picked up through the growth rates used for the DECC energy and emissions model.

Estimates for the indirect rebound effect note that this can be substantial.¹²⁸ However, it has been estimated that for the UK's climate change policy as a whole, the policies carry a small net cost. If this estimate is correct, then overall the UK's climate change policy would experience the opposite of an indirect rebound effect with the possibility that overall emissions reductions could be increased by second round macroeconomic effects. The Committee on Climate Change noted in their report "Building a Low Carbon Economy" that^[1]:

"Our scenarios do not account for 'indirect' or 'macroeconomic' rebound effects due to increased income that might follow energy efficiency improvement. Given however that we project a small decrease in GDP overall as a result of our carbon budgets, and an increase in energy costs, it is likely that any macroeconomic rebound effect will be insignificant or even reinforce abatement measures."

¹²⁷ A survey of academic research on the scale of the direct rebound effect suggests a range between 10% and 30%. See Jenkins, J., Nordhaus, T., & Shelendberger, M: *Energy Emergence: Rebound & Backfire As Emergent Phenomena*. Breakthrough Institute, 2011. Research focusing on heating demand of low income households in the UK found a direct rebound of 30%. See Milne, G., & Boardman, B. (2000). Making cold homes warmer: the effect of energy efficiency improvements in low-income homes: A report to the Energy Action Grants Agency Charitable Trust. *Energy Policy*, 411-424.

¹²⁸ Although there is a consensus in academic literature that indirect rebound effects are significant, the question of their scale is not settled. A recent report commissioned by DEFRA found a total indirect rebound effect of 34% for household abatement actions. See Druckman: "Missing carbon reductions? Exploring rebound and backfire effects in UK households," *Energy Policy*, 3572-358, 2011

^[1] <http://www.theccc.org.uk/pdf/TSO-ClimateChange.pdf>

10.3 Sustainability

The idea of sustainability is for the current generation to live within its means, so that the well being of future generations is not negatively affected by its actions. A key aim of the Green Deal is to reduce energy consumption in order to meet the UK's Carbon Budgets, which set a ceiling on the amount of CO₂ emitted during each five-yearly budget period to 2050. The benefits of this should help address dangerous climate change, which affect future generations disproportionately.

Other sustainability benefits of the policy would be a reduction in the use of non-renewable inputs in the energy generation process and gas supply, and less water usage in the generation of steam for electricity generation. These benefits have not been quantified in this IA.

10.4 Cost to business/One In One Out (OIOO)

10.4.1 Introduction/Summary

The cost to business is defined as the direct incremental economic cost to business of complying with new regulation minus the direct incremental economic benefit to business which results from new regulation. Second order costs and benefits are not considered, thus the pass through of these costs to consumers is not considered. The OIOO calculation includes cost and benefits to be incurred by energy companies, Green Deal advisors, Green Deal installers, businesses that take out Green Deals and the costs imposed across various other businesses by the oversight body (see Table 19 for a list of these costs and benefits). The cost and benefits over the lifetime of the policy are annualised over the period of benefits to calculate the OIOO score.

The discussion below presents estimates of the direct impact of the Green Deal and the ECO. Initial estimates, based on option 2 (see section 7), suggest an EANCB (equivalent annual net cost to business) of £222m¹²⁹ relative to a zero baseline.

The Office of National Statistics (ONS) is responsible for decisions on whether the ECO should be classified as a regulation or as tax and spend. Should the ONS make a decision to classify the ECO as tax and spend then there would be a *negative* EANCB of £16m¹³⁰ (i.e. a benefit to business). These figures represent the standalone EANCB of Green Deal and the ECO against a baseline of no existing policies.

10.4.2 Life time costs and benefits to business

10.4.2.1 Green Deal

Direct impacts occur for energy companies, Green Deal advisors, Green Deal installers, Manufacturers of Green Deal Measures and businesses taking out Green Deals. There would also be significant benefits to Green Deal Providers, though these are difficult to quantify at the current time. The consultation will be used to seek further evidence. Green Deal providers are not included in this calculation for the time being. This is a conservative omission as the Green Deal provider market will be newly created and voluntary to enter. Firms would only enter the market if they perceived there would be a net positive benefit from entering.

¹²⁹ These costs represent the combined impact of the Green Deal and ECO annualised over 51 years. EANCB would be approximately 3 times larger if costs were annualised over 10 years.

¹³⁰ For the purposes of OIOO this counts as a zero 'In' as only benefits from deregulation count as a 'Out'

10.4.2.1.1 Energy Companies

Energy Companies would incur costs for collection and payment systems and ongoing costs of facilitating Green deal. These Present Values of these are included in Table 19 Costs to business for OIOO - £m. The assumptions behind these can be found in section 19.1.5.6 “Collection of the Green Deal charge” and the costs are summarised in section 8.

Energy Companies would also incur administration costs for the Affordable Warmth target. These are estimated in two components: a) a fixed time cost for participating energy suppliers associated with managing and administering the installation of measures to achieve the target; and b) a variable cost associated with handling phone calls from householders identifying themselves as eligible for assistance under the target.

The fixed time cost component is calculated by taking an estimated profile of staff members required to administer achievement of each participating supplier’s target, and applying indicative salary rates to each member in order to estimate the opportunity cost of their time. On average this is equivalent to just under 4 Full Time Equivalents (FTEs) per participating supplier, per year of the scheme, valued at a weighted average salary cost of circa £38,000 per FTE. This results in an estimated annual time cost across all participating suppliers of £910,000 per year. In the first year of the scheme only, additional setup time costs are also calculated, in the same way, by taking an estimated 1 FTE and valuing the time with a weighted average value of circa £70,000 per FTE. This results in an estimated one-off setup cost across all participating suppliers of £385,000. The present value of the fixed element is £8.2m

The variable cost associated with phone calls is estimated by applying estimated time and resource costs of processing a phone call to the total number of measures that are estimated to be installed in each year of the scheme under the Affordable Warmth target. 30% of these phone calls are also assumed to require a follow up call. The capital costs of running a call centre are assumed to already have been incurred, and are therefore sunk costs that are not attributable to the ECO. Under the central working option, around 110,000 households are estimated to have measures installed on average in each year of the scheme (adjusted to account for some households potentially receiving more than one measure). Applying a 30% uplift results in an estimated 143,000 phone calls per year, which are then valued using an average cost of £7 per phone call.¹³¹ This results in an average annual cost of handling phone calls of around £1m across all participating suppliers per year giving a present value of £8.7m.

Under the Green Deal, in the event of default, the finance provider would bear the cost of outstanding payments (which would be worked into their risk assessment and balance sheets when valuing the package). Energy companies would bear the cost of chasing missed payments. This is estimated to equal £88m. Further to this, energy companies would be required to supply the relevant default history to finance providers, estimated to cost £32.5m (summing to £120.5m). These are consistent with the costs used in the Primary legislation Green Deal Impact Assessment, however costs are anecdotal and were a rough estimate given by one energy company. The consultation will be used to seek further evidence.

There is potentially a large cost associated with meeting the ECO target. This is described below.

¹³¹ Cost estimate based on previous experience of schemes targeted at low income and vulnerable households.

10.4.2.1.2 Green Deal advisors

Green Deal advisors would only enter the market should they stand to gain from doing so. The evidence to calculate these benefits is not currently available. The consultation will be used to seek further evidence. Workers most likely to take up these roles are those that are already employed as EPC assessors. The additional cost to business required by the step change in training and accreditation required as a result of the Green Deal is estimated to be £4.6m. For further details on these costs see section 19.1.4.1 “Certifying Green Deal advisors”.

10.4.2.1.3 Measure Manufacturers

Costs to manufacturers are estimated at £6.7m for product testing, £0.3m for Spot testing of compliance and £5m for registration of products. For further details see see 19.1.4.3 “product assurance” and the summary of costs associated with the Green Deal mechanism in section 8.

10.4.2.1.4 Green Deal installers

The main cost Green Deal installers will be exposed to as a result of Green Deal is the cost of accreditation. This is estimated at an NPV of £1.4m. For further details on this cost see 19.1.4.4 “Accredit Installers” in “Customer Protection”.

10.4.2.1.5 Businesses that take out Green Deals

Benefits for businesses that take out Green Deals are calculated using the value of the energy savings and savings from avoided EU ETS purchases. Costs include installation costs, additional costs, assessment costs and finance costs. In option 2 this is £3.4bn. A full breakdown of the non-domestic green deal costs and benefits is provided in Table 18 (below).

Table 18 - Costs and Benefits for businesses in non domestic Green Deal

	cost/benefit	£m
Costs	Installation costs	1221
	Additional costs	244
	Assessment costs	133
	Finance costs	244
	Total costs (£m)	1843
Benefits	Energy savings (using private energy prices)	4288
	Lifetime EU ETS savings	617
	Total benefits (£m)	4906
Total	Net Present Value	3398

10.4.2.1.6 Oversight

The cost of oversight is to be split across some 35 installer certification bodies, 15 assessor certification bodies and Green Deal provider companies and is estimated at a present value cost of £58m (see section 27319.1.5 “Institutional Arrangements”) and the summary table in section 8.

10.4.2.2 Energy Company Obligation target (ECO)

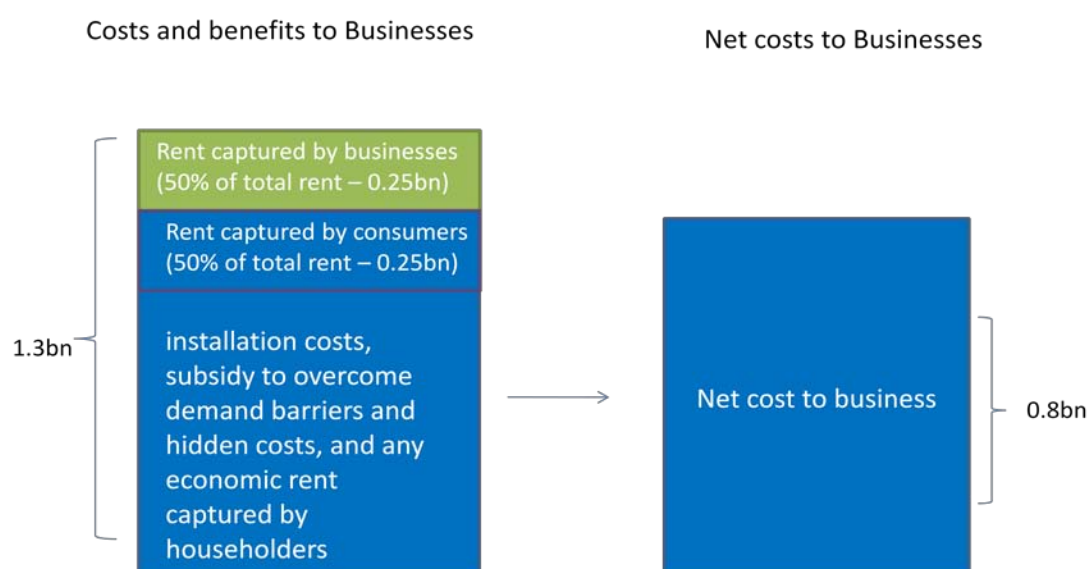
The calculation for the ECO is heavily reliant on its classification. As a regulation the direct costs fall to energy companies. Although there are a range of benefits that fall to Green Deal providers, Installers and energy companies, and it is expected that energy companies would pass through the

cost of meeting the obligation onto domestic energy bills these are considered to be of second order and are not included in the calculations.

Assuming the ECO is a regulation, the costs to business will be the payments that they make to householders to drive demand for installation. This will include contribution to the installation costs, subsidy to overcome demand barriers and hidden costs, and any economic rent captured by householders from the market for ECO points (see section 9).

Any benefits to business from economic rents captured in the market for ECO points are considered second order as they would not be realised until the suppliers have passed through the costs of meeting the obligation onto energy bills. Any economic rent captured by an installer in the interim will have a corresponding cost to an energy company and will not represent a net benefit to business. It would only be a transfer between businesses. The direct net cost to business of ECO can be seen in Figure 35.

Figure 35 Direct net annual costs to business of ECO



The subsidy towards the installation costs, subsidy to overcome demand barriers and hidden costs paid by businesses as calculated by the GDHM is on average £807m per annum giving a policy lifetime PV cost of £5.9bn.

It is estimated, based on the marginal cost of generating ECO points, that the present value of the pass through cost of the ECO onto consumer bills would be £11.2bn. The difference of £5.3bn represents the amount of economic rent in the market for ECO points. In the absence of evidence over the proportion of rent that would be captured by householders or by installers it is assumed that they each capture 50%. Rent captured by householders increases the costs to installers of driving demand for measures, increasing the total cost to business of meeting the obligation by £2.6bn.

The total cost to business of meeting the obligation is the sum of £5.9bn and £2.6bn, or £8.5bn.

10.4.3 Calculation of the 'IN'

In accordance with OIOO methodology, the costs and benefits are annualised over the period of benefits (51 years¹³²), this gives an EANCB (equivalent annual cost to business) of £222m if ECO is classified as a regulation.

Work is currently being carried out across Whitehall to further develop the assumptions used in the OIOO calculation and any agreed changes will be incorporated into the final impact assessment for Green Deal and ECO. It is possible that the analysis will be updated to annualise the costs to business over the period they are borne by businesses. This would reduce the period used for annualising the ECO from 51 years to 10 years which would increase the calculation of the EANCB by approximately 3 times to around £0.7bn. It is also possible that separate calculations will be presented for the Green Deal and ECO given the differing nature of the impact they have on business.

10.4.3.1 if ECO is classified as a tax

The current energy company obligations (CERT and CESP) are classified as business regulations for statistical purposes. We understand the Office of National Statistics (ONS) - who are responsible for issues of classification – are now considering whether there is a case for re-classifying CERT as a levy and thus an imputed tax. If the ONS were to decide to re-classify CERT, this would be very likely to set a precedent for the eventual classification of ECO. It is therefore possible that ECO will not be treated as a business regulation, and would therefore not be subject to the One In One Out regime. However, for the purposes of the discussion that follows we treat ECO as a business regulation.

If ECO is classified as a levy, then the cost of meeting the ECO target is not included in the OIOO calculation. The benefit of the NPV to businesses from the non-domestic Green Deal then outweighs the remaining regulatory costs to business resulting in a *negative* EANCB of £16m (i.e. a benefit to businesses).

Table 19 Costs to business for OIOO - £m

		Option 1		Option 2		Option 3	
		PV	EANCB	PV	EANCB	PV	EANCB
Costs							
Energy Companies	ECO target	0	0	5926	238	7840	315
	Energy company collection and payment systems	18		18	1	18	1
	Rent captured by consumers	0	0.00	2638	106	2877	116
	Energy companies ongoing costs of facilitating Green deal	60	2.42	128	5.13	130	5.23
	AW Admin costs	0.0	0.00	16.9	0.33	17.7	0.71
	Cost of default	120.5	4.84	120.5	4.84	120.5	4.84
Manufactures	Manufacturers product testing	6.7	0.27	6.7	0.27	6.7	0.27
	Spot testing of	0.3	0.01	0.3	0.01	0.3	0.01

¹³² This is the length of the policy (10 years) plus the live time of the longest lasting measure (CWI at 42 years)

	compliance						
	Manufacturers - registration of products	5.0	0.20	5.0	0.20	5.0	0.20
Green Deal Advisors	Accreditation of advisers	1.4	0.06	3.3	0.13	3.4	0.14
	Adviser training	0.6	0.02	1.3	0.05	1.3	0.05
GD installers	Installers - acquiring certificates	1.4	0.06	1.4	0.06	1.4	0.06
Multiple businesses	Oversight charge	58	2.33	58	2.33	58	2.33
Benefits							
Businesses that take up Green Deals	Non-Dom Green Deal NPV	3398	137	3398	137	3398	137
Total							
	Total costs	272	10	8,923	358	11,079	445
	Total benefits	3,398	137	3,398	137	3,398	137
	Net cost to Business	-3,126	-126	5,525	222	7,681	309
	Total In if ECO is regulation	-3,126	-126	5,525	222	7,681	309
	Total In if ECO is tax	-3,126	-126	-400	-16	-158	-6

10.4.4 Enforcement costs

Enforcement costs are considered to comprise the oversight charge and the costs of accreditation. These are annualised to result in an estimated enforcement cost of £6.28m per year.

The impact on microbusiness has not been included in this assessment, however we will look at the impact on and take-up by microbusiness of the Green Deal for the final assessment.

11 Competition Impact Assessment

11.1 Competition Assessment

The Green Deal is a market mechanism in which competition would play a central role. Competition between Green Deal providers would drive down operational costs and lead to lower prices for consumers. Competition between product manufacturers and installers would drive down costs of Green Deal measures and encourage innovation in the market. Where the Green Deal legislation introduces restrictions on suppliers (such as the accreditation of advisors, installers and products) it is to ensure that competition does not lead to reductions in quality that would undermine consumer confidence in the sector.

By passing this legislation Government is creating new opportunities to become a Green Deal provider – an organisation that provides finance and coordinates the package of measures. There is no existing market that packages efficiency measures along with finance tied to electricity bills, although standard consumer finance packaged with efficiency measures is already available in the market. A number of these existing markets could be affected by the creation of the legislation and consequently the impact on these needs to be assessed.

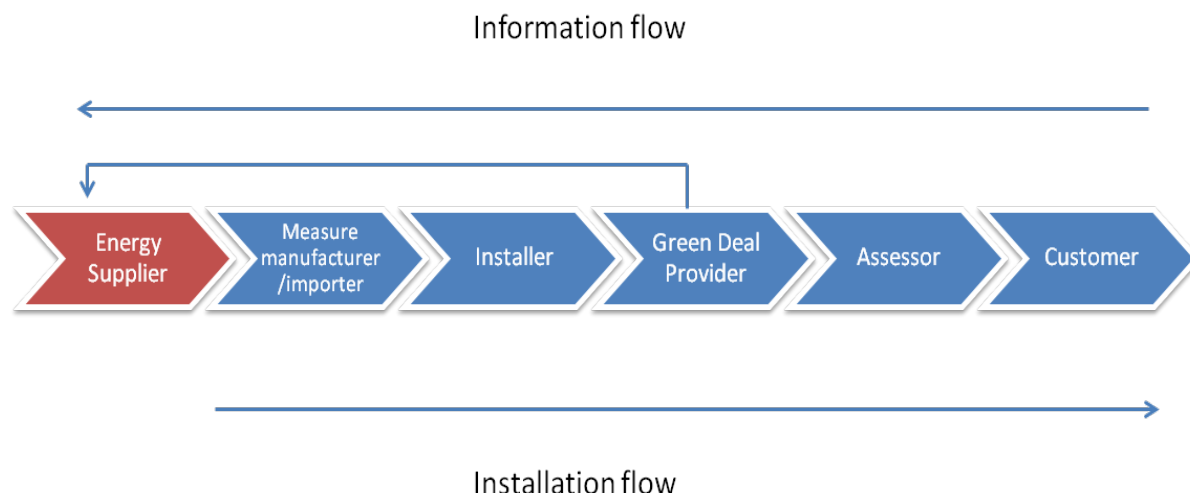
Many of the markets that would be most affected by the Green Deal legislation are already highly competitive, typically with low entry barriers and low levels of concentration.¹³³ The Green Deal would significantly increase the size of the market and encourage a broader range of suppliers to compete for customers. The Green Deal legislation has been developed with the specific objective of promoting competition in the sector. Where potential negative impacts on competition have been identified, powers have been taken to prevent them.

The existing markets within the Green Deal supply chain that could potentially be directly affected by the legislation are the provision of home and non-domestic energy efficiency assessments; the installation of energy efficiency measures; and the manufacture and supply of energy efficient products. Markets outside the direct supply chain which could also be affected by the Green Deal legislation include: energy supply; the supply of finance products; and the Energy Service Contract and Energy Performance Contract markets in the non-domestic market.

The Office of Fair Trading guidance lists four key questions to assess whether policies have an impact on competition. Below is an assessment of these questions applied to the Green Deal.

¹³³ The low entry barriers in the insulation manufacturing and supply market is illustrated by the recent entry of a number of foreign firms, including BASF, Parex and Dow. GHK, *In-depth Technology Innovation Assessment for Solid Wall Insulation*, 2010.

Figure 36: Potential Green Deal supply chain



11.2 Directly limit the number or range of suppliers

The Green Deal legislation would affect the range of suppliers competing in the market through the accreditation process, which is designed to protect consumers from 'sharp' practice or ineffective products and installations. The legislation would prevent installers and advisors without Green Deal accreditation from competing in the Green Deal market. It would not, however, directly limit how many suppliers can gain accreditation.

11.2.1 Assessment markets

The accreditation of advisors would give customers confidence in the Green Deal. There is currently a buoyant market for assessors of domestic buildings created through the implementation of the Energy Performance Certificate. The Green Deal would draw on the existing qualifications necessary to produce home energy efficiency assessments and therefore should not directly limit the number of suppliers operating in this market. In the non-domestic sector assessments are generally less generic. The regulatory cost of the new accreditation requirements is approximately.

Overcoming adverse selection problems in the market is a key reason the industry set up the current self-regulation system of certification bodies.¹³⁴ The Green Deal accreditation would not substantially extend the level of accreditation already developed by the industry, but would consolidate the requirements and standardise accreditation, which would strengthen consumer confidence in the sector. There is a risk that allowing existing industry participants to set the accreditation standards could place potential new entrants at a competitive disadvantage. The process for setting the assessment requirements for Green Deal advisors would need to be structured to prevent industry participants having undue influence to the detriment of new entrants.

Advisors would only be able to participate in the Green Deal section of the market if they are accredited. Although this would limit who can supply the market, there is still likely to be a sufficient number of companies for it to remain competitive. Participating in the Green Deal market is

¹³⁴ Accreditation gives customers confidence in the quality of the assessor. Without accreditation, a lack of information results in customers under estimating the quality of an assessment, and therefore its value. Accreditation allows skilled assessors to demonstrate their competence to potential customers.

voluntary, and the ability of non-Green Deal advisors and installers to also compete for customers would maintain competitive pressure on suppliers.

11.2.2 Installer market

A number of installer certification bodies already exist. These have been created by the industry as a form of self regulation to overcome adverse selection problems in the market. In addition, DCLG has set up a number of Competent Person's Schemes which set more rigorous standards for those trades whose work require Building Regulation approvals. The CPS is operated by many of the existing certification bodies and is becoming an industry norm in terms of setting minimum standards across the sector. The Green Deal installer accreditation would build on the existing certification processes and is not expected to significantly increase the requirements already common in the market. Although some installers already operating in the market may not meet the requirements of the Green Deal accreditation, there is likely to still be an adequate number of suppliers for it to remain competitive. Installers who do not currently meet the standard and wish to enter the Green Deal market would be able to undertake training to bring their skills up to required standard if they so choose. Otherwise they would be able to continue trading as usual outside the Green Deal. As with the accreditation of advisors, the process for setting the assessment requirements for Green Deal installers would need to be structured to prevent industry participants having undue influence to the detriment of new entrants.

11.2.3 Product market

In order for insulation products to be sold as part of a Green Deal package they would need to meet the accreditation requirements. Many of these requirements are already set out in building regulations or EU legislation.

Suppliers of energy efficiency products are already familiar with the legal requirements products have to meet under existing regulations, which the Green Deal would aim to consolidate. It is possible that the additional requirements introduced would exclude some existing products from the market, preventing their manufacturers from competing for Green Deal customers. However, the additional requirements of the Green Deal accreditation are not expected to significantly reduce the number of suppliers, and the market would still include sufficient firms to remain competitive.

The legislation would also set out which products would be eligible for funding under the ECO. Maximising the cost effectiveness of the ECO carbon target subsidies requires support to be targeted at specific measures. In many cases the measures supported by the ECO would be unlikely to be taken up by Green Deal customers without some level of subsidy. Not targeting the ECO support at these measures would significant increase the costs of meeting the ECO target. This targeting of the subsidy is likely to have a distortionary impact on the market, as products that do not receive support would be less attractive to Green Deal customers. However, there is likely to be a sufficient number of suppliers of each type of measure for the market to remain competitive.

11.2.4 Energy supply market

Under the Green Deal, smaller energy suppliers would be able to choose whether to opt into the repayment collection system. This gives small firms the opportunity to avoid the costs of the system, which might place them at a competitive disadvantage. However, those that choose to opt out

would be unable to supply energy to Green Deal customers. See section 19.1.5.9 for more details on exceptions for small energy suppliers.

The fact that firms would be able to choose whether to be part of the Green Deal system means competition in the energy market is unlikely to be affected. Firms may be able to implement partnership arrangements with larger suppliers to handle their billing arrangements. Some firms may even choose to specialise in providing energy to one section of the market (Green Deal or non-Green deal customers).

11.2.5 Green Deal Providers in social housing associations

Under the proposed regulations, tenants would be required to secure consent from the property owner before taking out a Green Deal. Social housing associations could choose to become Green Deal Providers, in which case they would have a monopoly over their tenants' access to the Green Deal. The inability of these consumers to shop around for different Green Deal providers may result in them paying higher prices. Housing associations are competing in the rented property market and the energy efficiency of their buildings is one of a number of factors that tenants take into account when choosing a property. The level of competition in the social housing market will therefore determine the extent to which housing associations will be able to raise prices.

11.3 Indirectly limit the number or range of suppliers

The Green Deal could indirectly limit the number of suppliers if its costs affect some suppliers more than others. Higher fixed costs relative to variable costs increase economies of scale in the market, which places smaller firms at a disadvantage.

11.3.1 Green Deal Providers

The Green Deal legislation would create new opportunities for innovative packaging of energy efficiency measures in the property market. The Green Deal providers would be the counterparty to the Green Deal plan and would be responsible for organising the finance package. They would also be liable for warrantees, defaults and redress payments. It would be for the market to determine which organisations become providers and how they are structured and operate. The regulations would set out a number of requirements that Green Deal providers would need to meet. These would in effect determine the types of organisations that become providers, and how competitive the provider market is.

The overriding constraint on an organisation becoming a Green Deal provider is the ability to access and structure long term finance to fund the installation of measures, or to hold Green Deal finance plans on their balance sheet.

There a number of other requirements on Green Deal providers, the overhead costs of which would increase the economies of scale in the market and could place smaller firms at a competitive disadvantage. These include:

- Compliance with the Consumer Credit Act (CCA): Green Deal providers would need to meet the requirements of the CCA which include maintaining a detailed record of credit provided.
- Warrantee liability: Green Deal providers would be responsible for honouring Green Deal product and installation warrantees.

- Redress / complaints procedure: Green Deal providers would be responsible for resolving their customers' reasonable grievances.
- Failure to disclose: Green Deal providers may be required to write off plans in cases where properties are sold without the seller disclosing the existence of the Green Deal plan. Green Deal providers would be entitled to seek compensation from the seller.
- Default liability: Green Deal providers would be liable for Green Deal customers defaulting.
- Consents: Green Deal providers would be required to record the bill payer and property owner's consent to the attachment of a Green Deal charge to the meter, and to maintain records of written consents where necessary

These requirements would involve a certain level of fixed costs, which would reduce the ability of small suppliers to compete in the market place, and lead to a more concentrated market. However, the most significant constraint on the number of Green Deal providers is likely to be the need to access Green Deal finance. Firms large enough to do this would not be significantly affected by the other requirements on Green Deal providers.

The ECO would give energy suppliers control over the subsidies needed to meet their ECO targets. Many energy companies are expected to become Green Deal providers and use a combination of Green Deal finance and ECO support to meet the carbon reduction targets. Given that a high proportion of Green Deal plans are expected to require some level of ECO, an inability to access the ECO funding streams would place non-energy company Green Deal providers at a significant competitive disadvantage. Over the long run the policy could lead to dominant firms not delivering what consumers want. To ensure that the Green Deal provider market is open to a wide range of suppliers, energy companies would be required to make a fixed proportion of the ECO funding available to all Green Deal providers. This could be done through a number of mechanisms, such as a brokerage. When designing this mechanism, it will be important to mitigate the risk that the funding system itself damages competition in the market.

11.3.2 Assessment and installer markets

Green Deal providers would be free to develop their own business models. As the primary contact for customers, they would be responsible for ensuring energy efficiency products are installed in the property. They may develop the capacity to do this themselves or subcontract to a third party. A range of organisations could become Green Deal providers and develop different relationships with the installer market. Some installation trade bodies could become 'passive' Green Deal providers, providing the financing function for their members, who could sell Green Deal plans directly to customers. Provided that the Green Deal provider market is competitive, vertical integration between Green Deal providers and installers is unlikely to affect competition in the installation market.

Green Deal providers may also choose to employ energy advisors to carry out Green Deal assessments for potential customers. Accredited advisors would be required to inform customers if they work for a Green Deal provider when making recommendations, to prevent conflicts of interest. Customers would also be free to use a Green Deal assessment to purchase a Green Deal package from any provider. These requirements would maintain competitive pressure in the market, provided the Green Deal provider market is also competitive.

11.3.3 Energy suppliers

The costs to energy suppliers of setting up and running the repayment collection process are likely to affect some suppliers more than others. The costs of setting up the system would depend on a firm's IT replacement cycle, meaning some firms would face larger costs than others. For large energy companies, setup costs are small relative to their balance sheet, so these variations are unlikely to have an impact on competition.

The cost of setting up and running the repayment collection system is likely to be proportionally larger for small energy companies, which would place them at a competitive disadvantage in the energy market. However, firms with a small number of customers would be able to opt out of the system and avoid the costs. The costs of meeting the ECO are also likely to be proportionally larger for small energy companies and so firms with a small number of customer fewer than would also be exempt from the obligation. See section 9.1.6 or more details on the exemptions for small firms.

11.3.4 Home improvement finance

Green Deal finance may be offered at lower interest rates than most consumer credit. The collection of repayments via energy bills would result in lower default rates, and therefore lower cost of capital, than other personal loans. Existing providers of credit for insulation work would therefore be at a competitive disadvantage. However, the net benefits to society of the Green Deal would more than outweigh the costs of this reduction in business for consumer credit providers, who would still be able to provide credit for home improvements not covered by Green Deal finance.

11.3.5 Energy Service Contract (ESCs) and Energy Performance Contract (EPCs) suppliers

Green Deal providers would be providing some of the measures that are currently supplied by Energy Service Companies and Energy Performance Contract suppliers. The benefits to Green Deal providers of the Green Deal accreditation schemes and their ability to attach repayment plans to electricity meters could place them at a competitive advantage to ESCs and EPCs. However, these firms would be able to become Green Deal providers themselves and would continue to provide a range of energy management services not available from Green Deal providers. Commercial organisations are therefore likely to continue to see the benefits of employing ESC and EPC to manage their energy use.

11.4 Limit the ability of suppliers to compete

Some aspect of the Green Deal legislation would raise the costs of innovation. and so reduce their ability to compete. However the net effect on innovation, and competition, in the market is expected to be positive.

11.4.1 Energy efficient product market

Products would be required to meet specific criteria in order to be included in Green Deal packages. These criteria would be based on existing regulations, but would include some extra requirements. In addition, the maximum amount that Green Deal providers would be able to recover from energy bills would be based on a predetermined level of energy saving for each product type (for a given property type).

New products that deliver higher energy savings would need to go through an assessment process before their superior quality can be accounted for in repayment calculations. The product assessment procedure would include a process for fast tracking new products to reduce costs to suppliers. New products that do not fall into the broad categories of measures used in the Standard Assessment Procedure (SAP) would have to go through BREs testing process. This can cost around £25,000-£30,000 and take 6-12 months. New SWI systems are most likely to need to go through this process.

The need for products to undergo assessment to gain the benefits of better performance, and the need for new measures to be included in the SAP, would increase the costs of bringing new products to market. Higher innovation costs would reduce competitive pressure in the market. However, overall the Green Deal would encourage innovation in the sector by increasing the size of the market.

11.5 Reduce suppliers' incentives to compete vigorously

The Green Deal legislation would not reduce suppliers' incentive to compete.

11.5.1 Energy suppliers

Energy companies are likely to be able to pass on the costs of the ECO to energy consumers. An energy company with higher prices than its rivals is likely to lose market share as customers switch to other suppliers. Energy companies therefore have a strong incentive to keep the costs of their obligations as low as possible in order to minimise the impact on energy prices.

Collection of Green Deal repayments through energy bills would require an additional process to be in place to manage a consumer switching from one supplier to another. This would be done automatically by the energy suppliers concerned using the customer switching processes already in place. As the customer would not be required to take any additional action or incur any additional costs, the existence of a Green Deal plan is not expected to affect their ability or incentive to switch energy supplier.

11.5.2 Green Deal Provider market

The information energy companies hold about their customer may give them a competitive advantage in the provision of Green Deal plans. They may be able to identify customers at a lower cost to rivals and have a direct 'energy relationship' with many households. The legislation therefore provides powers for generic promotion of the Green Deal by all energy companies, which should reduce this competitive advantage. In addition, other Green Deal providers are expected to develop customer acquisition processes, such as cross-selling Green Deal plans with other renovation work.

11.6 Small Firms Impact Assessment

Guidance from the Department for Business, Innovation and Skills stipulates that an impact assessment should include an assessment of impacts on small businesses.

The energy efficiency sector includes a number of small firms which the Green Deal legislation would affect. As the Green Deal is likely to significantly increase the size of the market for energy efficiency products, creating new business opportunities, it also has the potential to benefit small businesses.

As insulating hard to treat properties becomes increasingly important to meeting carbon targets, innovation by small firms would be necessary to ensure costs remain low.¹³⁵ Given the importance of small businesses to the sector, the Green Deal legislation has been developed in a way that would minimise the regulatory burden on these firms. However, where it is more cost effective for Green Deal providers or energy companies to vertically integrate into the insulation or assessment markets, this is likely to reduce the number small firms. Whilst this should result in lower costs overall, there could also be detrimental impacts on the market, due to a lack of competition, variety and thus potential innovation or cost savings associated with small business competition.

One possible adverse impact on small firms in the installation market is the control of ECO funding by large energy companies. Evidence suggests that some of the large energy companies are tending to create their own installation organisations by either buying up small installation firms or training up their own staff. If the major energy companies had sole access to the ECO support, they may choose to use this to increase their insulation market share at the expense of smaller providers. To ensure that the ECO does not lead to large energy companies dominating the Green Deal market, an 'ECO point' trading system would be set up. This would provide independent Green Deal providers with access to ECO funding, and ensure that small firms can continue to supply the market.

Green Deal providers would be free to choose their own organisational structure. Some may choose to subcontract assessment and installation work to smaller firms, where these are able to provide the relevant services at competitive prices. Small firms working in the insulation market may also choose to form groups large enough to access Green Deal finance, possibly using their respective trade bodies as 'passive' Green Deal providers.

The accreditation of installers and advisors has been designed to reduce the costs to individual firms, working within existing frameworks, in part due to concerns that excessive additional administrative burdens could fall disproportionately on smaller business. Accreditation would be of existing certification bodies, which would in turn ensure their members meet the required standards. The requirements of Green Deal accreditation are not expected to be substantially higher than standards already common in the market. The main addition is the accreditation of certification bodies to ensure existing standards are being consistently met. This should help smaller firms by ensuring a level playing field in terms of standards, training and levels of customer assurance, although there is like to be a small compliance costs. Full exemption of small firms from accreditation would increase the risk of poor quality work damaging consumer confidence in the sector, and could result in the policy failing to achieve its objectives. Policy development has taken into account the lessons learned from the Australian scheme, which suffered from poor quality installations.

The costs of meeting the ECO obligation, and of setting up and administering the Green Deal repayment system are likely to be proportionately higher for small energy companies. For this reason, small energy companies have been given exemptions from the GD/ECO regulatory requirements. It is proposed that those with fewer than 250,000 customers would not be required to meet targets under the ECO and those with fewer than 250,000 customers would have the option

¹³⁵ An example of this innovation is of one firm in the UK now installing cavity wall insulation into high rise properties by abseiling, creating large cost savings (no scaffold is necessary).

of opting out of the repayment collection system, should they choose to. These exemptions would ensure that small firms are not placed at a competitive disadvantage in the energy market.

12 Equality Impact Assessment

The Equality Act came into force on 8 April 2010. It replaced nine major pieces of legislation and around 100 other instruments with a single Act. The Protected Characteristics now supersede and extend the previous equality “strands” and set out the grounds on which discrimination will be deemed unlawful. The protected characteristics are: age, disability, gender, gender-reassignment, marriage and civil partnerships, pregnancy and maternity, race, religion or belief and sexual orientation. The new Public Sector Equality Duty which incorporates all these characteristics came into effect in April 2011. This section sets out our assessment of the Green Deal and Energy Company Obligation policy against the protected characteristics, and outlines where changes have been made to ensure all opportunities to promote equality are taken.

Green Deal finance, whilst increasing the ability of the majority of people to access energy efficiency measures, would not be suitable for everyone. Vulnerable consumers and those on low-incomes, who tend to under-heat their homes, could see their net energy bill rise if they use savings from energy efficiency measures to keep their homes warmer. Green Deal finance on its own is also unlikely to be sufficient to cover all of the up-front costs of more complex measures, such as solid wall insulation, which can cost substantially more than cavity wall insulation (CWI). The key purpose of the Energy Company Obligation (ECO) would be to ensure that the types of individuals who are likely to fall into the categories above, or who would need to install more complex measures continue to have access to support for energy efficiency measures. ECO would not discriminate against any of the protected groups covered by the Act.

The ECO is focussed on two key groups: those in hard to treat properties, such as solid walled homes; and vulnerable and low-income consumers for whom Green Deal Finance might not be suitable and who lack the means to heat their homes to a reasonable level. To this end, the ECO has two separate targets – a Carbon Reduction target for hard to treat properties; and an Affordable Warmth target for the vulnerable and low-income. The analysis below assesses each of these targets against the protected characteristics.

12.1 Impact of Green Deal on protected groups

The Green Deal would be available to all householders provided they are connected to the electricity grid. The Green Deal would not discriminate against any of the protected groups covered by the Act. All Green Deal customers would have an assessment of their property carried out first in order to determine what energy efficiency measures are appropriate for them before any finance arrangements can be taken out. Customers will be free to use the Green Deal assessment and shop around for the best deal from a Green Deal provider.

12.1.1 Age

The Government is proposing to introduce a remote advice service to ensure that all potential Green Deal customers have access to a source of impartial advice, which is particularly important for older people. As adults aged 65 and over make up almost two-thirds of those individuals who have never accessed the Internet, it is proposed that remote advice service includes a helpline.

12.1.2 Religion or belief

If the Green Deal charge has interest added to payments then this could potentially have an impact on some religious groups, such as the Muslim community, who do not want to handle interest payments since it may be prohibited by their faith. However, the repayment structure for the Green Deal is for the market to configure within the constraints of the legislation, the proposed legislation does not require the payment of interest as part of the repayments. The flexibility built into the proposed legislation would allow Green Deal providers to develop products, and repayment structures, to suit the needs of different customers. If there is a market for this it is likely to include Sharia compliant products. Providing a Green Deal product in line with such principles might increase costs to Green Deal providers, which could be passed on to these, and other, customers.

There is no evidence that the remaining protected characteristics of gender reassignment, marriage and civil partnership, disability, race, pregnancy and maternity, gender and sexual orientation will be more or less likely to benefit from the Green Deal.

12.2 Impact of Affordable Warmth (AW) target on protected groups

The AW target would be focussed on the vulnerable and low-income and would have specific eligibility criteria. Its purpose would be to ensure help is available to those who most need assistance to reduce the cost of heating their homes, and to those who might not achieve significant energy savings and therefore have little or no Green Deal finance. Households that fall under the AW target (i.e. vulnerable low income households) would be able to receive measures such as cavity wall insulation and loft insulation to improve the energy efficiency of their properties. Repairs to and the installation of heating systems, as currently undertaken through Warm Front, would also be eligible for AW support.

The specific eligibility criteria for AW support mean that beneficiaries of the AW target would be highly likely to be vulnerable and on low incomes. The assessment of how effective different eligibility criteria would be at supporting fuel poor households is discussed in section 9.1.3. This assessment of the impact of ECO on the protected characteristics is based on the preferred policy option for eligibility criteria (option 2), unless stated otherwise.

12.2.1 Age

The AW is expected to have a positive impact on some age groups, and a potentially negative impact on others. Because eligibility for AW support would be linked to pension credit, means tested benefits with a pensioner premium and means-tested benefits with a child component, only households that include someone of pensionable age or a child would be eligible to ECO support. Conversely, households which include only working age adults would not be eligible unless they meet one of the other eligibility criteria, but would still face the costs of ECO that are passed on through energy bills.

12.2.2 Disability

The ECO is expected to have a positive impact on disabled people who are on low incomes. Under eligibility criteria option 2, households with an occupant in receipt of both disability and income related benefits would be eligible for affordable warmth support. On the other hand those with a disability who do not claim income related benefits will not be eligible for AW support but still face

the costs of ECO that are passed on through energy bills. Under eligibility criteria option 3, eligibility for affordable warmth would not be linked to disability benefits, and so there would be no direct positive impact on this group.

12.2.3 Pregnancy and Maternity

The ECO is expected to have a positive impact of recent mothers on low incomes. Under eligibility criteria options 1 and 2 households on income related benefits with a child under 5 would be eligible for affordable warmth support, and so would be proportionately more likely to benefit.

The remaining protected characteristics of gender reassignment, marriage and civil partnership, religion or belief, gender and sexual orientation might be more or less likely to benefit from the AW target depending on how representative they are in the targeted groups. However, there are no known impacts on these groups.

12.3 Impacts of Carbon Reduction target on protected groups

The Carbon Reduction target is not expected to discriminate against any group. However, some groups may be more likely to receive support than others. Around 30% of all households in England are solid wall properties¹³⁶, which would receive a significant amount of the benefit from the Carbon Reduction target.

12.3.1 Age

Table 20 shows households with at least one occupant over the age of 65 years living in hard to treat homes or properties that have cavity walls which can be filled in England only. Around 25% of households have at least one occupant over the age of 65¹³⁷ and therefore could slightly less likely to benefit from the Carbon Reduction target in comparison to the average solid wall property in England.

12.3.2 Disability

Table 21 shows households who have at least one occupant with a disability living in homes which have hard to treat properties or properties that have cavity walls which can be filled in England only. Around 25% of households have at least one occupant with a disability¹³⁸ and therefore are slightly less likely to benefit from the Carbon Reduction target in comparison to the average property in England.

12.3.3 Pregnancy and Maternity

Table 22 shows households with at least one occupant under the age 5 years living in homes which have hard to treat properties or properties that have cavity walls which can be filled in England only. Around 33% of households have at least one occupant under the age of 5 years¹³⁹ and would therefore be marginally more likely to benefit from the Carbon Reduction target in comparison to the average solid wall property in England. However, there are a wide range of other factors that would affect uptake of energy efficiency measures.

¹³⁶ Energy use in English homes 2011

¹³⁷ Energy use in English homes 2011

¹³⁸ Energy use in English homes 2011

¹³⁹ Energy use in English homes 2011

The remaining protected characteristics of gender reassignment, marriage and civil partnership, race, religion or belief, gender and sexual orientation might be more or less likely to benefit from the Carbon Reduction target depending on how highly represented they are in the targeted group. However, there are no known impacts on these groups.

12.4 Evidence base

This section details the evidence that supports the conclusions of the equality impact assessment.

Table 20 Number of households with at least one occupant over the age of 65 living in a solid wall or cavity wall property

Age	Cavity with insulation (thousands)	Cavity uninsulated (thousands)	Hard to treat (thousands)	Total
65 years and over	2,594 (44%)	1,866 (31%)	1,453 (25%)	5,913
Total number of households in England	7,417 (33%)	8,073 (37%)	6,748 (30%)	22,238

Table 21 Number of households with at least one occupant with a disability living in a solid wall or cavity wall property

Disability	Cavity with insulation (thousands)	Cavity un-insulated (thousands)	Hard to treat	Total (thousands)
HRP or partner registered disabled	913 (48%)	526 (27%)	473 (25%)	1,912
Total number of households in England	7,417 (33%)	8,073 (37%)	6,748 (30%)	22,238

Table 22 Number of households with at least one occupant under the age of 5 living in a solid wall or cavity wall property

Age	Cavity with insulation (thousands)	Cavity un-insulated (thousands)	Hard to treat	Total (thousands)
5 years old and under	758 (29%)	995 (38%)	862 (33%)	2,615
Total number of households in	7,417 (33%)	8,073 (37%)	6,748 (30%)	22,238

England				
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Annexes

Annex 1 should be used to set out the Post Implementation Review Plan as detailed below. Further annexes may be added where the Specific Impact Tests yield information relevant to an overall understanding of policy options.

13 Annex 1: Post Implementation Review (PIR) Plan

A PIR should be undertaken, usually three to five years after implementation of the policy, but exceptionally a longer period may be more appropriate. If the policy is subject to a sunset clause, the review should be carried out sufficiently early to ensure that any renewal or amendment to legislation can be enacted before the expiry date. A PIR should examine the extent to which the implemented regulations have achieved their objectives, assess their costs and benefits and identify whether they are having any unintended consequences. Please set out the PIR Plan as detailed below. If there is no plan to do a PIR please provide reasons below.

<p>Basis of the review: [The basis of the review could be statutory (forming part of the legislation), i.e. a sunset clause or a duty to review , or there could be a political commitment to review (PIR)];</p> <p>DECC would conduct reviews of the Green Deal and ECO programmes 3 years and 5 years after implementation in 2012. These reviews would be used to inform any changes that may need to be made to the policy. The reviews would be based on commitments made in the Green Deal and ECO Monitoring and Evaluation Strategy, to be produced in Spring 2012. The Green Deal and ECO Monitoring and Evaluation Strategy will outline how monitoring and evaluation will be planned post policy implementation. The PIR will thus form a key part of this strategy.</p>
<p>Review objective: [Is it intended as a proportionate check that regulation is operating as expected to tackle the problem of concern?; or as a wider exploration of the policy approach taken?; or as a link from policy objective to outcome?]</p> <p>The reviews would seek to establish the impact of the Green Deal finance framework and the ECO on domestic and non-domestic energy consumption and carbon emissions. They would also assess whether ECO targets have been met and the impact of the ECO affordable warmth policy on Fuel Poverty. The reviews would also improve our understanding of the process through which the Green Deal and ECO affect energy consumption and contribute to ongoing policy development.</p>
<p>Review approach and rationale: [e.g. describe here the review approach (in-depth evaluation, scope review of monitoring data, scan of stakeholder views, etc.) and the rationale that made choosing such an approach]</p> <p>The reviews would include an evaluation of both the impact of the policies and the process through which they affect energy consumption. The impact evaluation would assess the policies impact on energy bills, carbon emission and fuel poverty. The process evaluation would seek a systematic understanding of how participants are delivering the Green Deal (e.g. how installers and Green Deal providers work together), to understand where</p>

changes to the Green Deal Code and accreditation frameworks may be necessary.

The impact evaluation would incorporate both economic-technical analysis (for example of energy and carbon savings, costs, and uptake) and social research methods (for example of consumer attitudes towards energy efficiency products and energy consumption). The process evaluation would use social research surveys of market participants (providers, advisor and installers) alongside focus groups and case studies. This would provide a strong evidence base which can be used to inform future policy development.

Through the proposed ECO reporting mechanism information will be provided to Government on a monthly basis allowing robust analysis to take place. Under this proposal, the authority will be required to publish monthly (overview of delivery – progress to targets and sub-targets, measures installed per region, tenure, etc) and annual delivery reports (progress by each supplier, aggregated ECO costs, technical monitoring summary, etc). These reporting approaches will contribute towards the PIR and assist in answering the following key questions. The key questions the review would seek to answer are:

- How much carbon and energy has been saved?
- How much money is being saved for energy consumers?
- How many measures have been delivered and where?
- What has been the impact of the Green deal and ECO on different demographic groups?
- How has Green Deal and ECO impacted fuel poverty?

Baseline: [The current (baseline) position against which the change introduced by the legislation can be measured]

The baseline would be established before the roll out of the Green Deal and ECO policies. This would include using the National Energy Efficiency Data framework to establish the state of the building stock, an analysis of the structure and capacity of the industry, and a survey of consumer attitudes. Each review would include the development of a counterfactual against which to assess policy impacts.

Success criteria: [Criteria showing achievement of the policy objectives as set out in the final impact assessment; criteria for modifying or replacing the policy if it does not achieve its objectives]

The ECOs success criteria include the targets set for reductions in carbon emission and heating bills. These would be used to assesses the ECO at each review. The Green Deal does not have an explicit target, but would expected to deliver around 13Mt/ non-traded CO₂ towards the Carbon Budgets 2, 3 and 4.

Monitoring information arrangements: [Provide further details of the planned/existing arrangements in place that will allow a systematic collection of monitoring information for future policy review]

The operational data requirements of the Green Deal programme would also provide the monitoring and evaluation information needed for the policy reviews. The reviews are not expected to require additional data collection, so would not lead to an additional cost for businesses or consumers.

Green Deal legislation provides the power to require market participants to generate and share data. This would be combined with the National Energy Efficiency Data framework to conduct the quantitative analysis of the impact of the Green Deal.

Reasons for not planning a review: [If there is no plan to do a PIR please provide reasons here]

N/A

14 Annex A: Analytical Assumptions

This annex sets out the key assumptions that are used as inputs in the modelling. The assumptions that are particular to either the non-domestic or domestic sector are set out in the earlier sections, and are followed by details on universal assumptions. In order to ensure a high level of transparency and accuracy, these assumptions have been subjected to scrutiny through the Interdepartmental Analysts' Group (IAG), and have subsequently been approved by the heads of profession at DECC for both the scientists and economists.

14.1 Domestic sector

14.1.1 Measures in the Green Deal Household Model (GDHM)

The Green Deal Housing Model (GDHM) is used to calculate the energy savings that are expected to be delivered by undertaking Green Deal measures. It considers energy efficiency installations comprising:

- insulation measures: cavity wall, loft, solid wall; and
- other: boilers and central heating.

The derivations of assumptions relating to measures incorporated in the GDHM are described in this section, and the specific model inputs are given in Table 24, Table 25 and Table 26, below.

Installation costs

Cost assumptions for the nine energy-efficiency installations included in the GDHM are based on the Supply Chain Review¹⁴⁰ (2009) and have been evaluated in DECC's *Review of costs & benefits of energy efficiency measures*¹⁴¹. This call for evidence asked stakeholders to submit evidence about the direct and additional costs of installation and the performance of energy efficiency measures. Around 300 responses were received and were analysed by Energy Efficiency Partnership for Homes (EEPH). The results of this analysis have been incorporated into the GDHM.

Solid Wall Insulation (SWI)

¹⁴⁰ *Solid Wall Insulation Supply Chain Review*, Purple Market Research, May 2009

¹⁴¹ Undertaken by the Energy Efficiency Partnership for Homes (EEPH) and Purple Market Research (May 2011), responses were requested between 14 March and 4th April 2011.

An attempt has been made to disaggregate the components of installation costs into fixed and variable elements, those likely to benefit from cost reductions due to learning rates, and those unlikely decline over time. A simple linear relationship, based on the EEPH call for evidence, has been used to determine the relationship between the size of property and likely installation costs. The costs are determined as follows:

The cost of installing these measure in typical 3 bedroom semi detached house (with external wall area of 80m²) is therefore £10,200 for external and £5,300 for internal SWI.

Additional costs

Additional costs to households have been included that relate to time and other costs to works that are unaccounted for in the above formulae. The majority of these derive from Ecofys¹⁴², although these have been superseded with findings for SWI costs as described above.

Performance of measures

The performance of measures has previously been assessed using controlled field trials, typically using small samples. The establishment of the National Energy Efficiency Data-framework (NEED)¹⁴³ gives analysts access to individual households' energy use data. This has enabled provision of a wider and more robust understanding of energy use and energy efficiency. This dataset has been analysed for this assessment and has revealed that previous field trials overstate observed savings from energy efficiency measures.

DECC scientists have used NEED to provide estimates of underachievement in real-world energy savings from the measures relative to SAP predicted savings. These factors have been estimated through a comparison of NEED 'actuals' with SAP performance predictions for CWI. Relative to SAP predicted savings, performance estimates from NEED indicate that CWI only delivers 50% of these savings. It is assumed that three factors contribute towards this

¹⁴² Ecofys (2009), "The hidden costs and benefits of domestic energy efficiency and carbon saving measures", http://www.decc.gov.uk%2Fassets%2Fdecc%2Fwhat%2520we%2520do%2Fsupporting%2520consumers%2Fsaving_energy%2Fanalysis%2F1_20100111103046_e_%40%40ecofyshiddencostandbenefitsdefrafinaldec2009.pdf

¹⁴³ NATIONAL ENERGY EFFICIENCY DATA-FRAMEWORK Report on the development of the data-framework and initial analysis. DECC, June 2011.

50% reduction: physical underperformance or systematic difference between buildings physics models and in use savings achieved; a proportion of the building stock walls that are inaccessible; and a degree of comfort taking.

Based on a review of measured versus theoretical energy savings,¹⁴⁴ a 35% 'underperformance' factor is assumed in the modelling. In addition, it is estimated that approximately 10% of the building stock's external walls are inaccessible, reducing performance of CWI installations. Once these two factors are accounted for, the residual of approximately 15% additional underperformance is assumed to be due to comfort-taking.

At present similar data on SWI does not exist, but it is assumed that the inaccessibility and comfort factors above will be similar in magnitude. Further studies are planned in this area in the coming months.

These assumptions are outlined in Table 23, and are applied to the GDHM via reduction factors in SAP performance.

Table 23 Average savings of measures in GDHM – (based on 3 bed semi detached house)

Measure	SAP savings (kWh)	Inaccessibility factor (%)	Underperformance factor (%)	Energy savings before comfort taking (kWh)	Average bill savings in 2012, excluding comfort taking (gas central heating)	Comfort factor (%)	Energy savings after comfort taking (kWh)
CWI	4,569	10	35	2,673	£120	15	2,272
External SWI	9,118	10	15	6,975	£314	15	5,929
Internal SWI	9,118	10	15	6,975	£314	15	5,929

¹⁴⁴ Glasgow Caledonian University – *Review of differences between measured and theoretical energy savings for insulation measures* – (2006)
http://www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/saving_energy/analysis/insulationmeasures-review.pdf

Loft Insulation (professional) (100 to 250 mm)	845	41	499	£22	15	424
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Learning-by doing installation cost savings

Reductions in costs are expected to have been fully exploited in mature markets (eg. boilers and CWI). However for SWI, savings to the scale of those observed for CWI over the period 1992 to 2005 are projected. These equated to 1.79% per 100,000 installations over the period, and are assumed to be replicated for SWI.

CWI costs

Modelling the uptake of CWI is based on the assumption that easy to treat cavities will be treated first, and that cost will rise once these have been filled. CWI cost are assumed to rise from £500 (the cost of easy to treat cavities) to £2000 (the cost of hard to treat cavities). Cost rise to £1000 once 1m CWI have been installed, £1500 when 1.2 CWI have been installed and £2000 once 1.4m CWI have been installed. There are 1.4m easy to treat cavities in the UK housing stock so this cost profile remains conservative. This conservative assumption reflects the fact that a) there is a small unknown number of active rejecters, and b) it is likely that some hard to treat cavities will be treated before all the easy to treat cavities have been filled.

Table 24: Domestic internal Solid Wall Insulation (SWI) assumptions

		Internal SWI									
		Large detached house	Small detached house	Large semi-detached or end-of-terrace	Small semi-detached or end-of-terrace	Large mid-terrace	Small mid-terrace	Large top-floor flat	Small top-floor flat	Large other flat	Small other flat
Lifetime	years	36	36	36	36	36	36	36	36	36	36
External Wall Area	m2	147	86	92	66	71	46	77	48	61	45

The Green Deal and Energy Company Obligation Impact Assessment

Installation cost, of which	£	8,147	5,556	5,806	4,688	4,906	3,838	5,186	3,939	4,510	3,830
Materials and fittings	£	6,247	3,656	3,906	2,788	3,006	1,938	3,286	2,039	2,610	1,930
Fixed costs	£	1,900 average									
Household time costs	£	632 average									
Lost floor space	£	3,400 average									
Precautionary Underperformance	% per wall	15%									
Comfort taken	%	15%									
Wall inaccessibility	%	10%									
Learning-by-doing	%	1.79% decrease in cost per 100,000 installations									

Table 25: Domestic External SWI assumptions

		External SWI									
		Large detached house	Small detached house	Large semi-detached or end-of-terrace	Small semi-detached or end-of-terrace	Large mid-terrace	Small mid-terrace	Large top-floor flat	Small top-floor flat	Large other flat	Small other flat
Lifetime	years	36	36	36	36	36	36	36	36	36	36

The Green Deal and Energy Company Obligation Impact Assessment

External Wall Area	m ²	147	86	92	66	71	46	77	48	61	45
Installation cost, of which	£	13,923	10,534	10,860	9,398	9,683	8,285	10,049	8,417	9,165	8,275
Materials and fittings	£	8,173	4,784	5,110	3,648	3,933	2,535	4,299	2,667	3,415	2,525
Make good costs	£	5750 average									
Hidden costs	£	1450 average									
Household time costs	£	171 average									
Precautionary Underperformance	% per wall	15%									
Comfort taken	%	15%									
Wall inaccessibility	%	10%									
Learning-by-doing	%	1.79% decrease in cost per 100,000 installations									

Table 26: Other GDHM assumptions

		Measure			
		CWI		Loft Insulation (professional 100mm-250mm)	Condensing Gas Boiler (G to A)
		Easy	Hard		
Lifetime	years	42	42	42	12-15
Installation cost	£	500	2000	300	2,500

Household costs, of which:	£	83	143	108	18
Household time costs	£	80	138	105	15
Additional cost of works	£	3	5	3	3
Underperformance factor	%	35%	-	-	-
Comfort taking	%	15%	15%	0%	0%
Wall inaccessibility	%	10%	N/A	N/A	N/A
Learning-by-doing	%	No further scope for installation cost savings			

14.1.2 Measures additional to GDHM

There are a number of measures that could potentially be paid for through Green Deal Finance that are not included within the GDHM. Table 27 shows the assumptions relating to these measures. Most of these measures cannot be fully financed alone using Green Deal finance, since the energy savings delivered do not cover the charge. However, it is possible that a number of these measures may be included fully or partially as part of a wider package of measures. A number of these are included in the analysis.

The energy saving estimates presented below take into account underperformance, but not comfort taking. The cost of these measures can vary considerably, depending on the individual property and the circumstances of the installation (for example, as part of a wider retro fit or as a standalone job). The cost estimates presented in Table 27 are averages which have been used for analysis. Green Deal Providers will use actual installation costs for the golden rule calculation, which are likely to vary considerably from the numbers presented below. All estimates are based on 3-bedroom semi-detached property, unless stated otherwise.

Table 27: Additional measures not included in GDHM

Measure	Energy saving	Annual bill savings	Green Deal Finance	Installation cost	Proportion financeable under
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The Green Deal and Energy Company Obligation Impact Assessment

	kWh pa	£/installation	£/installation	£/installation	Green Deal %
Floor insulation	1084	41	433	400	1
Heating controls	494.5	19	198	450	0.33
Flue Gas heat recovery (condensing boiler)	740	28	296	400	0.55
Hot water cylinder insulation (top up)	490	18	196	30	1
Double Glazing (old single to A)	2280	86	911	4500	0.2
Double Glazing (C to A)	190	7	76	4500	0.02
Secondary glazing	1657	62	662	1250	0.53
Flat roof insulation	2752	104	1099		
Room in roof insulation					
Loft hatch insulation					
High performance replacement doors	317	12	127	1000	0.13
Draughtproofing	649	24	259	100	1
Lighting systems and fittings	97	4	39		
Cylinder thermostat	2410	91	963	300	1
New or replacement storage heaters	1203	45	481	350	1

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Replacement warm-air unit	481	18	192	1750	0.08
Condensing oil boiler					
Under-floor heating	Normally zero			5000	
Waste water heat recovery systems					
Mechanical ventilation	Normally zero			1100	
Mechanical extract ventilation with heat recovery.	Normally negative			1100	
Biomass boiler				9000	
Biomass room heater with boiler					
Solar water heating	1336	50	534	4500	0.12
Photovoltaics	1595	60	637	12000	0.05
Ground source heat pump	13901	524	5553	12000	0.46
Air source heat pump	11003	415	4395	7500	0.59
Micro CHP		0	0	5500	0
Building mounted windturbine	570	21	228	3200	0.07

14.2 Projecting Business as Usual

14.2.1 Impact of other policies

There are a significant number of existing policies that will impact on the domestic and non-domestic buildings sector over the period covered by this impact assessment. The policies that form the BAU mix are shown in Table 28. Of these, products policy, building regulations and RHI are of particular importance due to the scale of the impacts of these policies and the extent to which the measures overlap with those in the Green Deal.

Table 28: Policies operating in the Green Deal sectors

Policy	Domestic	Non-domestic
Carbon Emissions Reduction Target Extension	~N ¹⁴⁵	N
Products Policy	Y	Y
Building Regulations	Y	Y
Renewable Heat Incentive (RHI)	Y	Y
EU Emissions Trading Scheme (EU ETS)	Y	Y
UK Emissions Trading Scheme (UK ETS)	N	Y
Climate Change Agreements (CCAs)	N	Y
CRC Energy Efficiency Scheme (CRC)	N	Y

In the analysis of the counterfactual, it is not possible to produce a BAU take-up profile for energy efficiency measures by simply extrapolating past take-up, since the historical drivers will not be replicated identically over the analysis period.

¹⁴⁵ The Carbon Emissions Reduction Target Extension will cease to be in operation in December 2012. This means there is a short overlap between this policy and the Green Deal framework launched from October 2012.

The following sections describe how the analysis in the domestic and non-domestic sectors have taken account of the BAU take-up of measures.

14.2.2 Domestic Sector BAU take-up

The consideration of measures taken up in the domestic sector BAU is split into two types: Those measures included in the Green Deal Household Model (GDHM); and those that are outside the scope of the GDHM. Annex A contains details on all of the eligible Green Deal measures, together with details on which are included in the modelling, and which have been excluded.

14.2.2.1 Measures included in the Green Deal Household Model

The GDHM covers the energy efficiency measures which are expected to be the largest contributors towards energy and carbon savings. The model has been used to estimate take-up of these measures in the absence of the Green Deal and ECO by estimating households' reaction to a choice of unsubsidised measures without the option to finance them through charges on electricity bills. Annex B provides more detail on the GDHM. The coefficients used in the model were derived from a stated preference survey in which individuals expressed preferences over a variety of subsidised offers. However, no unsubsidised measures were offered in this survey, which limits the confidence in the counterfactual estimates of take-up. This approach is adopted owing to the lack of any unsubsidised market data.

14.2.2.2 Measures not included in the Green Deal Household Model

Not all eligible measures are included in the GDHM. Besides from the measures included in the GDHM, additional measures are included in the analysis are double glazing; secondary glazing; floor insulation; and flue gas heat recovery.

The Green Deal and ECO are expected to drive very little additional take-up of micro-generation technologies, as these are driven primarily through the Renewable Heat Incentive (RHI) and Feed in Tariffs (FiTs). The remaining eligible measures have been excluded from the analysis for a variety of reasons. Additional information may be found in Annex A regarding specific assumptions taken in the modelling on these additional measures.

For the six measures included in the analysis, the counterfactual take-up has been taken as a continuation of existing sales trends.

Floor Insulation: The amount of floor insulation delivered under the Carbon Emissions Reduction Target (CERT) has been minimal¹⁴⁶. Since historical installations have been largely unsubsidised, it is assumed that past installation rates are a good indication of future BAU take-up.

¹⁴⁶ Ofgem quarterly updates on measures installed do not even list floor insulation as a measure. See: <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/CU/Pages/CU.aspx>

Double Glazing: Double glazing has been delivered at scale through CERT but these CERT sales are likely to have been driven predominantly by Building Regulations policy. This suggests that for the BAU, which includes the continuing impact of Building Regulations, projected take-up of these measures should again be based on past sales figures.

Flue Gas Heat Recovery: These are unlikely to be installed as retrofits without accompanying the installation of boilers. As a result, the counterfactual installation rates for these measures is assumed to be directly related to larger heating works.

14.2.3 BAU take up in the non-domestic sector

See Annex C.

14.2.4 BAU changes in energy service demand

The policies focus on retro-fitting energy efficiency measures to the existing building stock. Demolition of existing properties reduces the energy service demand in old properties and therefore the potential for energy savings from retro-fit measures. Demolition rates in the domestic sector are extremely low (less than 0.1% per year of the stock) – demolition has therefore been ignored in the domestic sector modelling. In the non-domestic stock, where demolition rates are higher, the stock of potential energy efficiency measures is reduced over time to account for demolition.

Smart-meters are to be introduced across the UK building stock over the next 10 years. They are expected to reduce waste of energy in the domestic sector, having a behavioural impact encouraging more careful use of energy. The energy service demand in the domestic modelling has been adjusted downwards to account for this.

14.2.5 BAU changes to carbon intensity of energy supply

The take-up of measures driven by the Green Deal and ECO would typically be expected to affect energy consumption, rather than carbon emissions directly. It is for this reason that the carbon intensity of energy consumption is important in judging potential savings and valuing the costs and benefits. The relevant factors are described below:

Carbon intensity in electricity generation

The changes in the efficiency of generation plant and distribution networks, together with the changing mix of the input fuels, are both accounted for in the projections used in the analysis. The emissions factors for grid electricity that have been adopted are those agreed and published by the Interdepartmental Analysts' Group (IAG).¹⁴⁷

Carbon intensity of heat supply and the Renewable Heat Incentive

For the purposes of this analysis it is assumed that the Green Deal and the ECO policy package will occur first, and as such there will be no adjustments made to the carbon intensity of heat supply as a result of the Renewable Heat Incentive (RHI). To avoid overstating the combined savings from the RHI and the Green Deal/the ECO, reductions in heat demand as a result of the Green Deal and the ECO will need to be accounted for in the analysis of the RHI impacts.

The increasing efficiency of the stock of boilers has been accounted for by reducing the savings deliverable from insulation over time. Building regulations are estimated to affect 1,566,084¹⁴⁸ boiler replacements per annum. This will reduce the energy savings from insulation measures in gas heated homes will fall overtime as old boilers are replaced with newer models that are of the standard mandated by building regulations. The adjustment factors shown in Table 29 will be used to scale energy savings from insulation measures.

Table 29: Scaling factors and improvement in boiler efficiency over time

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
gas boiler efficiency	78	78.7	79.4	80.1	80.8	81.5	82.2	82.9	83.6	84.3	85
scaling factor	1.00	0.99	0.98	0.97	0.97	0.96	0.95	0.94	0.93	0.93	0.92

¹⁴⁷ http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/analysis_group/81-iag-toolkit-tables-1-29.xls&minwidth=true

¹⁴⁸ Sales by SEDBUK band for 12 months to Jan 2009

14.2.6 Assessment costs

14.2.6.1 Assessment costs for domestic buildings

The assumed assessment cost is taken as an estimate related to the cost of obtaining an Energy Performance Certificate (EPC). The original impact assessment for the EPB Regulations suggested a figure close to £100. However, research done as part of the EPC Review and previously by DCLG suggests an average cost of around £50 per assessment. An estimate for the cost of the revised EPC, used in the Green Deal analysis is £75. It is assumed that there is a further cost for the occupancy assessment of £25.

14.2.6.2 Assessment costs for non-domestic buildings

The assumed assessment costs are given by qualitative size of building. These are:

Table 30: Non-domestic buildings' assessment costs

Small	Medium	Large
£250	£500	£1,000

The buildings that fall under each of these categories may be illustrated with , taken from Carbon Trust/AEA work on Green Deal scenarios of hypothetical non-domestic buildings.

Table 31: Non-domestic buildings illustrative categorisation

Size category	Illustrative buildings
Small (37%)	Small office Surgery (small building) Hotels and catering - Pub Hotels and catering - B&B small food shop small industrial unit (light manufacturing)
Medium (29%)	Medium office, single occupancy Medium office, multiple occupancy 1 floor on large building. School in one medium sized building Medium multiple building school Hotels and catering - Hotel in listed building medium size store in outlet centre medium department store medium sized leisure centre with swimming pool heated warehouse - medium size. No cooling medium industrial unit
Large (19%)	Large office including data centre Hospital (large building) Air conditioned prestige hotel large supermarket
Unknown (15%)	Other Communication and transport Government Agriculture

14.2.6.3 Number of assessors

In the central scenario a number of assessors has been assumed in order to estimate training and certification costs. The basis for this assumption is as follows:

Table 32: Assumed number of assessors used to estimate costs of assessor accreditation

no. of assessments a day (full time)	3
no. of assessments in a day (part time)	2
no of assessments that result in Green Deal	0.2
no. working days in a year	235
% Part time	0.5
No. of assessments needed per year	1.5m
How many assessments an average assessor can do in a day	2.5
How many assessments an average assessor does in a year	587.5
No. of assessors needed	2,600

14.3 Non-domestic sector

14.3.1 Non-domestic sector measures

Details on measures are taken from the Non-Domestic Buildings Energy and Emissions Model (N-DEEM), produced by BRE, including costs, abatement potentials and lifetimes. Assumed take-up rates are taken from Element Energy's analysis¹⁴⁹ and are adjusted according to projected policy savings¹⁵⁰ as described in the main body of this document. Assumptions relating to these measures are presented in Table 33.

Table 33: Eligible Green Deal measures in the non-domestic sector

			Energy savings potential in 2010 (GWh pa)					
Measure	Lifetime of measure (Years)	Total capital costs (2010)	Electricity	Gas	Coal	Oil	Total	BAU take-up to 2020 (% of 2010 potential)

¹⁴⁹ *Uptake of energy efficiency in buildings*. Element Energy (2009) http://downloads.theccc.org.uk/docs/Element%20Energy_final_efficiency_buildings.pdf

¹⁵⁰ DECC Energy Model projections

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Programmable Thermostats	10	44	2,728	15,318	0	2,005	20,051	46%
Basic Lighting Timer	10	6	6,187	0	0	0	6,187	32%
Light Detectors	10	10	652	0	0	0	652	32%
Sunrise-Sunset Lighting Timers	10	0	657	0	0	0	657	32%
Presence detector	10	478	1,802	0	0	0	1,802	33%
Stairwell timer	10	46	1,144	0	0	0	1,144	29%
Compressed Air - Reduced Inlet Temp	5	1	16	0	0	0	16	76%
Heating - More efficient air conditioning	10	0	1,975	40	0	0	2,015	99%
4 Pole Motor - EFF1 replace 4 Pole	3	1	10	0	0	0	10	67%
Variable Speed Drives medium	3	0	3	0	0	0	3	66%
Variable Speed Drives small	3	1	8	0	0	0	8	66%
Windows - Double Glazing Air Filled	20	21	8	24	0	3	36	69%
Windows - Double Glazing Argon Filled	20	17	5	19	0	3	27	69%
Windows - Low E Double Glazing - Air Filled	20	25	9	27	0	4	40	69%
Windows - Low E Double Glazing - Argon Filled	20	23	7	26	0	4	36	69%
Windows - Ultra-Low E Double Glazing - Air Filled	20	27	10	29	0	4	43	69%
Windows - Ultra-Low E Double Glazing - Argon Filled	20	20	7	22	0	3	32	69%

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Insulation - Roof - Flat 100 mm	20	582	270	1,463	0	193	1,925	19%
Insulation - Roof - Flat 150 mm	20	671	272	1,186	0	162	1,620	19%
Insulation - Roof - Flat 200 mm	20	283	240	422	0	74	736	19%
Insulation - Roof - Flat 80mm	20	566	266	1,445	0	190	1,902	19%
Insulation - Roof - Pitched 100mm	20	570	480	992	0	164	1,635	20%
Insulation - Roof - Pitched 150mm	20	157	327	84	0	46	457	20%
Insulation - Roof - Pitched 200mm	20	198	320	86	0	45	451	20%
Insulation - Roof - Pitched 80mm	20	549	473	968	0	160	1,602	20%
Insulation -Wall - External Cladding 50mm	20	19	6	20	0	3	29	37%
Insulation -Wall - Masonary Cavity 100mm	20	76	179	60	0	27	265	30%
Insulation -Wall - Masonary Cavity 65mm	20	108	217	137	0	35	389	30%
Insulation -Wall - Masonary Cavity 75mm	20	54	176	59	0	26	262	30%
Lights - 16 mm Fluorescent Tubes Replace 26mm	3	95	643	0	0	0	643	53%
Lights - Compact Fluorescent Lamps without ECG & Tungsten	3	110	2,521	0	0	0	2,521	72%
Lights - ECG Compact Fluorescent Lamps & Tungsten	3	282	2,558	0	0	0	2,558	72%
Lights - HF Ballast	3	94	664	0	0	0	664	70%
Lights - IRC Tungsten-Halogen - Spots	3	25	344	0	0	0	344	74%

Lights - LEDs Replace 26mm Fluorescent Tubes	3	118	887	0	0	0	887	53%
Lights - Metal Halide Floods	3	7	90	0	0	0	90	68%
Heating - TRVs Fully Installed	10	22	0	5,713	0	3,858	9,571	54%

14.3.2 Additional costs and benefits

14.3.2.1 Hidden costs

Hidden costs are taken as equivalent to a 20% mark-up on capital. This is based on findings from a literature review¹⁵¹, and takes the mean of the estimates for generic transaction costs.

14.4 Fossil fuel prices

Table 34: Energy price assumptions - variable price element

Domestic Sector			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Electricity	p/kWh (2011)	High	7.1	8.3	8.7	8.5	8.6	8.7	8.8	9.0	9.0	9.2	9.4	9.3	9.1	9.4	9.4
		Central	7.3	8.0	8.3	8.1	8.1	8.2	7.9	7.5	7.6	7.8	7.8	7.6	7.6	7.8	8.2
		Low	7.6	6.8	5.4	5.6	5.5	5.4	5.6	5.1	5.2	5.2	5.7	5.7	5.7	6.8	6.9
	p/kWh	High	2.3	2.8	2.9	3.0	3.1	3.1	3.2	3.3	3.4	3.4	3.5	3.6	3.6	3.6	3.6

¹⁵¹ Review and development of carbon dioxide abatement curves for available technologies as part of the Energy Efficiency Innovation Review (Enviros, 2006) http://www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/saving_energy/analysis/enviros-report.pdf (p43)

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Gas	(2011)	Central	2.3	2.5	2.7	2.9	2.9	2.9	2.8	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
		Low	2.3	1.8	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.5	1.5	1.6
Burning Oil	p/litre (2011)	High	53.7	54.6	55.9	57.3	58.4	59.5	60.7	61.9	63.2	64.4	65.7	67.0	68.4	69.8	71.2
		Central	53.7	54.0	54.6	55.2	55.7	56.1	56.5	56.9	57.3	57.8	58.2	58.6	59.1	59.5	60.0
		Low	53.7	52.7	52.0	51.4	50.5	49.7	48.9	48.1	47.3	46.5	45.7	45.0	44.3	43.6	42.9

Non-domestic sector			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Electricity	p/kWh (2011)	High	7.1	8.3	8.7	8.5	8.6	8.7	8.8	9.0	9.0	9.2	9.4	9.3	9.1	9.4	9.4
		Central	7.3	8.0	8.3	8.1	8.1	8.2	7.9	7.5	7.6	7.8	7.8	7.6	7.6	7.8	8.2
		Low	7.6	6.8	5.4	5.6	5.5	5.4	5.6	5.1	5.2	5.2	5.7	5.7	5.7	6.8	6.9
Gas	p/kWh (2011)	High	2.3	2.8	2.9	3.0	3.1	3.1	3.2	3.3	3.4	3.4	3.5	3.6	3.6	3.6	3.6
		Central	2.3	2.5	2.7	2.9	2.9	2.9	2.8	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
		Low	2.3	1.8	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.5	1.5	1.6

Table 35: Energy price assumptions - retail prices

Domestic Sector			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Electricity	p/kWh	High															

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(2011)	Centr al		14.3	16.4	17.0	17.4	17.7	18.5	19.0	19.4	20.1	20.7	21.4	21.6	21.6	22.4	22.9
			14.3	15.8	16.4	17.0	17.2	17.9	18.0	17.7	18.5	19.2	19.5	19.6	19.7	20.2	20.9
		Low	14.3	14.0	12.8	13.9	13.9	14.4	15.3	14.9	15.5	16.2	17.2	17.4	17.7	19.3	19.6
Gas	p/kWh (2011)	High Centr al	4.1	5.0	5.0	5.2	5.4	5.6	5.7	5.8	6.0	6.1	6.2	6.4	6.4	6.4	6.4
			4.1	4.5	4.7	5.1	5.2	5.3	5.1	4.8	4.9	5.0	5.0	5.0	5.0	5.0	5.0
		Low	4.1	3.5	2.8	2.9	3.0	3.1	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.7
Burning Oil	p/litre (2011)	High Centr al	59.8	60.7	62.0	63.5	64.6	65.9	67.1	68.4	69.7	71.0	72.3	73.7	75.2	76.6	78.1
			59.8	60.0	60.6	61.3	61.8	62.2	62.7	63.1	63.5	64.0	64.5	64.9	65.4	65.8	66.3
		Low	59.8	58.6	57.9	57.3	56.4	55.5	54.6	53.8	53.0	52.2	51.4	50.6	49.8	49.1	48.4
Non-domestic sector			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Electricity	p/kWh (2011)	High Centr al	12.0	13.4	14.1	14.2	14.3	14.7	15.1	15.5	15.9	16.4	16.9	17.0	17.2	17.8	18.3
			12.0	13.0	13.7	13.9	13.9	14.3	14.2	14.1	14.6	15.2	15.4	15.4	15.6	16.1	16.7
		Low	12.0	11.5	10.8	11.4	11.3	11.5	12.1	11.9	12.2	12.7	13.5	13.7	14.1	15.3	15.6
Gas	p/kWh (2011)	High Centr al	3.7	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.5	5.5
			3.7	4.0	4.2	4.5	4.5	4.6	4.4	4.2	4.2	4.2	4.3	4.3	4.3	4.3	4.4
		Low	3.7	3.2	2.6	2.7	2.7	2.7	2.8	2.8	2.9	2.9	3.0	3.1	3.1	3.2	3.2

14.5 EUA prices & carbon valuations

Valuations of the savings pertaining to avoided carbon emissions are made according to projected EU Emissions Trading Scheme Allowance (EUA) prices, and modelled shadow prices of carbon. These are in line with Interdepartmental Analysts' Group accepted projections¹⁵² and are given in Table 36.

Table 36: EUA price assumptions and shadow price of carbon assumptions

			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Traded carbon value	£/tCO ₂ (2011)	High	17.4	18.5	20.0	21.3	23.5	26.5	27.8	30.8	32.7	35.5	43.1	50.6	58.2	65.8	73.4
		Central	13.5	14.5	15.9	17.1	18.9	20.5	21.9	23.5	25.7	28.5	33.1	37.7	42.2	46.8	51.4
		Low	6.4	7.2	8.8	10.0	11.5	13.8	15.1	15.9	17.2	19.1	20.9	22.7	24.5	26.3	28.1
Non-traded carbon value	£/tCO ₂ (2011)	High	83.5	84.7	86.0	87.3	88.6	89.9	91.3	92.6	94.0	95.4	97.0	98.6	100.2	101.8	103.4
		Central	55.6	56.5	57.3	58.2	59.1	59.9	60.8	61.7	62.7	63.6	64.7	65.7	66.8	67.9	68.9
		Low	27.8	28.2	28.7	29.1	29.5	30.0	30.4	30.9	31.3	31.8	32.3	32.9	33.4	33.9	34.5

14.6 Interest rates

Table 37: Interest rate sensitivities

	Green Deal Finance interest rate ¹⁵³
Low	6%
Central	7%

¹⁵² Available at http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx

¹⁵³ Nominal, applicable to domestic sector modelling. A real rate of 8% has been applied in the non-domestic sector analysis.

High	8%
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14.7 Air Quality

A damage cost approach has been taken using Defra guidance¹⁵⁴. These factors are given in Table 38 below.

Table 38: Air quality damage cost factors

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
National average																	
Gas	(p/KWh)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Coal	(p/KWh)	4.60	4.70	4.80	4.90	5.00	5.10	5.20	5.30	5.40	5.50	5.60	5.71	5.83	5.94	6.06	6.18
Burning oil	(p/KWh)	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.80	0.80	0.80	0.80	0.82	0.83	0.85	0.87	0.88
Biomass	(p/KWh)	9.60	9.80	10.00	10.30	10.50	10.70	10.90	11.10	11.40	11.60	11.80	12.04	12.28	12.52	12.77	13.03
Non-domestic																	
Electricity	(p/KWh)	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16

¹⁵⁴ Details available at http://uk-air.defra.gov.uk/reports/cat19/1102150857_110211_igcb-damage-cost-calculator.xls

15 Annex B: The Domestic Green Deal Model

15.1 Overview

The impact on the domestic sector of the Green Deal and the Energy Company Obligation has been modelled using the Green Deal Household Model (GDHM). This model simulates the uptake of energy efficiency measures amongst British households under different policy scenarios based upon the characteristics of homes, households, measures and other environmental circumstances. Different scenarios have been modelled to represent different possible trajectories for Green Deal take-up.

This annex describes how the GDHM works and how these take-up scenarios were produced. Section 15.2 discusses the technical inputs to the GDHM. This includes the characterisation of the housing stock and a discussion of the remaining opportunities for major building fabric energy efficiency improvements. Section 15.3 describes how the model estimates uptake of those opportunities. This includes a description of the model of consumer choices and the parameters underlying the demand scenarios that have been used to describe the variation in the potential impacts of the Green deal and Energy Company Obligation. These scenarios describe varying levels (and success) of a range of supporting policies. Section 15.3.8 describes the approach to modelling the behaviour of energy companies, in their subsidy of energy efficiency measures in order to meet different levels of obligation at least cost. This section also outlines the estimate of marginal costs that has been used to estimate the subsidy cost for the obligation. Further details of the classification of the housing stock, the SAP calculations used to estimate energy saving and the analysis of the Green Deal consumer survey responses can be found in the Green Deal Household Model Assumptions Document published alongside this Impact Assessment.¹⁵⁵

15.2 Homes and measures

15.2.1 Classification of the housing stock

In order to represent the varied nature of the housing stock's current physical and energy efficiency characteristics, the GDHM is based on data from the English House Condition Survey 2007/08, the Scottish House Condition Survey 2007/09, and the Living in Wales Survey to segment the housing stock into the following groups:

- 5 dwelling types split by large and small size;
- fuel/ heating system types;
- 3 external wall types; and
- 3 levels of loft insulation.

Households are also grouped by tenure (social, private rented and owner occupier) and according to their income and vulnerability. This segmentation results in 1,582 house types for Great Britain.

For the purposes of identifying the low income and vulnerable groups, survey responses regarding the receipt of benefits are used. Survey responses have been found to understate the number of benefit claimants found in administrative survey responses have been found to understate the

¹⁵⁵ http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx

number of benefit claimants found in administrative sources¹⁵⁶. To account for this the stock homes lived in by low income and vulnerable groups has been scaled up to match estimates from administrative data¹⁵⁷.

15.2.2 Major building fabric measures to improve energy efficiency

Three major insulation measures are considered, either singly or in combination, and in some cases accompanied by a condensing-boiler¹⁵⁸:

- solid wall insulation (applying insulation to the exterior or interior of a wall without cavity);
- cavity wall insulation (applying insulation to a wall cavity, or in some extreme hard to treat cases, the exterior or interior of the wall);
- loft-top-up insulation (increasing the depth of loft insulation to 270mm or more).

The number of opportunities for these measures expected to remain in 2013 is described in Annex A, along with their associated costs. The housing survey results have been adjusted to reflect this estimate of potential.

The impacts of measures on a home's modelled energy consumption are estimated using the Standard Assessment Procedure (SAP 2005) for energy rating of dwellings¹⁵⁹. This is based upon the average house characteristics for each segment of the model with some values imputed from other characteristics. The SAP estimate for total energy consumption is then rescaled to match the total level of energy consumption reported in the Digest of UK Energy Statistics¹⁶⁰.

Estimates of the impact of measures have been further adjusted to reflect technical underperformance of measures, the assumptions for the level of underperformance are set out in Annex A. This adjustment rescales the average impact of each measure installed in "large" semi-detached house type segments to match the typical house type for which underperformance has been estimated. The estimated impacts of measures in larger and smaller house-types have been scaled according to the same percentage reduction factor¹⁶¹.

15.3 Modelling Uptake

This section first outlines the sequence of steps that are modelled each year to determine the uptake of energy efficiency measures. This highlights several key parameters that are subject to the influence of a range of supporting policies and other external conditions over the course of the period under consideration. The final part of this section describes the set of parameters that underlie several demand scenarios and explains the reasoning and evidence behind those choices.

¹⁵⁶ See annex 3 in : <http://www.decc.gov.uk/assets/decc/Consultations/warm-front-eligibility/1442-ia-warm-front-eligibility.pdf>

¹⁵⁷ The stock of homes lived in by other households has been correspondingly scaled down.

¹⁵⁸ That is where a home is connected to the gas grid, and has a central heating system, but either no boiler or a non-condensing boiler is present.

¹⁵⁹ <http://projects.bre.co.uk/sap2005/>

¹⁶⁰ <http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx>

¹⁶¹ Analysis of the relationship between the difference between theoretical performance and that observed in recent analysis of data from the National Energy Efficiency Data-framework, showed no consistent relationship between "underperformance" and dwelling size. DECC(2011) "Development of NEED and initial analysis" <http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=11/stats/energy/energy-efficiency/2078-need-data-framework-report.pdf>

15.3.1 Decision sequence

The GDHM estimates consumer uptake of the Green Deal by simulating customer decisions for each segment of the housing stock in each year of the simulation period (2012-2022). This is based on the following six steps:

1. A fraction of each housing stock segment is assumed to make a decision regarding the suitable modeled measures in each year - the “*decision making frequency*” or “*trigger point frequency*”.
2. The expected year 1 total bill savings are calculated for each option using the technical energy saving performance of the measure in that segment and the relevant fuel price.
3. The Green Deal charge is calculated, based on the assumed interest rate, the length of the repayment period and the installation cost of the measure (after deducting the assumed ECO subsidy).
4. For each option that meets the Golden Rule¹⁶², a consumer “utility” score that reflects the desirability of each option is calculated.
5. This utility score weights the characteristics of the package offered to the consumer. These weights are based on consumer *choice coefficients* that have been estimated by fitting a logit model to the Green Deal consumer survey responses¹⁶³. The characteristics that are included are:
 - a) The measure itself – reflecting consumers bias for or against any particular measures
 - b) The expected net bill saving (after deducting the Green Deal charge)
 - c) The repayment period
 - d) Whether the interest rate is fixed or variable
 - e) The cost of the assessment
 - f) The upfront cost (zero for Green Deal measures)
 - g) The type of interest rate (fixed or variable)
6. The take up of each option is based upon the relative utility of all available options, including do nothing. The utility is derived by combining the coefficients and the characteristics of the options

15.3.2 Demand parameters and their influences

As set out above, the modelled demand parameters are: the decision making frequency, the consumer choice coefficients, and the characteristics of the offer to consumers (in particular the expected future bill savings and the interest rate¹⁶⁴). Each of these is discussed in turn, highlighting the evidence and assumptions that have been used to arrive at parameter values.

15.3.3 Customer decision making frequency

Initial estimates of decision making frequency for the owner occupier sector have been derived from responses to the consumer survey. These results broadly correspond to other surveys of consumer

¹⁶² Where the year 1 bill saving exceeds the Green Deal charge in year 1.

¹⁶³ See Annex D.

¹⁶⁴ The other characteristics of the offer to consumers are largely determined and described by the assumptions set out in Annex A.

behaviour.^{165,166,167} This suggests using decision making frequencies for cavity wall insulation of 26% per year for owner occupiers relating to cavity wall insulation and 6 % for solid wall insulation.

This decision frequency is expected to vary over the Green Deal period for several reasons.

Customers may become increasingly familiar with solid wall insulation, which is currently a relatively new measure with around 100k expected to have been installed by 2013. The consumer survey found that 15% of those with solid walls were unaware that the measure was a possibility, the corresponding figure was around 3% for cavity wall and loft insulation. Increased consumer awareness could therefore increase the decision frequency to around 8%.

The high level of decision frequency observed for cavity wall insulation results from the activity of energy companies under the Carbon Emissions Reduction target¹⁶⁸. It is expected that under the energy company obligation this activity will switch to the promotion of solid wall insulation as cavity wall insulation is proposed as a qualifying measure in limited circumstances only.

Further to this there are several other potential supporting policies that are expected to increase the number of circumstances where householders consider Green Deal home improvements. This includes anticipated promotional activity by Green Deal providers and energy companies in combination with a government sponsored independent advice service that are expected to increase customer awareness and confidence in Green Deal opportunities beyond that found amongst respondents to the 2011 survey. In addition, other policies such as the roll out of smart meters, improvements to energy performance certificates, the renewable heat incentive and feed-in-tariffs provide an opportunity to encourage consideration of domestic energy efficiency improvements and the Green Deal financing mechanism.

To reflect the combination of consumer awareness, additional supporting policies and energy company activity the demand scenarios are based upon a range of decision making frequencies for solid wall insulation ranges from 6% to 10% and 15%.

15.3.4 Customer choice coefficients

As mentioned above the consumer choice coefficients are based on the survey of consumers stated preferences described in annex A.

The coefficients were derived from responses to a “stated preference exercise”. This exercise involved each respondent being faced with a series of choices between three to five home

¹⁶⁵ Energy Saving Trust (2010) “Trigger points: a convenient truth: Promoting energy efficiency in the home”. p5. 22% of homeowners were considering a refurbishment, 85% of whom (i.e. 19% of all homeowners) would consider stretching their budgets to install energy efficiency measures within 3 years.

¹⁶⁶ BERR (2008) “The growth potential for Microgeneration in England, Wales and Scotland”, p 29. 14% of respondents considered installing insulation in the previous year.

¹⁶⁷ One discrepancy is the proportion considering cavity wall insulation appears to be higher than in the earlier surveys. This is plausible since the survey was carried out in early 2011; this is a period towards the end of the CERT period when suppliers activity in promoting Cavity wall insulation is likely have been concentrated over a smaller number of remaining unfilled cavities.

¹⁶⁸ Around 1.5m Cavity wall insulation measures have been delivered by suppliers in the period 2008-2010 under the CERT scheme, see, <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/CU/Documents1/CERT%20newsletter%20issue%2012%20June%202011.pdf>

improvement packages. Each “forced choice” was then followed by a question about where they would take up the measure had they the option to do nothing. This design enabled the use of information about choices between attributes for a larger range of consumers, whilst still deriving results that enabled respondents to choose nothing.

Each respondent was offered around 6 sets of choices of different packages, each with varying levels of attributes. In reality some of these packages might require high subsidies to realistically offer the levels combinations that were offered. This means that the range of packages tested should in general cover relatively large ranges of subsidy.

The baseline estimates reflect the weight placed by respondents to the survey on each of the characteristics that was tested. These were derived by regression to fit a “logit” utility function to the choices made by respondents. The resultant coefficients are summarised in Table 39. Models were tested for a range of different consumer segments including:

- Environmental attitudes (“I’m environmentally friendly in most or all the things I do”)
- Solid wall versus other measures
- Moving house within 3 years
- Owner occupier / private renters
- Household income
- “Likely to take up the Green Deal”
- Respondents who find home “hard to heat”
- A vulnerable and low income group versus non-vulnerable group.

Of the variables tested, splitting the sample according to the low income and vulnerable group provided the largest improvement in the model fit while allowing the calculation of statistically significant coefficients for all of the Green Deal attributes. Using this segmentation has a further advantage in that it matches the segmentation of the housing stock within the Green Deal model, allowing the mapping of all house types to one of two sets of coefficients.

The first set of coefficient describes characteristics of the package that exist for all measures, the possibility for upfront payment of a share of the costs was included in the survey, as long as attributes covering the audit costs the net energy bill savings and the length of the repayment term.

The second set of attributes describes the consumers attitudes towards measures themselves. Measures were presented alongside descriptions of the impact on the house and living space in terms of changes in appearance or usable floor area, along with additional household time or hassle that may be experienced surrounding installation. These provide a combined “bias” against a measure and the associated hassle costs for each measure. The “biases” against solid-wall insulation were generally much larger than for other measures which might be expected as they represent more significant changes to a building’s fabric and imply a larger degree of hassle associated with installation.

Table 39: Consumer coefficients

Characteristics of package	Consumer coefficients	equivalent capital cost (£)
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	affordable warmth group	other households	affordable warmth group	other households
Upfront cost	-0.0003	-0.0003	1	1
Audit cost	-0.0005	-0.0003	2	1
Savings - fixed interest risk	0.0017	0.0034	-7	-12
Savings - variable interest risk	0.0013	0.0031	-5	-11
Repayment - 5 years	0.0000	0.0000	0	0
Repayment - 10 years	-0.1167	-0.1230	466	439
Repayment - 20 years	-0.1443	-0.3394	575	1,212
Repayment - 25 years	-0.1186	-0.3632	473	1,297
SWI internal	-2.5500	-2.1666	10,169	7,738
SWI external	-2.1546	-2.0644	8,592	7,373
SWI internal + boiler	-2.9303	-2.3207	11,686	8,288
SWI external + boiler	-2.5348	-2.2185	10,109	7,923
CWI	-1.4522	-1.3087	5,791	4,674
Loft top up	-1.1467	-0.8613	4,573	3,076
CWI + boiler	-1.8325	-1.4628	7,308	5,224
Loft top up + CWI	-1.5382	-1.3866	6,134	4,952

There are several reasons that these coefficients may not be representative of the ultimate preferences of those who are offered Green Deal packages:

- The survey tested “white label” products rather than “market ready” products that will have been designed to appeal to consumers in different situations.
- The survey was based upon a limited range of choices and characteristics. In reality providers will be able to offer products that differ in other ways, and present those differences to consumers.
- The existence of possibly subsidies was not explicitly mentioned¹⁶⁹.
- The market is likely to target its activity on those more likely to respond, the survey attempted to capture a cross section of all private households.

¹⁶⁹ Responses to other questions suggested that 32% of respondents would be more likely to make their home more energy efficient if subsidies or grants were available.

- Estimates of take up are a short-term measure of uptake (not a long-term forecast model)
- Estimates assume 100% awareness of the Green Deal: if awareness levels are lower, then uptake levels will be lower
- Estimates are a snapshot in time based on respondents' current financial, economic and household situation
- Estimates will be sensitive to changes in the economy, interest rates, etc.
- Estimates may be influenced by good/poor reputation, word of mouth, press, marketing, etc
- The reputation of the Government as a supplier of information/accreditation as well as the partners providing the work will all impact

To reflect these factors, some of the demand scenarios incorporate a reduction in the bias against solid wall insulation so that the bias is 25% closer to that of cavity wall insulation. These “high-scenario” choice coefficients retain a “bias” against solid wall insulation that is in excess of the central estimates of the monetary value of additional household costs presented in annex A.

15.3.5 Expected net bill savings

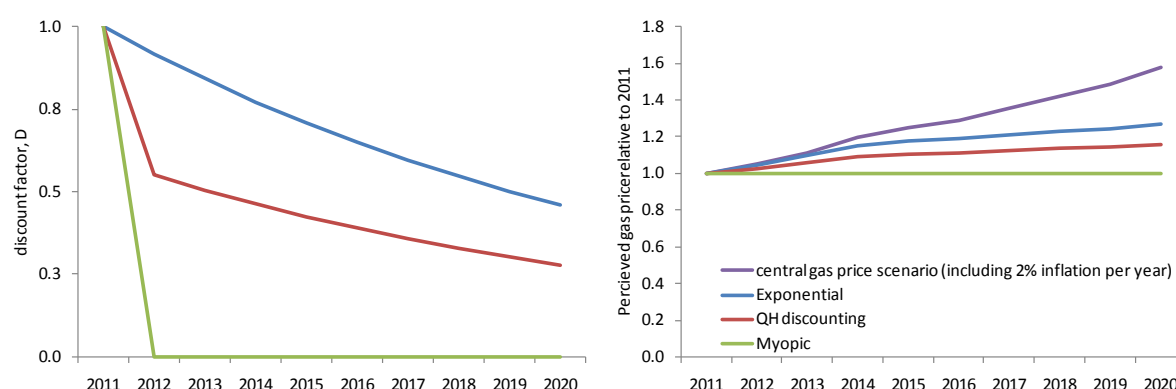
A low take up scenarios is modelled based on “myopic” or short-sighted consumers who consider the annual bill saving to be equal to the year one bill saving throughout the lifetime of the measure.

A high take up scenario is modelled by assuming consumers consider likely increases in retail prices. The annual bill saving is scaled up to reflect the weighted average discounted retail price of the relevant fuel over the lifetime of the measure¹⁷⁰. This scenario represents consumers who are well informed about the future and account for that in their decision making. This reflects successful information provision and promotional activity on the part of Green Deal providers and other parties.

An intermediate take up scenario is modelled in a similar manner but using a “quasi-hyperbolic” discount rate. This involves reducing the discount factor to 60% of the level of the (exponential) discount factor used above for all benefits beyond year 1¹⁷¹. Figure 37 demonstrates the implications of these different assumptions about future perceptions for consumers valuation of future energy prices.

¹⁷⁰ These are based on the projected retail prices stated in the supplementary Green Book guidance on valuing changes in energy use. Whilst consumers are assumed to be long sighted in this scenario, they are assumed to have a private discount rate of 9% per year in nominal terms. This is 2 percentage points higher than the consumer interest rate assumed in the central scenario.

¹⁷¹ This model of quasi-hyperbolic discounting is used by, Laibson, D. (1997): “Golden eggs and hyperbolic discounting”, The Quarterly Journal of Economics, 112(2), 443:77.

Figure 37 Discount rates and perceived present value of future gas prices


15.3.6 Supporting private rented sector regulation

Supporting policy in the private rented sector is assumed to increase uptake in all PRS homes that are rated below the minimum standard. To reflect this in the modelling the main scenarios it is assumed that all private rented sector properties that begin below an E rating undertake at least one of the options available to them that meets the golden rule (their choices are split proportionately among all golden rule compliant choices in accordance with the utilities that would have applied were the home modelled as part of the owner occupied sector). This does not reflect the tenant requests element of the regulations. Monitoring, enforcement and sanctions for non compliance with the PRS regulations is yet to be determined, so a working assumption of 75% compliance has been used. This assumption reflects exemptions as well as non-compliance, and is an assumption made solely for the purposes of modelling Green Deal uptake in the Green Deal Household Model. Exemptions will be set in secondary regulations, and a full Impact Assessment will accompany the consultation on PRS secondary regulations when further details on the possible exemptions are known.

15.3.7 Supporting policy in the social sector

The social sector is modelled with a 20% decision rate and is assumed to adopt all options that meet the golden rule. The social housing sector has historically been active in undertaking energy efficiency improvements under previous energy efficiency schemes. A number Local Authorities and Social housing providers have expressed an interest in the Green Deal as a mechanism for further improvements. In addition improvements in the Local Authority housing stock are likely to contribute to requirements of the Home Energy Conservation Act.

15.3.8 Summary of demand scenarios

Table 40 summarises the parameters that have been used in the demand scenarios that have been used in modelling the impacts of the Green Deal and Energy Company Obligation. The impacts are primarily assessed against three scenarios with the impact of business as usual take up deducted. Other scenarios have been modelled as part of sensitivity analysis and to describe policy options that have been ruled out at the primary stage.

Table 40: Summary of parameters underlying demand scenario

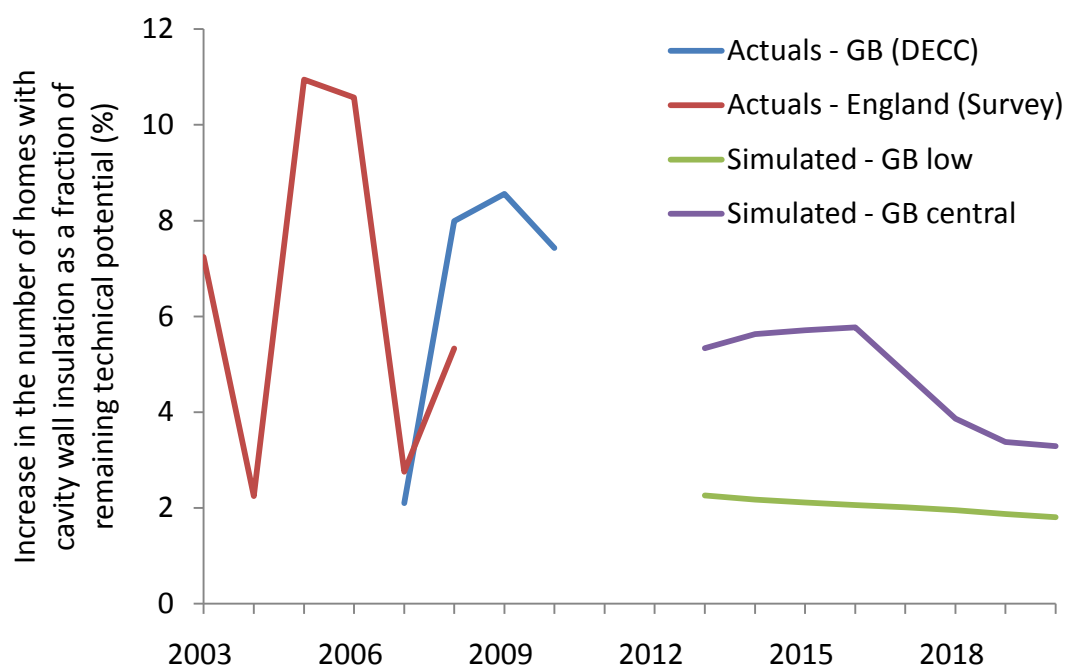
Scenario	0	1	2	3	4
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Parameters	BAU	low	central	high	GD only
Decision making frequency – solid wall insulation	6%	6%	10%	15%	6%
Consumer coefficients	As per survey	As per survey	As per survey	Reduced bias against solid wall insulation	As per survey
Perceptions of future prices	myopic	myopic	Quasi hyperbolic discounting	Exponential discounting	Quasi hyperbolic discounting
Interest rate	7%	7%	7%	7%	7%
Supporting policies	No	Yes	Yes	Yes	No

15.3.9 Calibration of demand scenarios.

The GD scenarios cannot easily be calibrated to historical sales because current policies such as the Carbon Emissions Reduction Target are structured differently, permitting delivery of a wider range of measures than is proposed for ECO. Solid wall insulation has yet to be extensively promoted to owner occupiers under CERT, loft insulation has been focussed on lofts with lower baseline levels of insulation and therefore the installations offer better value. The most similar measure that can be modelled is cavity wall insulation, Figure 38 presents the historical sales of cavity wall insulation and the levels predicted by the model. These are shown as a fraction of remaining technical potential. The levels of subsidy have been set to approximate levels for CERT at 50% for cavity wall insulation in the non-priority group and 100% for the priority group.

Figure 38: cavity wall insulation actual historical installation, and as predicted by the GDHM under different scenarios



15.4 Energy company obligation

The Energy Company Obligation is modelled as a subsidy offered to consumers that reduces the upfront cost, or the repayment period for each measure in each group. The subsidy varies by tenure, measure and whether or not the recipient qualifies for the affordable warmth group, and enters into the consumer uptake function as described above by reducing the costs of measures that consumers face. Higher subsidies result in offers to consumers that have higher net bill savings that are therefore more attractive.

Different elements of the obligation are modelled separately.

1. The carbon target – carbon emissions reductions achieved through the installation of solid wall insulation in all homes
2. Affordable warmth via insulation measures – installation of loft and cavity wall insulation in homes that count towards the affordable warmth target.
3. Affordable warmth via heating measures

Element 1 are modelled using the GDHM with the elements 2-3 being modelled as described in section 15.6.

The marginal cost of the total obligation is found by finding the highest cost per target point measure of all measures delivered over the period.

Identifying the optimal set of subsidies is an iterative process that does not necessarily result in a unique solution. Initially adjustments are made to the subsidy levels of 5 percentage points, reducing the subsidy in the groups that represents the highest marginal cost. Fine adjustments of between 1 and 2 percentage point changes in each subsidy level are then applied, again reducing the highest marginal costs are used to identify the final estimate for any given scenario or level of target.

15.5 Additional measures

The aggregate impacts have included two other measure that have been analysed of model. These are floor insulation and flue heat gas recovery systems.

The impact of each measure has been estimate using the assumption that a they will be included in a package of measures. Floor insulation is assumed to be installed along side SWI and flue gas heat recovered is assumed to be installed along side boiler. For each scenario, 20% of SWI sales are assumed to be accompanied by floor insulation and 20% of boiler sale are assumed to be accompanied by FGHR. Further details on the costs and energy savings delivered by these measure can be found in section 14.1.2.

15.6 Affordable Warmth Target Methodology

The heating and insulation measures delivered under the Affordable Warmth target are currently not included in the GDHM. This is due to the GDHM being focussed on insulation measures and consumer demand for the Green Deal, rather than measures which would expected to receive full upfront ECO subsidy. Consequently a separate economic model has been developed to calculate the level of delivery of heating and insulation measures under the Affordable Warmth (AW) target, and the associated costs and benefits. Modelling of uptake of AW measures is consistent with demand for Warm Front, where there have historically been high levels of uptake for heating and insulation measures where part or all of the cost as been met upfront by the scheme.

The model considers the number of heating and basic insulation measures that are installed over the period for varying levels of spend across the assumed 10 years of the ECO. The starting point for this is with estimates of the number of opportunities to install heating and basic insulation to the AW eligible group. This combines estimates from the English House Condition Survey, the Scottish House Condition Survey and the Living in Wales Survey of the number of households in the AW eligible group where one or combination of: a) there is no central heating; b) a heating system is likely to have come to the end of its lifetime; c) the property has an unfilled cavity wall; d) the property has an unfilled or partially filled loft space. Adjustments to the number of opportunities to install these measures are made for the impact of CERT between 2008 and 2012 and the impact of Warm Front in England over the same time period. The unfilled cavities are split into estimated proportions of those that are relatively low cost to fill ('easy to treat') and those that are more costly to fill ('hard to treat'). The opportunities to install heating systems are estimated by heating fuel type (e.g. gas, oil, electricity, LPG). Recognising that not all opportunities to install measures are actually feasible – for example certain cavity walls may simply not be technically feasible to insulate, or suppliers will not be able to find all eligible households with opportunities to install measures – all opportunities estimates are scaled down by an assumed 15%.

There is uncertainty over precisely how many and of which type of heating or insulation measure would be delivered under the AW target, therefore the current working assumption is that energy suppliers will seek to deliver measures that are most cost-effective in achieving points towards the AW target. The model therefore takes cost data for each measure type – the costs of heating systems are based on historical data from the Warm Front scheme, insulation costs are consistent with the GDHM – and compares these to the number of AW points that a measure would achieve under the metric based on expected lifetime bill savings (see section 9.1.5.1 for discussion of the

options for setting ECO target metrics). It then ranks the measures in the order of cost-effectiveness, with the measure achieving the highest number of AW points per £ of upfront cost classed as the most cost-effective. Measures are then delivered in cost-effectiveness order until the AW target is achieved under each option considered in this impact assessment.¹⁷²

Estimates of Costs

The modelled costs of achieving the AW target consist of:

Direct costs of measures. Once the number of measures to be delivered – in cost-effectiveness order – have been estimated, average direct costs of each measure (i.e. the material costs, time costs of the installation engineer, the cost of a technical survey and one follow up inspection) are applied to the estimated number of measures in each year, to calculate total direct costs of measures.

Administration costs. Cost estimates of administering the scheme are broken into two components: a) a fixed time cost to participating energy suppliers for setting up the scheme in year 1 and administering the scheme in each year thereafter; and b) a variable cost of taking and processing applications for assistance via call centres. Fixed costs are estimated by taking an estimated profile of staff that would be required to operate the scheme for each participating supplier and applying appropriate salary rates to estimate the opportunity cost of their time. Variable costs are estimated by assuming each measure installed requires at least one call, and 30% require a follow up call, with each call valued in line with previous Government experience of assisting low income and vulnerable households.

Hidden costs. Hidden costs for each different type of measure, adjusted from the ECOFYS report on domestic energy efficiency measures¹⁷³ are applied to calculate the costs to households of factors such as having to supervise installations and redecorate afterwards. These hidden costs are equity weighted to reflect that the resources used are likely to be worth more to the poorer households receiving measures than households on higher incomes that receive them. The method for this is detailed in the Equity Weighting section below.

Estimates of Benefits

The modelled benefits of achieving the Affordable Warmth target consist of:

Changes in energy demand. The table below presents assumptions for each heating measure installed in terms of the type and volume of energy used by households before and after a heating measure is installed. These assumptions are used to estimate the energy reduced or increased by fuel type for each measure in kWh, using data from the Building Research Establishment and internal

¹⁷² There are a number of alternative mixes of measures and delivery order choices that participating suppliers could employ. Similarly, there are additional policy decisions that could be taken to incentivise delivery of particular measures through the definition of the metric.

¹⁷³ ECOFYS – *The Hidden Costs and Benefits of Domestic Energy Efficiency and Carbon Saving Measures*. http://www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/saving_energy/analysis/1_20100111103046_e_@@_ecofyshiddencostandbenefitsdefrafinaldec2009.pdf

DECC scientific analysis. Energy savings estimates from insulation measures are consistent with those in the GDHM. Changes in energy use are valued using the variable element of the relevant fuel price listed in the DECC IAG tool kit.¹⁷⁴

Table 41: Assumptions underpinning changes in energy use resulting from installation of Affordable Warmth Heating Measures

Measure	Before installation of Affordable Warmth Measures	After installation of Affordable Warmth Measures
Electric Central Heating	Non-central, non-storage electric heating indefinitely	Use central storage electric
Gas Central Heating	Non-central, non-storage electric heating for 60% of households and 40% of households with gas non-central heating or gas room heating ¹⁷⁵ .	Full gas central heating system
Heating Repairs	Non-central, non-storage electric heating for 60% of households and 40% of households with gas non-central heating or gas room heating – heating is not repaired if Affordable Warmth is not given	Heating repaired. This extends life of existing system (average central heating type) by 6 years.
New Gas supply	No additional impact as savings accounted for in 'gas central heating'	
Oil Replacement	Non-central, non-storage electric heating for 60% of households and oil non central heating for 40%.	Boiler is replaced by A/B – rated boiler in base year
Replacement Boiler	Non-central, non-storage electric heating for 60% of households and 40% of households with gas non-central heating or gas room heating.	Boiler is replaced by A/B – rated boiler in base year
Warm Air Replacement	Non-central, non-storage electric heating indefinitely.	Boiler is replaced by A/B – rated boiler in base year
LPG Replacement	Non-central, non-storage electric heating indefinitely.	Boiler is replaced by A/B – rated boiler in base year

It is assumed that all households heat to 18°C before an installation and 19°C after an installation¹⁷⁶. The energy changes relating to the installation of a new heating system will be dependent on other characteristics of the dwelling, in particular the level of insulation present. The level of insulation is assumed to be the average for cavity wall homes (around 70%) and no insulation for solid wall homes (around 30%) prior to installation or replacement of a heating system. After heating measures are installed it is assumed that if a household's cavity wall was not filled pre-intervention, it would be filled at the same time as the heating system is installed. The same is assumed for solid walled properties, where it is assumed insulation would be installed with partial or full ECO subsidy (see above for a discussion of whether there may be a need for a distributional safeguard).

¹⁷⁴ http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx

¹⁷⁵ This is based on data from Warm Front which shows that when a heating system was not fully functional pre-installation, around 60% of households used non-central electric heating, and around 40% used non-central gas heating.

¹⁷⁶ Based on evidence from the Warm Front Evaluation for the average internal temperature pre and post intervention; see Green, G. and Gilbertson, J. (2008), available at : <http://www.apfo.org.uk/resource/item.aspx?RID=53281>

Reductions in the value of greenhouse gas emissions. Carbon dioxide equivalent savings are estimated by applying the appropriate emissions factors by fuel to the estimated changes in energy. These are then monetised using the EU ETS price (for traded carbon) and the DECC non-traded carbon price (for non-traded carbon).

Improvements in air quality. Air quality impacts are valued using national average air quality damage cost per kWh of fuel used or saved. It should be noted that due to a considerable amount of fuel switching there are some negative benefits associated with particular fuels.

Comfort taking. The assumed change in temperature within the property reflects comfort taking by the householder, and is based on empirical observations of households that have received Warm Front measures in the past, where on average households heated their homes to a greater level post-installation. By estimating the energy use of this increase in temperature it is possible to estimate the value of comfort taking, using the domestic retail price. The energy bill associated with heating the property to 18°C post-installation is compared to the energy bill to heat to 19°C. The difference between these numbers is the forgone energy bill saving by the household and is a representation of the value they assign to having an extra degree of heat. This is valued using the retail energy price for the relevant fuel on which comfort is taken.

In addition, a number of additional benefits can be monetised in relation to societal benefits of benefits being targeted at low income and vulnerable households. These are considered below in Section 15.7 below.

Affordable Warmth Points Target

The illustrative points target with the Affordable Warmth target are based on the cost savings presented on the EPC assessment conducted when a measure is installed, which assumes a household heating regime that reaches internal temperatures of 21°C in the living room. It also assumes that where a central heating system is not present, the household by default uses secondary electric heating. For heating measures the points per installation are the net energy bill reduction associated with switching from secondary electric heating to a working central heating system; i.e. cost of heating prior to receiving a measure minus cost of heating afterwards. For insulation measures the points per installation are calculated by taking the net energy bill reduction – again assuming a heating regime that achieves internal temperatures of 21°C in the living room – from installing either one or a combination of cavity wall and loft insulation. The total points are an aggregation of the expected lifetime bill savings¹⁷⁷ for each measure, for all properties over the 10 year period ECO is assumed to roll out for.

ECO subsidy level

The ECO subsidy assumes the market clearing price is used for all measures. This is the cost of the marginal measure to achieve each interim target, rather than the average cost of measures installed (which is applied for the social cost). The difference between these costs is a transfer and thus is not a cost to society. Therefore, this economic rent is not included itself in the net benefit to society, but it does impact the size of the ECO subsidy and ultimately the impact on consumer bills. The societal

¹⁷⁷ Using the DECC retail price estimates rather than an average of the previous two years which is the procedure in the EPC.

benefits associated with the proportion of rents that are captured by low income and vulnerable households are included in estimates of the equity-weighted benefit considerations set out in section 15.7 below.

15.7 Equity weighting in the Green Deal and ECO model

Equity weights were applied to different costs and benefits to capture the value to households of the inherent transfers associated with the scheme. Equity weights were applied in line with Green Book guidance¹⁷⁸ to the reduction in household energy bills, the comfort taken and to the hidden costs.

The equity weighting associated with each income decile is calculated as the ratio between the marginal utility of consumption for that decile and the average marginal utility of consumption across all deciles. These are calculated in accordance with Green Book guidance using the median level of income in each income decile. The marginal utility of consumption for each income decile is calculated using the Green Book methodology; assuming that the elasticity of the marginal utility is one, then this implies that the utility function is $U = \log C$ (where C is consumption). Consequently the marginal utility of consumption is $1/C$. In addition it is also assumed that the marginal propensity to consume is one therefore all income is spent on consumption. So for example the marginal utility for the lowest income decile is $1/7500 = 0.000133$. The equity weighting is calculated by dividing each income group's marginal utility by the average marginal utility of consumption.

Table 42: Equity weightings across income deciles

Income Deciles	Average Income	No of HH	Total income	Marginal U of Consumption	Equity Weight
1	£7,500	2,529,000	£18,967,500,000	0.000133	3.46
2	£10,600	2,525,000	£26,765,000,000	0.000094	2.45
3	£13,400	2,530,000	£33,902,000,000	0.000075	1.93
4	£16,400	2,530,000	£41,492,000,000	0.000061	1.58
5	£19,800	2,529,000	£50,074,200,000	0.000051	1.31
6	£23,700	2,525,000	£59,842,500,000	0.000042	1.09
7	£28,300	2,531,000	£71,627,300,000	0.000035	0.92
8	£34,100	2,532,000	£86,341,200,000	0.000029	0.76
9	£42,900	2,526,000	£108,365,400,000	0.000023	0.60
10	£62,500	2,532,000	£158,250,000,000	0.000016	0.41

¹⁷⁸ Page 91 of the Green Book: http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

Total		25,289,000	£655,627,100,000		
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Average

Income £25,925

Average

Marginal U $4E^{-05}$

A range of cost and benefit transfers are taken into account. These are:

- Energy bill savings – for households receiving 100% ECO subsidy
- Energy bill savings – from future energy price rises for households receiving Green Deal measures
- Comfort taking
- The interest on the Green Deal charge
- ECO pass through cost onto consumer bills
- The economic rent associated with the ECO subsidy
- Hidden costs to the householder

Installation costs under Green Deal and social benefits have not been considered for equity weighting as they are an investment and return to society and do not represent a transfer from one section of society to another. There are also a range of groups that are considered with a different distribution of the costs and benefits. Table 43 presents the spread across the different income groups under these different groups.

Table 43: Spread of benefiting households across income deciles for an illustrative vulnerable group proxy

Income Deciles	Affordable warmth group ¹⁷⁹	Non-affordable warmth group	Carbon obligation group ¹⁸⁰	Equal distribution
1	0.15	0.09	0	0.1
2	0.23	0.08	0	0.1
3	0.22	0.08	0	0.1
4	0.2	0.09	0.14	0.1
5	0.11	0.10	0.14	0.1
6	0.05	0.11	0.14	0.1
7	0.02	0.11	0.14	0.1

¹⁷⁹ Spread of CWP and CTC <£16k across deciles

¹⁸⁰ This differs from the non-affordable warmth group as it assumes that no households below income decile 4 receive a measure.

8	0.01	0.11	0.14	0.1
9	0.01	0.11	0.14	0.1
10	0	0.11	0.14	0.1

The benefits and costs accruing to each decile subsequently receive the relevant equity weight and are summed across income deciles to represent the total equity benefit or cost. The net equity impact is then gained by subtracting from these totals the un-weighted hidden cost and comfort taken respectively, to avoid double counting the benefit or cost in the NPV figures.

The net equity impact hence represents the additional value of the benefit or cost to the household over the un-weighted value included in the un-weighted NPV.

Equity weighted energy bill savings

These benefits differ for separate parts of the ECO and Green Deal.

One group is the affordable warmth group which it is assumed will receive 100% ECO subsidy and thus will have energy bill benefits from year one. The total energy bill benefits for the lifetime of the measure are considered. These benefits are then assumed to be spread across the income deciles for households within the affordable warmth group before being multiplied by the income equity weightings and the difference between these and the non-equity weighted savings are presented.

The second group of energy bill savings is for homes receiving measures under the Green Deal and therefore not receiving a bill reduction in year one. However, due to expected energy retail price increases over time they will see future bill savings as a result of lower consumption. These bill savings are assumed to be spread across the non-affordable warmth group and the same methodology is followed.

Equity weighted hidden cost and comfort taken

The estimated hidden costs and comfort taken are distributed between income deciles according to the estimated of who receives measures – the table above presents this distribution for the Affordable Warmth and non- Affordable Warmth groups.

Equity weighted interest of the Green Deal Charge

The interest of the charge is seen as a cost to households receiving green deal, however the benefit is faced by banks and their shareholders. This is then considered as a cost using the non-affordable warmth distribution, but the benefit is assumed to be distributed across all groups equally (assuming that shareholders are spread equally across society). The net result is the difference between the two.

ECO pass through onto consumer bills

It is assumed that all consumers will see bill increases as a result of funding the ECO. Thus the costs are spread equally across all income groups. The difference between the equity weighted and non-equity weighted numbers will be used as the net equity weighted ECO bill increase impact.

Economic rent associated with the ECO subsidy

The economic rent is a result of the ECO subsidy level for each measure being set at the market clearing rate (marginal subsidy level). This rent will therefore be a transfer from household energy bill payers to either households receiving measures or installers/energy companies. It is assumed that the beneficiaries of the rent are split equally between installers/companies and householders. The proportion received by companies is assumed to be taken as profit and is removed from the redistribution. The proportion received by households is assumed to go to the carbon obligation group as low income and vulnerable homes are unlikely to participate in the Green Deal and will lack the bargaining power to ensure they receive the benefit. As the cost of the transfer is spread across all household bills the equal distribution group is assumed. The net equity weighted impact is the equity weighted benefit minus the equity weighted benefit.

16 Annex C: The Non-Domestic Green Deal Model

16.1 Overview

Two separate models have been used to determine the impacts of the Green Deal in this IA: the first models the voluntary take-up of energy-efficiency financed through the Green Deal amongst the whole non-domestic building stock; while the second models the impacts of a supporting policy which, for the purposes of this IA, is assumed to be a measure encouraging an improvement in the private rented sector's (PRS) least efficient properties' energy performance certificate (EPC) rating, through cost effective measures.

These models are run sequentially, with the outputs of the former feeding into the latter. This ensures that only the additional impact of the PRS supporting policy is accounted for, given that there is likely to be some voluntary take-up of Green Deals in PRS properties with poor EPC ratings. These models are described in turn below.

16.2 Non-domestic Green Deal model

This model is used for the analysis of the impacts resulting from the voluntary take-up of the Green Deal in the non-domestic buildings sector. It takes as a starting point the likely cost-effective abatement potential of buildings by type of measure; it determines which measures are likely to meet the Golden Rule to qualify for the Green Deal, then looks at the likelihood of different agents in the sector deciding to undertake a Green Deal.

Figure 40 presents the relationship between the various elements that contribute to the modelling. The main components of the model are summarised as follows:

1. Produce a profile of the building stock suitable for Green Deal measures

Data from the Valuation Office Agency (VOA) gives the number and rateable value of buildings by sector in the year 2010, to a substantial level of disaggregation. This information is used to provide a framework for aggregating specific snapshots of eligible buildings to a Great Britain total.

This is then applied to work commissioned by the Carbon Trust, from AEA¹⁸¹. This identified a sample of typical, but hypothetical, properties in different commercial sectors and assessed the bundles of measures that would be eligible for a Green Deal, based on compliance with the Golden Rule.

For this work 20 snapshots were assessed, representing some of the most significant contributors to emissions in the non-domestic sector. The selection of snapshots was determined through a consideration of several factors including the stock of buildings in the sector, the aggregate 'unconstrained'¹⁸² energy consumption of buildings in the sector, and AEA expert judgement. The snapshots included are listed in Table 44.

¹⁸¹ Analysis of Green Deal measures – payback in the non-domestic sector, with separate Excel spreadsheet, http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx

¹⁸² Those emissions not covered by the EU ETS, CRC Energy Efficiency Scheme, and Climate Change Agreements.

Table 44: Properties included in AEA analysis

- Small office
- Medium office, single occupancy
- Medium office, mult. occ., 1 floor in large building
- Large office including data centre
- School in one medium sized building
- Medium multiple building school
- Med-sized leisure centre with swimming pool
- Heated warehouse - medium size. No cooling
- Small industrial unit (light manufacturing)
- Heated warehouse - medium size. No cooling
- Hotels and catering - Hotel in listed building
- Air conditioned prestige hotel
- Small food shop
- Medium size store in outlet centre
- Medium department store
- Large supermarket
- Hotels and catering - Pub
- Hotels and catering - B&B
- Medium industrial unit
- Surgery (small building)
- Hospital (large building)

The specifications of each of these snapshots were determined according to judgement of what constitutes a 'typical' set of characteristics for the building, including size; age; building materials; occupancy; energy bills; and typical fabric. Following this, a choice of energy savings measures were determined, based on the relevance to the building; the speed of payback; the Green Deal eligibility criteria; and the need to consider a portfolio of savings measures. The energy savings and costs associated with these measures were also assessed.

For each of these snapshots, the potential Green Deal measures were grouped into bundles to represent choices of energy savings packages that could be adopted under a Green Deal.

Finally, these properties, bundles and measures are then aggregated by the non-domestic Green Deal model to determine the stock of buildings and Green Deal opportunities in the sector.

2. Produce a Business As Usual (BAU) profile of take-up of measures

The scale of abatement potential from Green Deal-type measures (those that are fabric measures that meet the Golden Rule) is estimated using the National Non-Domestic Buildings Energy and Emissions Model¹⁸³ (N-DEEM), together with technology penetration rates as estimated by Element Energy.¹⁸⁴ This produces a profile of what remaining potential for uptake of Green Deal measures is likely to be over the period in question. This potential is then adjusted for take-up brought about by other, non-Green Deal, policies, based on projected policy savings that are derived from DECC's energy model. This is to eliminate double counting of savings. The take-up of measures under the BAU and under the central scenario of the Green Deal is indicated in Table 45. Note that these figures do not account for take-up as a result of supporting policy within the private rented sector.

Table 45: BAU and Green Deal take-up of measures

Measure	Energy savings potential in 2012	Energy savings achieved under the	Additional savings made under Green
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¹⁸³ NDEEM was developed by the Building Research Establishment to provide an insight into energy use and abatement potential within the country's non-domestic properties. Christine Pout: "N-DEEM: The national non-domestic building energy and emissions model – an overview," in: Environment and Planning B: Planning and Design 2000, volume 27, pages 721-732

¹⁸⁴ Element Energy – *Uptake of Energy Efficiency in Buildings* – 2009.

http://downloads.theccc.org.uk/docs/Element%20Energy_final_efficiency_buildings.pdf

	(TWh)	BAU in 2020 (TWh)	Deal in 2020 (TWh)
Compressed Air	7	4	0
Air conditioning	1,250	1,238	0
Programmable Thermostats	16,344	6,832	252
TRVs	5,458	2,639	41
Flat roof insulation	5,411	1,001	83
Pitched roof insulation	3,627	697	55
SWI	23	8	0
CWI	760	211	6
Energy-saving lighting	3,428	2,038	43
Lighting timers	9,178	2,678	223
Motors	6	2	0
Double Glazing	146	94	1
HF Ballast (Lighting)	379	243	4

3. Assess customer preferences for bundle types and the Green Deal

The outputs from the above steps are combined into three main scenarios for take-up of Green Deal measures. These are:

Low: where additional policy targeted at the private rented sector is implemented, but with significant proportions of the potential savings in the sector being undeliverable by the policy. Organisations' preferences are for measures that pay back rapidly, with Green Deal finance agreements being shorter in duration as a result.

Central: which includes supporting regulatory policy targeted at the private rented sector, but with some limitations regarding its deliverability. Organisations' preferences are still for measures that pay back more quickly, but they are more willing to consider more comprehensive packages with longer paybacks. Finance arrangements are on average longer to accommodate the packages with longer aggregate payback periods.

High: which similarly includes supporting regulatory policy, but in a scenario where there are fewer barriers preventing delivery. Organisations prefer more comprehensive packages that comply with the Golden Rule, even when payback periods are extended.

A decision tree is used to determine the process of moving towards a decision to take out a Green Deal. It considers the interaction between the market's participants – such as tenants and landlords – and attributes likelihoods of continuing towards a Green Deal at each major decision point they face. This gives a framework with which to model the take-up of the Green Deal when decisions are influenced at different points along this journey.

A summary of the results of this modelling are shown in Figure 39. By considering the different participants in the Green Deal market, it is possible to apply different likelihoods of undertaking certain actions. This approach reflects the different barriers facing the three groups. It is possible to see that the smaller number of barriers present in the owner-occupier sector, due to there being no need to consult with a third party, results in a greater take-up of Green Deals. Conversely, tenants face the most significant barriers as they are often required to consult with their landlord first, and are also only likely to receive benefits for a limited number of years due to the tenancy period. This has the result that fewer Green Deals are taken out by tenants than by landlords.

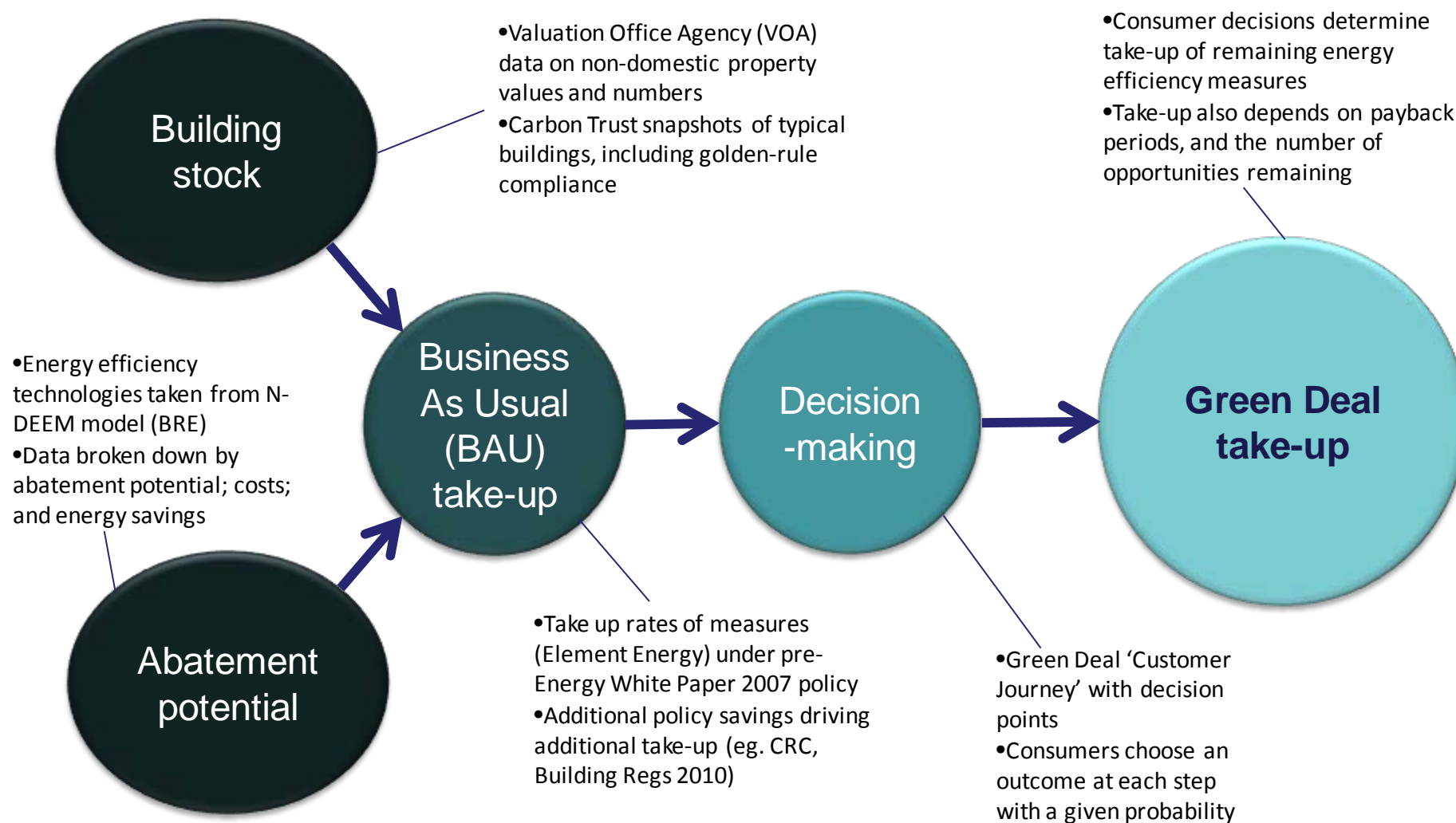
Figure 39: Results of consumer decision-making analysis during a single tenancy period (PRS) or during a 10-year period (Owner-occupier sector)

	% of landlords who...	% of tenants who...	% of owner- occupiers who...
Have an assessment	13.7%	4.7%	11.4%
Obtain quotations for work	9.8%	1.7%	9.1%
Undertake energy-management	22.8%	21.3%	28.5%
Don't abate	78.9%	88.5%	52.1%
Self-finance their abatement	17.5%	8.3%	43.8%
Refer to their tenant/landlord	0.5%	2.6%	N/A
Take out a Green Deal	3.0%	0.6%	4.1%
Green-Deal-triggered (self-financed)	1.3%	0.2%	2.0%
Total Green Deal stimulus	4.3%	0.9%	6.1%

4. Produce cost-benefit analysis

Step 3 allows for a profile of Green Deal-driven installations to be produced, from which costs and benefits may be analysed. These follow Green Book guidance and include time-series valuations of carbon, energy, air quality, the costs of undertaking assessments, the costs of finance, and hidden costs. Hidden costs are assumed to be an additional 20% of the capital costs (see Annex A) for Green Deal measures, and are factored in to the costs to the consumers. It is assumed that these are not visible at the time of decision-making, and do not affect the rate of take-up of Green Deals.

Figure 40: Non-domestic Green Deal model process



16.3 Private Rented Sector-Focussed Supporting Policy Model

The impact of a supporting policy targeted at the PRS sector is modelled separately from the voluntary take-up of the Green Deal. This is because of three main factors:

- this policy is likely to provide a stronger incentive for landlords to consider energy-efficiency measures that are Green Deal-compliant;
- this policy would affect a subset of the total stock of premises that can qualify for the Green Deal; and,
- the mix of measures is likely to be different from those who voluntarily utilise the Green Deal, where there is no requirement to link the measures and a premises' EPC rating.

A working assumption to model this policy has been to apply it to all new tenancies taken out in premises with an EPC rating of F or G, the least energy efficient bands. It is further assumed that it would require these premises to undertake all the energy efficiency improvement measures compliant with the Golden Rule, which would improve their rating to E or better. Due to the strictness of the Golden Rule criterion, some buildings' physical constraints and the rate of turnover of leases, the model suggests that not all rented premises would achieve an E rating if this policy was fully bedded into the market.

The process undertaken to estimate the figures is as follows:

- **Identify total abatement to move band F and G-rated buildings to band E**
This is based on analysis undertaken by the Carbon Trust¹⁸⁵, which identifies the average costs and savings that would be required and delivered for a typical building to move up from a specified EPC rating to another. Adjustments are made so that this analysis is consistent with The Green Book's¹⁸⁶ appraisal guidelines. Further adjustments are made to model just those buildings in bands G and F, and determine how much abatement they would require to move to band E.
- **Reduce to the scope of PRS-focused supporting policy**
Several factors limit the deliverability of the energy efficiency opportunities initially identified. Achievement of the Golden Rule once finance has been taken into account; exemptions for listed buildings; the inability to get to an E EPC-rating with Green Deal-compliant measures; and other individual circumstances are each likely to affect the impact of such policy. To account for these constraints, an 'undeliverability' factor has been applied (35%, 25%, and 15% of the identified abatement potential for the Low, Central and High take-up scenarios respectively), and a consideration of the distribution of the cost-effectiveness of measures has been made.
The rate of non-compliance with any such potential regulation is likely to be higher in the non-domestic sector relative to the domestic sector. The primary reason for this is that there is much greater uncertainty regarding future energy savings within a particular property. A future tenant's use of a building is likely to be unknown, since successive

¹⁸⁵ *Building the Future, Today*

<http://www.carbontrust.co.uk/Publications/pages/publicationdetail.aspx?id=CTC766>

¹⁸⁶ The Green Book, HM Treasury http://www.hm-treasury.gov.uk/data_greenbook_index.htm

tenants are often likely to engage in different activities within the building. As a result of this, the cost effectiveness of future energy savings are much less certain. This is in contrast to most properties in the domestic sector, where energy usage within the property is likely to be more stable for future tenants.

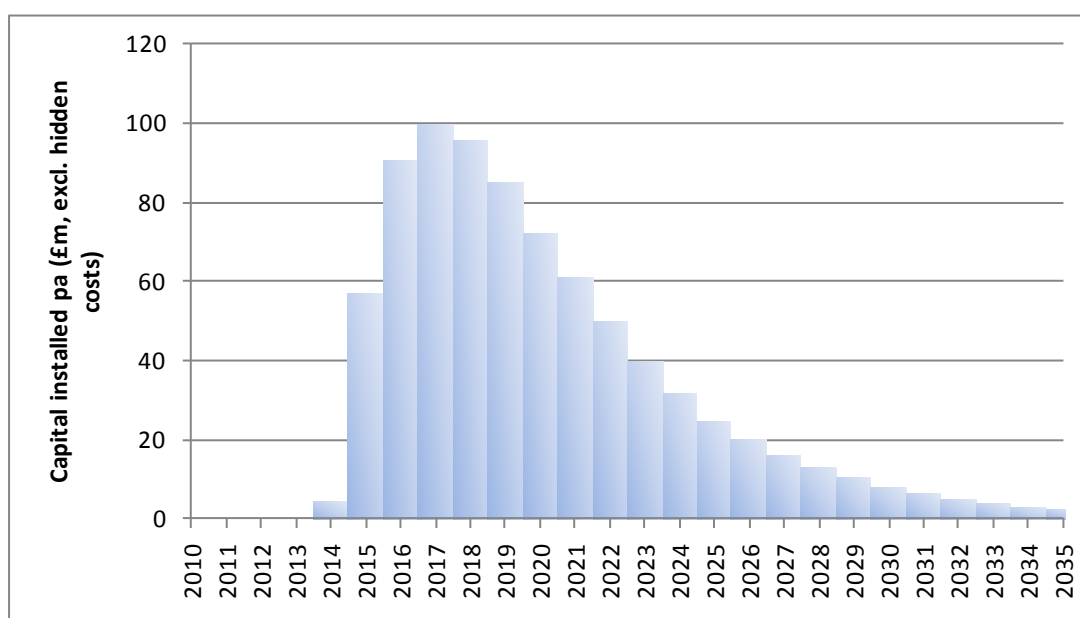
- **Account for BAU uptake and existing policy coverage**

N-DEEM and the analysis for the voluntary Green Deal take-up are used to assess the level of take-up of relevant measures being driven by existing policy or in the BAU. This is to avoid double counting and excess attribution to the regulation.

- **Fit PRS-focused supporting policy savings to annual profile**

The aggregate savings derived from the supporting policy are applied to an annual profile of take-up, demonstrated for the central scenario in Figure 41. This is dependent on the year of introduction of the policy, and also the average period of a lease. There is also expected to be some pre-compliance with the anticipated policy, as landlords anticipate its introduction.

Figure 41: Annual energy efficiency capital installations as a result of regulation in the non-domestic PRS



- **Produce cost-benefit analysis**

The annual profile of installation of measures allows a time-series of the relevant components to be created, from which net present costs and benefits are calculated.

17 Annex D: Consumer Insight/Social Research

17.1 Understanding potential consumer response to the Green Deal

This research summary presents the key findings from three pieces of research commissioned by the Department of Energy and Climate Change between December 2010 and April 2011. The research aimed to capture initial consumer response to the Green Deal – a new Government framework designed to improve the energy efficiency of Britain’s building stock.

17.1.1 Methodology

The research aimed to provide an understanding of overall response to the Green Deal concept, any key motivators or barriers and concerns or issues from a consumer perspective. Views on key Green Deal components relating to advice, assessment, installation and accreditation and finance were gathered.

The research comprised:

- A survey of a representative sample of 2,023 participants across Great Britain. The sample covered 1,684 owner-occupiers and 339 tenants in private rented properties.
- Qualitative research with homeowners and small to medium sized enterprises (SMEs). Eighteen discussion groups with a broad range of homeowners; and 16 in-depth interviews with vulnerable homeowners and 16 in-depth interviews with SMEs were conducted.
- Qualitative research with landlords and tenants in the domestic private rented sector and among businesses. The sample included 10 focus groups with tenants (in both the domestic and commercial sector), 2 focus groups with domestic landlords; and 8 in-depth interviews with domestic landlords and 8 in-depth interviews with commercial landlords.

The Green Deal was presented in the research using neutral terminology as a “new initiative” or “home improvement plan”. The term Green Deal was not used but is used in this summary for ease of reference. It was also not presented as a Government initiative and any reference to Government involvement was spontaneously raised by research participants.

The social housing sector was not covered and remains an important area for future research.

Findings across all pieces of research were fairly consistent and an overall summary is provided. Where differences were observed between groups, these are presented. Any percentages refer to findings from the survey.

DECC’s research with consumers is published alongside the publication of the ‘Green Deal and the new Energy Company Obligation (ECO) consultation on secondary legislation’ which sets out the policy proposals for developing the Green Deal.¹⁸⁷ Some of the proposals are highlighted in this summary where there is a direct link to the research findings.

¹⁸⁷ See http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx

Caveats

It is important to note that the research tests reactions to an initiative at the early stages of development. The Green Deal will be delivered through private sector providers who will develop, communicate and market it, to maximise demand. Since the Green Deal is a future initiative yet to be market tested, this research could only cover initial reaction to the overall concept and core elements. In reality, the offer put to the consumer may build on an existing awareness of the Green Deal and take a variety of forms and include incentives which could not be accounted for in this research.

17.1.2 Key findings

17.1.2.1 Demand for energy efficiency improvements

The top reasons participants gave for being prevented from doing more to make their home energy efficient was a lack of money (35%), already doing enough (24%), too much hassle or disruption (15%) and a lack of time (15%).

Participants said they would be encouraged to make their home more energy efficient if it led to a reduction of costs (46%), at the availability of a subsidy or grant (32%), if they had convincing information that installing measures would lead to a warmer home and lower energy bills (24%) and if they received information from a trusted source on how to reduce energy use (19%). Discussions with participants showed an expectation among some that energy efficiency measures should be discounted based on general awareness of deals or grants, or having either received or seen them advertised in the past.

In the survey, when participants were asked to select between different Green Deal packages, the key influencing factor driving preference was the type of energy efficiency measure (32% of likely take up was influenced by a preference for a particular measure) suggesting that a perceived need or desire for energy efficiency measures is required to give impetus to the Green Deal.

17.1.2.2 Attractiveness of the Green Deal

The main attractions of the Green Deal for participants were lower energy bills (67%), a warmer, more comfortable home (46%), not wasting energy (37%) and being better for the environment (24%). Almost a fifth of participants (18%) said it was good that it enabled a spread of payments over time. While lower energy bills are important, many people seek warmer homes and benefits for the environment.

Some of the features perceived as less attractive were the cost of improvements (35%), the length of the payment term (33%), the hassle/physical disruption of making improvements (31%) and uncertainty about the costs being on the energy bill of the property (20%). A third (33%) had a preference to pay the cost up front rather than spreading it over time.

17.1.2.3 Trigger points

The survey found that preference for taking out a Green Deal was driven by the perceived need for an energy efficiency measure. Green Deal packages including boiler replacement or upgrade

were more popular than packages with unfamiliar measures such as solid wall and underfloor insulation.

Discussions with participants identified a number of trigger points for when they would consider taking up energy efficiency measures. These included the purchase of a new property – particularly a long-term investment or final move, a major renovation or refurbishment of a property and the replacement of a boiler or heating system. The survey showed a higher than average likelihood of taking up a Green Deal package among those who had undertaken recent changes and who were planning to move or refurbish their homes soon.

In the survey, three fifths of participants said they plan some home improvements in the next 12 months with a third planning substantial refurbishments.

17.1.2.4 Key audiences

The survey showed that the groups with higher levels of interest in taking up a Green Deal offer were younger, male, those on means tested benefits, households needing two or more energy efficiency measures, those with homes that are hard to heat, those who struggle to pay their bills, those who live in rural areas and the affluent. In contrast, the survey also showed that those households including someone aged over 70 or in receipt of a benefit were less likely to take up a Green Deal offer compared to those in the non priority groups.¹⁸⁸

17.1.3 Participants response to elements of the Green Deal package

17.1.3.1 Advice

Participants said they would expect individual Green Deal providers to be the main contact point for advice and support and for lodging complaints. However, a separate contact advice service was viewed as being helpful at three points: Firstly, at the contemplation stage (prior to committing to an assessment) to seek advice on a property's suitability for the Green Deal; secondly, following the assessment and prior to selecting a provider, to access price comparison information online; and thirdly, as a final course for redress, if a complaint is not dealt with satisfactorily by a Green Deal provider.

17.1.3.2 Assessment

Discussions with participants showed that a particularly appealing aspect of the Green Deal was the tailored onsite assessment providing people with recommendations based on their property, household occupancy and current energy usage. There was support for being able to take the recommendations from an assessment and shop around among providers for the best deal. The survey showed that 68% of participants said they would be more likely to take up the Green Deal if they were able to choose from a range of suppliers to carry out any work, after the assessment. A further fifth of participants (21%) said it would make no difference to their likelihood of take up and a minority (10%) said it would reduce their likelihood of take up.

¹⁸⁸ Priority groups defined under CERT include people in households with someone aged over 70 or in receipt of a benefit.

Discussions also showed that participants wanted assessments to cover behavioural advice on how to improve their energy efficiency so they could ensure they maximised potential savings available through Green Deal measures. In the consultation document, we propose that assessments cover the wide range of efficiency measures available at a property, including behavioural advice.

Consumers expressed a preference for the assessment to be by invitation/ appointment only. There was a general reluctance for a “hard sell” approach by providers, with marketing tactics used by a number of cold calling or door-to-door salesmen disliked.

17.1.3.3 Installation

Discussions with participants showed a preference for choosing an installer from an approved list of suppliers made available through Green Deal providers. There was an expectation that local tradesmen could be accessed via these lists.

Participants wanted to see installers’ credentials and ensure they were working to minimum standards. This would include warranties for the installations and the products installed, as well as high standards of customer service. There was an expectation that installers would be courteous and to leave a property in a good state. We are working with industry groups to develop strong accreditation standards and a code of conduct to reflect consumer expectations. Views are invited on the draft code of conduct attached to the consultation document.

17.1.3.4 Accreditation

Seven in 10 participants said their likelihood of taking out a Green Deal would be increased if installers and assessors were skilled and regulated. For just under a fifth of participants it would not have any impact on whether they took out a Green Deal, and for a minority (10%) it would reduce the likelihood of take up. Discussions with participants showed that they felt accreditation would help alleviate concerns about not receiving objective advice and having to deal with untrustworthy (‘cowboy’) builders.

In the research, participants were presented with a list of well known supermarkets, energy companies, DIY stores, high street retailers and building merchants and asked to identify which they thought might be a future Green Deal provider. The research showed that the potential wide variety of players in the market was welcomed by participants. They expected to see energy companies operating in this market, given that they are already associated with energy efficiency measures, but were also interested to see a range of other potential new players involved. Well known brands were considered to offer high standards of customer care and have suitable infrastructure and stability.

17.1.3.5 Visibility of Government

Discussions with participants showed an automatic expectation of a Government presence in the Green Deal, both at a local and national level. Participants wanted national Government to set regulations for standards of the work carried out under the Green Deal. Participants also felt it was

important that Government was involved in setting and communicating the context and rationale for the Green Deal and helping to instil consumer confidence. In order for the Green Deal to enjoy widespread acceptance it was felt that endorsement by a trusted source was needed. Government was seen to be linked to encouraging positive environmental behaviours; and local Government was particularly viewed as a sector that could have a role in promoting the Green Deal. The policy proposals in the consultation document set out a number of ways in which local Government can get involved. National Government will also help build confidence in the scheme through a national energy efficiency advice service.

17.1.3.6 Financial

The survey aimed to understand participants' preferences in relation to Green Deal finance and how this might impact on overall demand. Participants were asked to choose which Green Deal package they would prefer based on a number of varying financial attributes. These were: the cost of an assessment, upfront payment, net savings, terms of payment and type of interest rate.

The findings showed that the greatest influence on choice of packages was the attraction of a particular measure (accounting for 32% of the preference for the Green Deal) followed by the length of the payment term (25%), level of net savings (18%) and lack of upfront cost (15%). Characteristics of the financing package such as a fixed or variable payment (7%), and the cost of the assessment (4%) were relatively less important. Participants preferred shorter payment terms, no upfront costs, no cost for the assessment, and high net savings.

The Green Deal presents a novel idea of the cost of energy efficiency improvements being attached to energy bills rather than to the individual or property. The survey found that just over half (53%) of participants said this method of payment would make them more likely to take up the Green Deal; almost a quarter (23%) said it would make no difference to their likelihood of take up and a similar proportion (22%) said it would make them less likely to take out the Green Deal.

Some participants were uncertain about the idea of passing on the charge and tended to see themselves liable for the full payment term, often considering it as a personal debt. Many were uncomfortable taking on repayments on their energy bills over a long period of time. The policy proposals in the consultation document are flexible enough to meet the needs of those who wish to extend the duration of the charge to the maximum permissible length as well as those who would rather pay the charge over a shorter time period, provided it still meets the golden rule. Nonetheless, Government will continue to work with potential Green Deal providers and other stakeholders to consider best how to communicate the difference between Green Deal finance and conventional personal debt.

Findings showed that no upfront costs could be a motivating factor to take up the Green Deal, but participants were also attracted by higher cost savings within the payback period. The overall novelty of the finance mechanism led to an understandable desire for a more flexible payment approach e.g. part-financing measures, early repayment or shorter payback periods. The policy

proposals in the consultation document are entirely flexible: customers can part-finance Green Deal, repay early, or choose shorter repayment periods within the terms of the agreement. Over time, we would expect more consumers to become familiar with Green Deal finance and be more willing to take advantage to the fullest extent. We will be looking at how best to communicate the message that as fuel bills rise, consumers will see increasing levels of savings over time.

While participants liked the cost of any energy efficiency improvements being covered by savings on their energy bills, they wanted reassurance over the level of the net saving, if they took out a Green Deal. A lack of a guarantee for the savings reduced interest in the Green Deal with 62% of participants saying it would make them less likely to take it out, of which over a fifth (22%) said it would make them much less likely. A further quarter (24%) said having no guarantee would make no difference to their decision. The desire for a guarantee was particularly strong from those who struggled to pay their energy bills. Many packages of measures considered in the consultation document will deliver significant enough expected net savings to reassure consumers that they are likely to be better off. Government is also introducing a new Energy Company Obligation which will give energy companies flexibility to offer larger subsidies which generate higher net savings in order to encourage take up and alleviate consumers' concerns over the likely level of savings. At the time the research was conducted it was not possible to account for this or the greater savings over time as energy prices rise and the total cost of products decrease as demand rises.

Participants spontaneously suggested additional incentives to encourage further interest in the Green Deal – these were both Government and provider led. For example, a rebate on council tax, a reduction in stamp duty, cheaper tariffs and money off energy bills.

17.1.3.7 Private rented sector

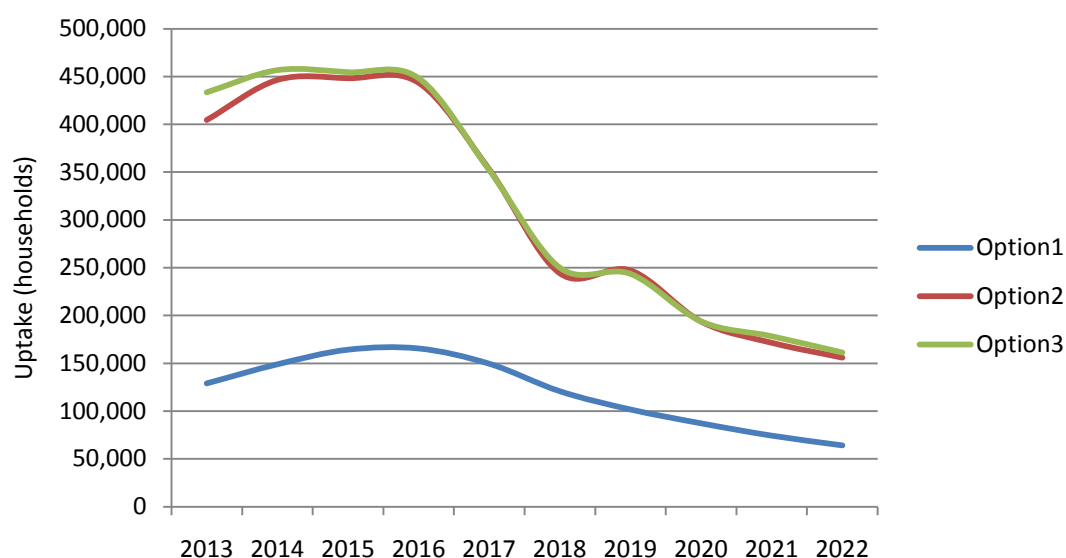
The Green Deal will be available to those in the private rented sector. The research showed that this group had a slightly different response to the Green Deal compared with homeowners. Key differences were about who should have overall responsibility for the payment of measures; in a typical relationship between tenants and landlords, tenants hold responsibility for paying the bills and the landlord for financing major improvements. The fact that the Green Deal leads to the tenant financing the improvements was viewed by some as counter intuitive. The long-term nature of the charge was also seen to be at odds with the short-term nature of tenancies in the domestic market and for many in the commercial market. This is because the greater bill savings are likely to be achieved in the long-term once the repayment charges are paid off.

18 Annex E: Additional analytical results

This annex sets out the detailed result for the uptake in domestic sector and the sensitivity analysis for the domestic and non-domestic sector results.

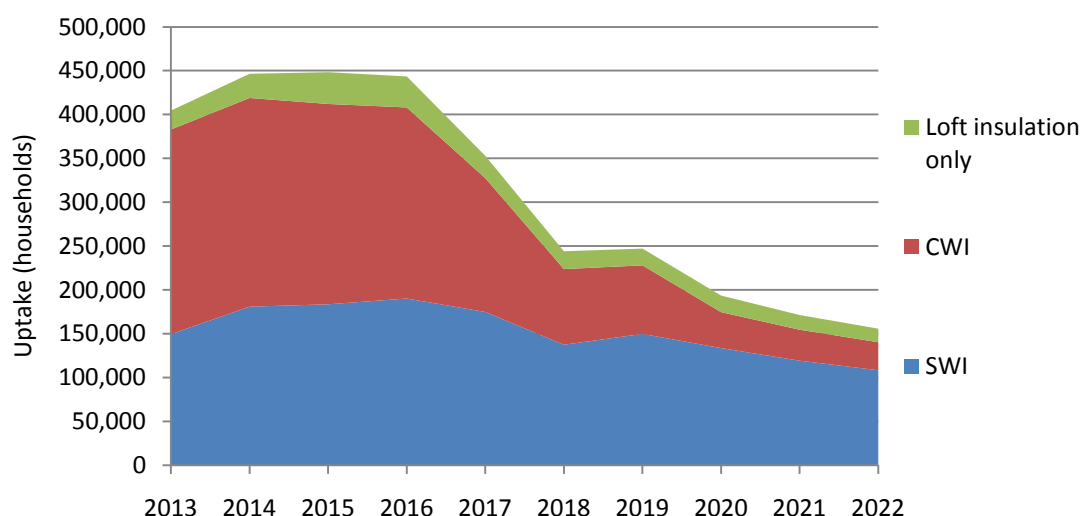
18.1 Uptake of energy efficiency measures in the domestic sector

Figure 42: Uptake of Green Deal plans by option



The modelling analysis suggests a high proportion of the total Green Deal sales will be during the early year (2013-2016). These results partly driven by the high uptake in the social housing sector during this period (see discussion in section 7.1.1.2), and partly by the decline in CWI sale in 2016 illustrated in Figure 43. This in turn is driven by the assumed cost of CWI. There are around 1.4m easy to treat cavities (with an assumed cost of £500). Once these are filled remaining cavities cost substantially more to treat (assumed to be around £2,000).

Figure 43: Uptake of different measures in option 2



18.2 Sensitivity analysis – domestic sector

Eight sensitivities have been used to provide a range of total costs, total benefits and NPV for option 2. These are:

- High energy prices (high fossil fuel price assumptions)
- Low energy prices (low fossil fuel prices assumptions)
- High consumer preferences: reduced consumer aversion to SWI (see Table 40)
- Low consumer preferences: households are myopic and there is no marketing activity by Green Deal providers
- High SWI installation costs: 25% increase in SWI costs
- Low SWI installation costs: 25% decrease in SWI costs
- High interest rates (8%)
- Low interest rates (6%)

More details of the assumptions used in the sensitivity analysis can be found in Annex A: Analytical Assumptions. For the energy price and SWI costs sensitivities, the BAU was adjusted accordingly (for example, the high energy price scenario was compared against a high energy price BAU). For consumer preferences and interest rates the BAU was not adjusted as these variables are partly determined by the effectiveness of the policy package itself (in addition the BAU was based on the assumption that consumers pay 100% of the costs upfront, so interest rates do not affect uptake in that scenario).

Table 46 sets out the detailed results from the sensitivity analysis of option 2. The highest and lowest NPV (high and low energy prices) have been used to provide the low and high estimate costs, benefits and NPV in the summary sheets. The high and low energy prices energy prices sensitivities have also been used for low and high estimates for options 1 and 3 (see Table 47 for details).

Table 46: Detailed result from sensitivity analysis of Option 2

	Option 2 Central	High energy prices	Low energy prices (targets not met)	High interest rates	Low interest rates	High consumer demand	Low consumer demand (targets not met)	High SWI costs	Low SWI costs
Installation costs	£13,764	£15,874	£12,762	£13,699	£13,973	£13,209	£9,672	£15,283	£12,094
Additional costs	£4,113	£6,840	£2,834	£3,847	£4,428	£5,530	£1,852	£3,670	£5,377
Assessment costs	£912	£1,120	£716	£877	£956	£930	£611	£883	£931
Finance costs	£1,540	£2,266	£345	£1,985	£971	£1,825	£401	£1,531	£1,830
GD mechanism costs	£222	£222	£222	£222	£222	£222	£222	£222	£222
Total costs (£m)	£20,550	£26,322	£16,878	£20,629	£20,550	£21,716	£12,758	£21,589	£20,455
Energy savings (Variable element)	£16,841	£24,959	£9,683	£16,177	£17,350	£17,548	£9,142	£16,470	£17,386
Comfort benefits	£3,760	£5,570	£2,411	£3,662	£3,873	£3,937	£2,125	£3,675	£4,030
Air quality benefits	£1,313	£1,456	£1,306	£1,278	£1,333	£1,349	£711	£1,263	£1,354
Lifetime non-traded carbon savings	£5,377	£7,394	£3,158	£4,919	£5,702	£5,717	£1,753	£5,253	£5,618
Lifetime EU Allowance savings	£1,917	£2,270	£1,496	£1,913	£1,920	£1,922	£1,732	£1,902	£1,920
Total benefits (£m)	£29,209	£41,649	£18,054	£27,949	£30,178	£30,472	£15,464	£28,564	£30,309
Net Present Value (£m)	£8,659	£15,327	£1,176	£7,320	£9,627	£8,757	£2,705	£6,975	£9,854
2020 Non-traded carbon savings (MtCO ₂ pa)	2.11	3.08	0.92	1.94	2.24	2.25	0.42	2.05	2.23
2020 Traded carbon savings (MtCO ₂ pa)	3.77	3.79	3.67	3.76	3.77	3.79	3.46	3.74	3.78
2020 Energy savings (TWh)	21	26	15	20	22	22	12	21	22

Table 47: Detailed results from energy price sensitivity analysis of Options 1, 2 and 3

	Option 1 Low energy prices	Option 1 High energy prices	Option 2 Low energy prices	Option 2 High energy prices	Option 3 Low energy prices	Option 3 High energy prices
Installation costs	£2,610	£3,954	£12,472	£15,473	£12,712	£16,378
Additional costs	£1,701	£2,273	£2,769	£6,665	£2,775	£7,055
Assessment costs	£330	£492	£687	£1,086	£687	£1,120
Finance costs	£507	£1,082	£244	£2,577	£244	£2,621
GD mechanism costs	£151	£151	£222	£222	£224	£224
Total costs (£m)	£5,298	£7,952	£16,394	£26,022	£16,643	£27,398
Energy savings (Variable element)	£3,119	£7,559	£8,563	£25,443	£8,740	£26,034
Comfort benefits	£707	£1,217	£2,355	£5,403	£2,394	£5,580
Air quality benefits	£313	£448	£1,285	£1,414	£1,290	£1,486
Lifetime non-traded carbon savings	£1,085	£1,999	£2,952	£7,415	£2,924	£7,484
Lifetime EU Allowance savings	£714	£995	£1,365	£2,410	£1,408	£2,522
Total benefits (£m)	£5,938	£12,217	£16,520	£42,084	£16,755	£43,106
Net Present Value (£m)	£640	£4,265	£126	£16,062	£113	£15,708
2020 Non-traded carbon savings (MtCO ₂ pa)	0.93	1.52	0.73	3.17	0.61	3.14
2020 Traded carbon savings (MtCO ₂ pa)	1.10	1.50	3.48	4.00	3.67	4.19
2020 Energy savings (TWh)	8.13	14.93	12.08	29.02	11.91	29.34

18.3 Non-domestic sector scenarios and sensitivities

Table 48 and Table 49 show the non-domestic element of the estimated impacts of the Green Deal and the supporting policy in the PRS. The central scenario corresponds to the impacts presented in the Aggregate Impacts section above. Specific sensitivities to the assumptions underlying the central scenario are presented in Table 50 and Table 51. The sensitivities presented in these tables concern the real interest rate charged on Green Deal Finance, together with variations around carbon valuations and energy price projections. In addition, there is an analysis of the sensitivity regarding assumptions of take-up probabilities for the Green Deal, and also around the proportion of the potential savings that are undeliverable in the PRS.

Table 48: Impact of the Green Deal in the non-domestic sector

		LOW scenario	CENTRAL scenario	HIGH scenario
Costs (£m)	Installation costs	-£41	-£118	-£235
	Additional costs	-£ 8	-£ 4	-£47
	Assessment costs	-£ 49	-£49	-£49
	Finance costs	-£15	-£36	-£81
	Total costs (£m)	-£114	-£226	-£412
Benefits (£m)	Energy savings (Variable element)	£589	£1,183	£2,085
	Air quality benefits	£10	£20	£35
	Lifetime non-traded carbon savings	£42	£94	£174
	Lifetime EU Allowance savings	£50	£82	£131
	Total benefits (£m)	£691	£1,378	£2,424
Total (£m)	Net Present Value (£m)	£577	£1,152	£2,012
Carbon savings	2020 Non-traded carbon savings (MtCO ₂ pa)	0.03	0.07	0.12
	2020 Traded carbon savings (MtCO ₂ pa)	0.08	0.13	0.20
	Life time non-traded carbon savings	0.89	2.02	3.74

Table 49: Impact of potential supporting policy in the non-domestic sector

	PRS	LOW scenario	CENTRAL scenario	HIGH scenario
Costs (£m)	Installation costs	-£924	-£1,123	-£1,316
	Additional costs	-£185	-£225	-£263
	Assessment costs	-£69	-£84	-£98
	Finance costs	-£132	-£209	-£521
	Total costs (£m)	-£1,309	-£1,640	-£2,198
Benefits (£m)	Energy savings (Variable element)	£1,104	£1,347	£1,582
	Air quality benefits	£50	£61	£71
	Lifetime non-traded carbon savings	£610	£746	£877
	Lifetime EU Allowance savings	£437	£536	£631
	Total benefits (£m)	£2,201	£2,690	£3,161
Total (£m)	Net Present Value (£m)	£892	£1,049	£963
Carbon savings	2020 Non-traded carbon savings (MtCO ₂ pa)	0.69	0.83	0.98
	2020 Traded carbon savings (MtCO ₂ pa)	0.65	0.79	0.93
	Life time non-traded carbon savings (MtCO ₂)	13.34	16.32	19.19

Table 50: Sensitivities within the non-domestic Green Deal analysis

		Low energy prices	High energy prices	3% real interest rate	5% real interest rate	12% real interest rate	Low assessment probability ¹⁸⁹	High assessment probability
Costs (£m)	Installation costs	-£118	-£118	-£153	-£129	-£107	-£48	-£182
	Additional costs	-£24	-£24	-£31	-£26	-£21	-£10	-£36
	Assessment costs	-£49	-£49	-£49	-£49	-£49	-£20	-£77
	Finance costs	-£36	-£36	-£15	-£23	-£52	-£14	-£55
	Total costs (£m)	-£226	-£226	-£249	-£227	-£229	-£91	-£349
Benefits (£m)	Energy savings (Variable element)	£860	£1,413	£1,539	£1,318	£1,115	£476	£1,828
	Air quality benefits	£20	£20	£25	£22	£19	£8	£31
	Lifetime non-traded carbon savings	£141	£47	£127	£105	£88	£38	£145
	Lifetime EU Allowance savings	£117	£45	£94	£87	£79	£33	£126
	Total benefits (£m)	£1,138	£1,525	£1,786	£1,531	£1,301	£555	£2,130
Total (£m)	Net Present Value (£m)	£912	£1,298	£1,537	£1,303	£1,072	£463	£1,780
Carbon savings	2020 Non-traded carbon savings (MtCO ₂ pa)	0.07	0.07	0.09	0.08	0.06	0.03	0.11
	2020 Traded carbon savings (MtCO ₂ pa)	0.13	0.13	0.15	0.14	0.13	0.05	0.20
	Life time non-traded carbon savings (MtCO ₂)	2.02	2.02	2.72	2.24	1.89	0.81	3.12

Table 51: Sensitivities within the analysis of the potential supporting policy in the non-domestic sector

		Low energy prices	High energy prices	3% real interest rate	5% real interest rate	12% real interest rate	35% undeliverability ¹⁹⁰	15% undeliverability
Costs (£m)	Installation costs	-£1,123	-£1,123	-£1,120	-£1,122	-£1,124	-£930	£1,316
	Additional costs	-£225	-£225	-£224	-£224	-£225	-£186	-£263
	Assessment costs	-£84	-£84	-£84	-£84	-£84	-£69	-£98
	Finance costs	-£209	-£209	-£75	-£127	-£324	-£172	-£245
	Total costs (£m)	-£1,640	-£1,640	-£1,502	-£1,557	-£1,756	-£1,358	£1,923
Benefits (£m)	Energy savings (Variable element)	£1,145	£1,438	£1,343	£1,346	£1,348	£1,113	£1,582
	Air quality benefits	£61	£61	£60	£61	£61	£50	£71
	Lifetime non-traded carbon savings	£1,119	£373	£743	£745	£746	£615	£876
	Lifetime EU Allowance savings	£774	£289	£534	£535	£536	£442	£630

¹⁸⁹ In the central scenario, the proportions of agents taking out an assessment are 13.7%, 1.2%, and 11.4% of landlords, tenants and owner-occupiers respectively. For the low probability sensitivity, these probabilities are 5%, 0.5% and 5% respectively. For the high probability sensitivity, these are 20%, 2.5%, and 20%. These probabilities will be further informed through the forthcoming consultation.

¹⁹⁰ The undeliverability factor specifies the proportion of the potential savings that are not achievable through the potential supporting policy in the PRS. In the central scenario, this proportion is 25%.

Total benefits (£m)		£3,098	£2,161	£2,681	£2,687	£2,691	£2,220	£3,160
Total (£m)	Net Present Value (£m)	£1,458	£521	£1,179	£1,130	£935	£862	£1,237
Carbon savings	2020 Non-traded carbon savings (MtCO ₂ pa)	0.83	0.83	0.83	0.83	0.83	0.69	0.98
	2020 Traded carbon savings (MtCO ₂ pa)	0.79	0.79	0.79	0.79	0.79	0.65	0.93
	Life time non-traded carbon savings (MtCO ₂)	16.3	16.3	16.3	16.3	16.3	13.5	19.2

19 Annex F: Green Deal mechanism decisions

The annex on Green Deal mechanism decisions is structured as follows:

- Assessments: ensuring the correct recommendations are made.
- The Golden Rule: ensuring expected bill savings outweigh the Green Deal charge.
- Green Deal Measures: ensuring the measures delivered are appropriate and perform as expected.
- Customer Protection: ensuring customers are sufficiently protected from sub-standard offerings.
- Institutional Arrangements: ensuring the organisational infrastructure is in place to handle the Green Deal and the collection of the Green Deal charge.

19.1.1 Assessments

The options discussed in this section relate to:

- the basis of the fabric assessment for domestic and non-domestic properties; and
- whether there should be an additional assessment of occupancy for domestic and non-domestic properties.

The first step of the customer journey is the assessment of potential Green Deal measures suitable for a particular dwelling. Assessments need to take into account the fabric of a premises but could also reflect a specific occupant's pattern of demand for energy. Customers need to be able to trust the advice they receive and be sure it is consistent regardless of who undertakes the assessment. The outcome of the assessment must provide a robust and transparent basis on which Green Deal quotes can be provided.

19.1.1.1 What should be the basis of the fabric assessment for domestic properties?

The fabric assessment measures the expected level of energy use in the home for heat, light and to provide hot water. Fabric assessments are based on building physics models which consider the age, size and construction type of the home and the type of heating system present. Assumptions of average occupant energy demand behaviour are made. During the fabric assessment, the advisor would identify and recommend the appropriate improvement measures for the property.

The market would decide who pays for a Green Deal assessment. The cost of the assessment could be part of the Green Deal finance plan, be paid for by the household upfront or by the Green Deal Provider as an incentive to take-up.

Three options have been considered for the basis of the fabric assessment for domestic properties:

- 1 leave it to the market (do nothing);**
- 2 require that the assessments use the existing Standard Assessment Procedure (SAP) methodology with additional Green Deal information (preferred option); or**
- 3 design a new assessment methodology.**

Option 1. Leave it to the Market

Leaving this element to the market to decide what form this assessment takes would be flexible and allow the Green Deal Provider to tailor their offer to the customer. However, it would be open to significant abuse. There is no assurance that the tools used would be good at predicting energy savings from measures. With no control over the assessment tool used and the inputs and calculations taking place, it would be possible for participants to adjust the tool to favour certain products, to misrepresent (whether accidentally or on purpose) the savings from measures, and to present the final report in a wide array of different formats including or removing information as they saw fit. This would run the risk of:

- confusion over what householders receive and an inability to compare offers and shop around for the best deal; and
- confusion over liability for inaccurate savings figures and difficulties in delivering effective redress giving the Green Deal a poor reputation.

Option 2: Require that the assessment uses the existing Standard Assessment Procedure (SAP) methodology with additional Green Deal information

The existing EPC framework is being improved, following a review in early 2011¹⁹¹, and is expected to produce more useful and accurate information to households. The RdSAP methodology which is used for assessment and production of EPC for existing dwellings and which calculates likely savings from measures, is being improved.

This methodology could also be used for the Green Deal assessment. EPCs are currently produced by a qualified Domestic Energy Assessor who would be required to know how the Green Deal works. Either a Domestic Energy assessor or a Green Deal advisor could produce the EPC for use in the Green Deal assessment. For a Green Deal assessment, the assessor may go beyond the EPC, as set out in the next section.

Requiring the assessment to be undertaken as an extension of the current EPC process benefits from the existing institutional arrangements and reduces the cost of the additional training required to deliver Green Deal assessments at scale.

The analysis of the impacts of the GD and the ECO assume that the cost of a Green Deal fabric assessment is £75. This level represents a mark-up to recent research suggesting an average cost of £50.¹⁹²

¹⁹¹ The Department of Communities and Local Government (DCLG) and DECC jointly conducted a review into the EPC framework. This made a number of recommendations to improve the regime, including changes to the design of the EPC, improving the accuracy of the assessment through revising the tools and methodology, and introducing a new qualification and certification regime for domestic energy assessors. These improvements for an improved EPC are expected to be in place by April 2012. We are also considering using “in-use factors” to adjust performance of measures, see section 19.1.2.3. These improvements will provide benefits for consumers through more accurate information and recommendations and in terms of a more consistent product.

¹⁹² EPC prices are set by the market and depend on the size and location of the property. The original impact assessment for the EPB Regulations suggested a figure close to £100. However, further research for the EPC Review and previously by DCLG suggests an average cost of around £50.

Option 3: Design a new assessment methodology from scratch

A new fabric assessment could be created specifically for the Green Deal. Currently there are no alternatives to the EPC assessment that could achieve the robust, standardised savings estimate needed to inform the Green Deal. This would be a significant undertaking of work in order to define the methodology, the training and qualifications for advisors, and as to the delivery, quality assurance and lodging of assessments. The option would require time to implement – the process leading to the introduction of EPC's for domestic dwellings took over four years.¹⁹³ As such, this option would not represent value for money if, as explained above, the current EPC assessment methodology can be improved to address any weaknesses.

Option	Costs / risks	Benefits / advantages
1: Do nothing	<ul style="list-style-type: none">• No additional costs for the development of an assessment standard• Risk for the customer that the assessment does not reflect the savings potential that can be realistically expected• Lack of comparability of offers from different providers• Potential lack of objectivity in the assessment• Inaccurate assessments may fail to realize full carbon saving potential	<ul style="list-style-type: none">• Least regulatory interference in the market
2: Use existing EPC framework (preferred option)	<ul style="list-style-type: none">• £75 per fabric assessment which is likely to be passed on to Green Deal customers	<ul style="list-style-type: none">• Uses existing assessment framework of EPC• Assessment is based on standardized metrics• Assessment is carried out by independent party• Avoids customer confusion when different methodologies are used
3: Design new methodology	<ul style="list-style-type: none">• Significant resource costs to Government for development of methodology• Time delay in implementation of Green Deal and realization of efficiency improvements• Operational cost likely to	<ul style="list-style-type: none">• Large scope to tailor assessment methodology to requirements of Green Deal

¹⁹³ The Energy Performance of Buildings Directive (2002/91/EC) came into force at the EU level in January 2003. This was transposed into UK law by the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007.

	be similar to option 2	
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19.1.1.2 Should there be an additional assessment of occupancy for domestic properties?

To understand the impact of improving the fabric of a dwelling, it is necessary to about the way the dwelling is used by the occupants. Actual energy use can vary dramatically between otherwise similar dwellings depending on the occupants' usage patterns: the amount of time spent in the dwelling, the temperature the home is heated to and the number of appliances in the home. For instance, a one degree Celsius difference in average indoor temperature changes the heating consumption by around 10%.

Since the Green Deal is attached to the property rather than the individual and could be a long term finance arrangement, it is proposed that the cap on the Green Deal charge would be calculated based on standard occupancy as in the fabric assessment (see section 19.1.1.1). To this end, the RdSAP methodology underpinning the EPC makes standard assumptions about these occupancy factors when estimating the amount of energy required to heat, light and provide hot water for the dwelling. This provides the typical savings necessary for Green Deal finance but also means that, all else being equal, higher than average energy users would see more savings from a measure than is estimated by RdSAP, while lower than average energy users would see smaller savings.

For the purposes of the Green Deal, providing information from an occupancy assessment on the Green Deal improver's energy use would allow them to make a better informed decision about whether to take up a Green Deal. The improver would be able to better estimate whether the energy bill savings they would realise from energy efficiency measures would be expected to be greater than the Green Deal charge.

In addition to this assessment of the household's energy use, the occupancy assessment process would enable the Green Deal advisor to provide further behavioural advice to help householders reduce their energy consumption and a discussion about whether a Green Deal finance plan would be suitable for households. The assessor would also be able to discuss the options with the current occupier and to propose a potential package of measures to suit their needs and wishes.

Three options have been considered as to how to do this in a cost effective way:

- 1. leave to the market (do nothing);**
- 2. require a minimum standard of occupancy assessment (preferred option); or**
- 3. require a comprehensive occupancy assessment.**

Option 1: Leave to the market

Under this option it would be for the Green Deal provider to determine whether to provide any additional advice to the householder.

However, leaving the provision of an occupancy assessment to the market could result in significant variation in the quality of any additional advice if it is provided at all. This could result in a lack of take-up of Green Deal measures or, more seriously, deliberate mis-selling of measures' savings potential to low energy users. These householders would remain unaware that they are unlikely to

achieve the typical savings until it is too late. This could have particular implications for vulnerable householders and knock-on effects for the reputation of the Green Deal.

Option 2: Require a minimum standard of occupancy assessment

The occupancy assessment could be a standard assessment that covers a minimum set of factors which drive energy use in a dwelling. This would help to ensure that consumers receive some advice that takes into account their actual energy use and could make a more informed decision about whether the Green Deal is likely to be right for them. The Green Deal advisor would carry out the assessment along with providing more information about the Green Deal. The Green Deal Provider would be required to take account of this information when offering finance.

BREDEM (the Building Research Establishment Domestic Energy Model) already accounts for some occupancy variables. So a light touch occupancy assessment could be based on this existing methodology with only small changes required. Standard software could be produced for the advisor to use in home or permission could be given for software to be produced by different providers and approved as in the EPC framework.

The Green Deal assessor will also be able to talk through the most suitable package of measures for the householder and provide information about the likely level of energy savings these would achieve using standard occupancy and tailored occupancy information.

The costs of this would depend on the minimum level of occupancy advice required. Less additional data would need to be collected than for the initial fabric assessment, so the additional cost of the occupancy assessment is likely to be less than the estimated £75 for the improved EPC. While it is expected that the advisor would need to spend some time discussing the household's suitability for Green Deal, it is assumed that both the fabric and the occupancy assessment would be carried out at the same time, reducing the additional travel and time costs of the occupancy assessment. The additional effort required has been assumed to add some 25-35% to the cost an EPC, though DECC would welcome views to help refine this estimate.

Option 3: Require a comprehensive occupancy assessment

A comprehensive occupancy assessment could be required where the assessment provides a fully bespoke quantitative estimate for the energy bill savings the occupants would see from installing recommended improvement measures and additional bespoke additional advice to householders on ways to improve the energy performance and wider sustainability of their home.

A comprehensive assessment would require a significant amount of time to perform and would carry a more substantial cost. There are a range of private sector providers of detailed energy assessments with typical charges of approximately £250-£300 with higher costs depending on the number of rooms in the property. Even assuming a proportion of the £250-£300 cost is for the fabric assessment, a detailed occupancy assessment would incur a substantial additional cost which would represent a potentially significant up-front barrier to Green Deal take-up.

To increase attractiveness to consumers, the cost of the occupancy assessment could be recouped through energy bill savings as part of the Green Deal. However, if the cost of the more

comprehensive occupancy assessment were wrapped up in the Green Deal plan then this option would be likely to reduce the number of measures that meet the Golden Rule in their own right.

The level of detail provided by a detailed occupancy assessment would not be required to secure Green Deal Finance because it is proposed that the limit on the Green Deal charge would be based only on standard occupancy assumptions. In addition, the increased accuracy from the in-depth assessment would not remove uncertainty altogether. Some of the most important behaviours which drive the level of energy demand, such as internal temperatures, are difficult for the advisor to observe. However, should there be sufficient consumer demand, innovative providers offering “gold standard” services should not be blocked from entering the market. There would be nothing to stop individuals from paying for a detailed occupancy assessment themselves.

Option	Costs / risks	Benefits / advantages
1: Do nothing	<ul style="list-style-type: none"> No additional mandated costs for an occupancy assessment Missed opportunity for tailored advice Potential mis-selling to households with low consumption and to vulnerable households 	<ul style="list-style-type: none"> No regulatory burden
2: Require minimum standard (preferred option)	<ul style="list-style-type: none"> 25% to 35% cost increase of the EPC standard assessment (additional £19 - £26) Assessors would spend more time per visit 	<ul style="list-style-type: none"> Uses existing framework of BREDEM Enhances the robustness of the estimate of the savings potential and increases certainty for customer Ensures incentive for high consumption households to take up Green Deal
3: Require a comprehensive occupancy assessment	<ul style="list-style-type: none"> Up to £250 - £300 per occupancy assessment (compared to £75 for EPC) Reduction in premises that meet Golden Rule Disruption to customers because of time required to carry out 	<ul style="list-style-type: none"> Further reduction in risk of over-estimating savings potential Enables market to develop “gold standard” assessment

19.1.1.3 What should be the basis of the assessment for non-domestic buildings?

Non-domestic buildings can vary more significantly in both their type and use when compared to domestic buildings. This leads to complexities in defining an appropriate assessment methodology. Factors such as hours of use, what equipment is used in helping the business run and commercial considerations are all important in determining whether Green Deal-type measures might be appropriate in a particular building.

A 'generalist' advisor might be able to account for a building's operational use, but could not be expected to be sufficiently expert to advise on the suitability of complex systems. Nor could they consider future uses of the building's space over the lifetime of any Green Deal measures. As a result, decisions are required on how to frame the assessment of non-domestic buildings when there might be specialist equipment used. It is assumed that there would be no consideration of future use, though.

Four options have been considered:

- 1. let the market choose assessment tools.**
- 2. deliver a generalist assessment by an improved EPC, or other qualifying generalist method;**
- 3. require a generalist assessment but permit drawing on specialists in the production of this assessment(preferred option); and**
- 4. require a generalist assessment but, in the case of specialist skills being required, allow an additional specialist assessment to be used.**

Option 1: Let the market choose assessment tools (do nothing)

This option lets the market to decide on the assessment tool to use. There are concerns that enabling the market to select the most appropriate tool for a particular building would be open to abuse of the system. There is a risk that assessment tools are chosen just because they fit with a particular Green Deal provider's desire to push specific products. Quality assurance may be impossible. It may also be difficult to understand results or compare them between alternative assessment methodologies.

Option 2: Generalist assessment with improved EPC method

This option would require a generalist assessment to account for the occupancy of the building as well as the fabric, and to consider all potentially eligible measures within its scope.

The existing tool for non-domestic buildings, SBEM,¹⁹⁴ is used to produce EPCs and could be the basis for generalist assessments. Whilst it includes a list of recommended improvements (on a qualitative basis), it does not currently provide a prediction of the associated energy savings. In order to be suitable for the Green Deal, further development of the tool would be required; and this would be largely funded through existing contracts.

The advantage of this approach is its consistency with the domestic approach. But it would not be able to handle complex systems beyond the competency of the advisor.

The costs of assessment are likely to be similar to those for the current EPC. There is a wide range of costs, reflecting the variety of building types, and sizes in the non-domestic sector. These are assumed to range between £250 - £1,000.

Option 3: Generalist assessment, drawing on specialists

This option proposes delivery of a generalist assessment (as per Option 2), but would let the advisor draw upon specialist expertise where appropriate in producing the single assessment. Advisors

¹⁹⁴ the Simplified Building Energy Model

would be expected to have the skills to identify and interpret information from specialists and these skills would be set out in National Occupational Standards.

Costs for the generalist assessment would be as for Option 2 Costs where a specialist is required would reflect the current market prices for this advice. Costs could vary greatly depending on the type of advice required and the size of the building (and hence the scale of the measure being considered).

This option provides the benefit that more specialist measures could be assessed and approved for Green Deal finance.

Option 4: Generalist assessment plus specialist assessment where appropriate.

This option would enable a specialist assessment, in addition to a generalist assessment (as per Option 2), to be carried out. Candidates for specialist assessment methodologies are currently under consideration.

Option 3 is preferred over option 4, but allowance for additional advice to be accounted for at the point of a Green Deal quote is discussed in section 19.1.2.2 “Quantifying the maximum Green Deal charge in the first year”.

Options	Costs/risks	Benefits/Advantages
1: let the market choose assessment tools.	<ul style="list-style-type: none"> • Risk of customer confusion • Potential for mis-selling from misrepresentation of savings 	<ul style="list-style-type: none"> • No regulatory burden
2: deliver a generalist assessment by an improved EPC, or other qualifying generalist method;	<ul style="list-style-type: none"> • £250 to £1,000 per assessment • Some costs to government from extending the capability of the SBEM assessment 	<ul style="list-style-type: none"> • Consistent with domestic approach • Uses existing SBEM
3: require a generalist assessment but permit drawing on specialists in the production of this assessment(preferred option); and	<ul style="list-style-type: none"> • Costs would vary, depending on particular building. 	<ul style="list-style-type: none"> • Provides greater flexibility to factor in different building uses • More specialist measures may be installed
4: require a generalist assessment but, in the case of specialist skills being required, allow an additional specialist assessment .	<ul style="list-style-type: none"> • Costs in respect of time, lodgment, and quality assurance 	<ul style="list-style-type: none"> • More measures could be financed by the Green Deal • Additional costs could reduce value for money

19.1.2 Golden Rule

At the heart of the Green Deal mechanism is the 'Golden Rule' principle whereby the energy bill savings are expected to be at least as great as the level of the Green Deal charge. The Golden Rule ensures that properties with a Green Deal could expect to reduce their outgoings for energy bills, if their energy use stays in line with the assumptions used in assessing the Golden Rule and nominal energy prices do not fall.

The options discussed in this section relate to how the Golden Rule should be defined and calculated in order to strike the balance between providing a high degree of confidence that the Golden Rule would be met while allowing access to reasonable levels of Green Deal finance. Specifically, they relate to:

- the energy prices used to estimate fuel bill savings in year 1;
- quantifying the maximum Green Deal charge in the first year;
- whether to apply a precautionary reduction to bill savings;
- the appropriate interest rates to use;
- the structure of the charge;
- whether to allow up-front cash incentives; and
- how to deal with unexpected costs.

19.1.2.1 What energy prices should be used to estimate fuel bill savings in Year 1?

A decision is required on the source of the energy prices used to calculate the estimated bill savings from the installation of measures.

Two options have been considered:

1: Use energy prices set out in SAP and the RdSAP tool/ the existing EPC (preferred option)

2: Devise another comparator for energy costs taking into account the prevailing retail prices

Option 1: Use energy prices set out in SAP and the RdSAP tool/ the existing EPC

The Green Deal assessment will build on the current EPC in reaching estimates of likely savings to inform the Green Deal quote. The EPC already uses information based on prevailing average retail prices¹⁹⁵, which provide a broad indication of fuel cost for a number of fuel types.

The Sutherland Comparative Domestic Heating Costs Tables have been published regularly since 1976 with quarterly publications each year. They gather fuel unit costs throughout the regions from a broad range of suppliers.

The EPC calculation methodology uses the latest figures from the Sutherland Tables when calculating the cost of recommendations. This 'averaged' approach is also consistent with the standardised

¹⁹⁵ Based on a 3 year rolling average

assumptions that the tools use to calculate energy consumption. The advantage of using this approach is that it provides a good indication of average energy retail prices in a way that links with the typical use approach set out above for the Green Deal fabric assessment. The disadvantage of this approach is that energy prices are unlikely to be precisely accurate as of the exact moment the estimate is made. However, real accuracy would be dependent on obtaining the actual energy supply tariffs to the home, and as the energy supplier can be changed on a 30-day notice period or the tariff can be changed there is a limited benefit to the greater accuracy.

Option 2: Devise another comparator for energy costs taking into account the prevailing retail prices

An alternative approach would be to devise a new comparator for energy costs that takes into account prevailing retail prices and offered more up to date figures on a 'snapshot' basis.

This approach, whilst potentially providing better accuracy immediately after collection and production would require a new system to collect and collate data on a much more frequent basis and to provide that data to the advisor/ assessment tool; and potentially to Green Deal providers in a format that can then be used to formulate assessments. This would involve significant development and maintenance costs.

The associated benefits of increased price accuracy could prove to be marginal. As with option 1, more up to date snapshot figures may not be any more helpful unless they are the actual energy supply tariffs to the home, and as the supplier can be changed on a 30 day notice or the tariff changed, there is still no assurance of greater medium term accuracy. In addition the nature of the snapshot approach would require instant updates or would be subject to volatility in the market in a more significant way than any broader indication of average retail prices offered elsewhere.

Options	Costs/Risks	Benefits/Advantages
1: Use energy prices set out in SAP and the RdSAP tool/ the existing EPC (preferred option)	<ul style="list-style-type: none"> Does not refer to property's actual energy costs at exact time of assessment, so Golden Rule calculation accuracy compromised 	<ul style="list-style-type: none"> Uses familiar methodology No development costs incurred No additional training costs for advisers
2: Devise another comparator for energy costs taking into account the prevailing retail prices	<ul style="list-style-type: none"> Significant resource costs for development Training costs for advisers Additional accuracy minimal and increased volatility in assessed savings. 	<ul style="list-style-type: none"> Potentially more accurate

19.1.2.2 Quantifying the maximum Green Deal charge in the first year

Section 19.1.1 looked at the type of assessments that would required to get a good understanding of the energy use of a domestic and non-domestic building. This section looks at how the assessment information should be used to calculate the maximum Green Deal charge in the first year.

Domestic Sector

This section looks at how the fabric assessment should be considered alongside the occupancy assessment in the domestic sector. Decisions are required for how to use this information and to set the maximum level of the Green Deal charge.

The three options considered are:

- 1. Cap the year 1 charge to the savings estimate from the fabric assessment (preferred option);**
- 2. Cap the year 1 charge to the savings estimated for the specific household;**
- 3. Cap the year 1 charge to whichever is the lower of the fabric assessment or the estimate for the specific household.**

Option 1: Cap the first year's charge to the fabric assessment's savings

Since the Green Deal charge would pass from current to future occupants, capping the charge by reference to standard energy demand, based on the building's fabric, would provide a best estimate of the energy bill savings for future occupants (in the absence of any knowledge of who they will be or their energy demand behaviour). By remaining neutral with regard to occupants' energy demand behaviour, the savings estimate would remain a valid assumption over the Green Deal's life.

In cases where the Green Deal improver's energy use is below the standard level, the cap on the Green Deal charge from applying this option would be greater than their expected energy bill savings. However, the occupancy assessment would provide a warning that this was the case to the Green Deal improver. The improver would then be able to make an informed decision on whether a Green Deal package is appropriate for them. For high use customers, they could expect to see greater savings than the maximum charge that could be attached. Not reflecting their high energy use would constrain their access to Green Deal finance.

Option 2: Cap the first year's Green Deal charge to the energy bill savings estimated for the specific household

The merit of capping the charge to the level of savings estimated for a specific household would be that it would reduce the risk of the Golden Rule being breached for low energy using households. The cap on their Green Deal charge would more accurately reflect their expected (lower) savings than for an estimate based on standard occupancy assumptions. However, this option would create a risk that high energy using households take on a Green Deal plan with a high charge that would exceed energy bill savings for future occupants whose energy use is more standard.

This option could result in the presence of a Green Deal charge adversely impacting on house prices because buyers would not necessarily know if they were able to make the energy savings needed to offset the Green deal charge.

Option 3: Cap the first year's charge to whichever is the lower of the fabric assessment or the estimate for the specific household.

The benefit of option 3 would be that the savings are likely to be offset by the charge in all cases. However, given that low users would most likely have correspondingly lower savings estimates, this would limit what measures they could have under the Green Deal, or increase the amount of ECO subsidy that might be required. There is a concern that those who might be particularly keen to make their home 'greener' might also be those who use less energy, and that such an approach would penalise such customers or - worse – encourage people to mislead the advisor as to their genuine energy usage in order to avoid limiting the charge they are allowed to attach.

Effectively the third option is already open to Green Deal providers as the fabric assessment acts as an upper limit, but they can and should where appropriate, reduce the charge attached to the property to either reflect the occupancy assessment or if the occupiers cannot afford it.

Option	Costs/Risks	Benefits/Advantages
1: Cap the year 1 charge to the savings estimate from the fabric assessment (preferred option);	<ul style="list-style-type: none"> For low demand households, Golden Rule may not be met 	<ul style="list-style-type: none"> Occupancy neutral assessment best expectation of savings for future occupants
2: Cap the year 1 charge to the savings estimated for the specific household;	<ul style="list-style-type: none"> Risk that Golden Rule would not apply to future tenants 	<ul style="list-style-type: none"> Would expand volume of Green Deals for households with above average energy demand
3: Cap the year 1 charge to whichever is the lower of the fabric assessment or the estimate for the specific household.	<ul style="list-style-type: none"> Risk of excluding low demand households Incentive to provide misleading information for occupancy assessment 	<ul style="list-style-type: none"> Reduced risk that customer repayment charges outweigh bill savings

Non-Domestic Sector

In the non-domestic sector, the savings estimate would reflect the actual use of the building, rather than standard assumptions about energy use. This would be appropriate because of the varied use and type of non-domestic buildings and because savings are likely to accrue not just based on the measures being installed, but also on whole system design and installation. It is also expected that the measures likely to be installed would pay back over shorter periods, or within the lease length, thus minimising the impact on future occupants. Because there may be specialist equipment assessments (see 19.1.1.3), there are options over how these should be considered with respect to a cap on the size of the Green Deal.

Two options have been considered:

1. the assessment caps the year 1 charge; or
2. the assessment cap can be increased based on further independent advice, subject to customer and Green Deal provider agreement (preferred option).

Option 1: Assessment caps first year's charge

The advantages of basing the cap on the assessment are its clarity and that the savings estimate would be likely to be conservative compared to option 2. This would provide assurance to both customers and investors that the payments would be affordable. This charge could be increased if product differentiation suggests higher savings.

However, this option may lead to underestimates of possible saving, as it would not provide for independent specialist advice that could identify steps to maximise savings.

Option 2: Independent specialist advice can increase the cap on the first year's charge

This option would keep the requirement of Green Deal advice to the business as a minimum, but would let Green Deal Providers and customers employ the services of a specialist supplier for a more detailed estimate of savings, subject to mutual agreement. Allowing specialist advice to raise the allowed level for the Green Deal charge would offer more flexibility than Option 1 and give greater potential for fuel bill saving to be delivered. The measures would still be required to be recommended by the Green deal assessor, this option would simply allow for the customer and provider to agree a different savings estimate. However, this option increases the likelihood that some specialised measures are implemented and deliver savings to the existing businesses which occupy the building. Following a change of occupant, measures which were tailored to the business of the previous occupant might no longer realise the same level of savings.

Option	Costs/Risks	Benefits/Advantages
1: the assessment caps the year 1 charge	<ul style="list-style-type: none"> • does not make use of occupancy/specialist assessment and misses potential opportunity for increasing access to Green Deal finance 	<ul style="list-style-type: none"> • Reduced risk that customer repayment charges outweigh bill savings
2: the assessment cap can be increased based on further independent advice, subject to customer and Green Deal provider agreement (preferred option).	<ul style="list-style-type: none"> • Advice may not be right for the needs of future tenants 	<ul style="list-style-type: none"> • Enables consumer choice

19.1.2.3 Should there be a precautionary reduction in the assessed level of bill savings?

There are a number of reasons why even energy bill savings based on detailed assessments might not be fully realised. As well as the energy efficiency of a building, other reasons why its energy consumption might vary include:

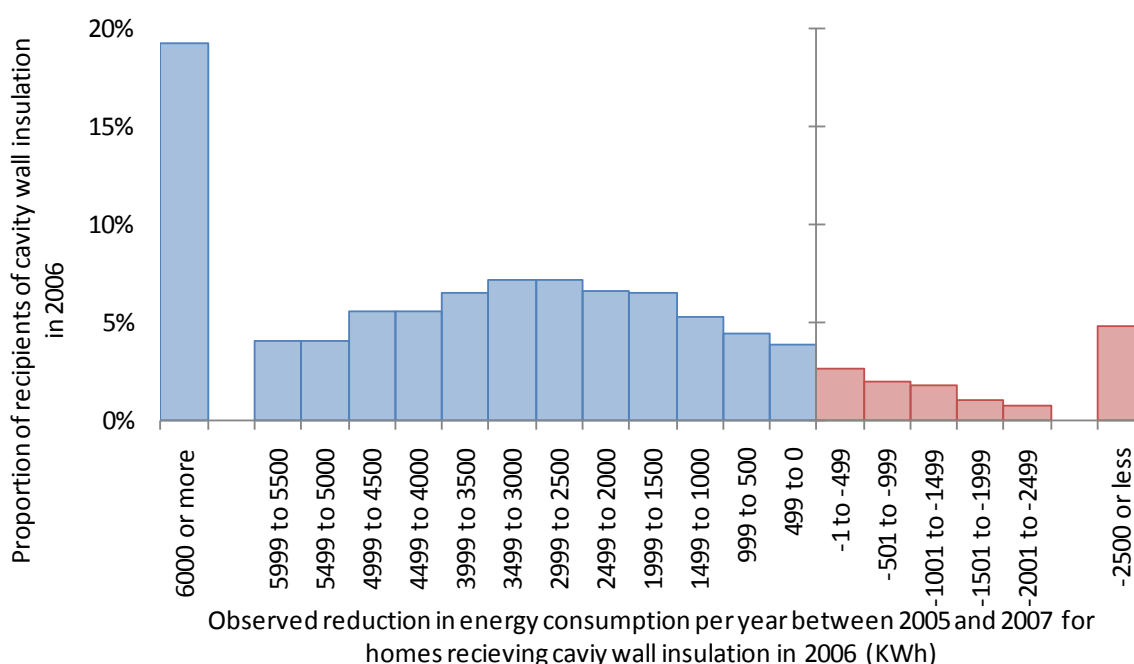
- external factors: these include changes in household income, businesses' output levels, energy prices or external temperature;
- changes in occupancy within a dwelling: this includes changes in household size or a change in business activity;
- changes in occupants' heating patterns: this includes changes caused by different work patterns and different temperatures at which people are comfortable;

- technical performance of energy efficiency measures: performance levels can vary according environmental factors such as the existing heating system in the recipient building, the initial level of thermal efficiency and particular characteristics of the building; and
- variation in users' interaction with controls: some people and organizations use their buildings' systems more optimally than others.

Box 10: Variation in energy consumption between 2005 and 2007 for homes that received cavity wall insulation in 2006

As an example Figure 44 shows the variation in the change in energy consumption between 2005 and 2007 that has been observed for homes in Great Britain that received cavity wall insulation in 2006. Around 13% of the homes receiving cavity wall insulation exhibited an increase in energy consumption and a further 30% were below the theoretical savings of 2,700 KWh estimated for a large semi-detached home with standard heating and occupancy patterns. Comfort-taking may explain all or some of this shortfall¹⁹⁶.

Figure 44: Distribution of energy savings from cavity wall insulation for large semi-detached homes¹⁹⁷



External factors may explain much of this variation - for example between 2005 and 2007 the fuel and light component of the Retail Price index increased by around 33%.¹⁹⁸ Statistical analysis has compared the savings to a control group in an attempt to distinguish the impact of energy efficiency measures from external factors. This analysis showed a greater reduction¹⁹⁹ in energy consumption over the period for those receiving cavity wall insulation when compared to a control group of between 1,200 kWh and 3,150kWh across the distribution.²⁰⁰ This suggests that a considerable amount of the variation shown in Figure 44 is due to external factors that mask the specific impact of cavity wall insulation.

¹⁹⁶ For a discussion of observed comfort taking and rebound effects, see: Sanders, C. and Phillipson, M. , (2006) "Review of Differences between Measured and Theoretical Energy Savings for Insulation Measures"

¹⁹⁷ DECC (2011) "National Energy Efficiency Data-framework Report on the development of the data-framework and initial analysis"

¹⁹⁸ DECC (2011) "Retail price index UK: fuel components in the UK/ relative to GDP deflator" Table 2.1.1

¹⁹⁹ Or smaller increase in energy consumption.

²⁰⁰ DECC (2011) "National Energy Efficiency Data-framework Report on the development of the data-framework and initial analysis" Table 5.6

The Green Deal assessment is designed to ensure that these sources of variation are accurately represented to consumers so that they can make an informed decision on whether to take out a Green Deal.

- The fabric assessment is a bespoke assessment that directly takes into account the most relevant physical characteristics of the home in question.
- The occupancy assessment would enable a household to consider whether their energy use diverges from the assessment's standard assumptions. Households that are likely to experience significantly lower than expected bill savings may choose not to undertake marginal Green Deal investments.
- Evidence on the technical performance of measures would be taken into account where possible. This anticipates that there will be periodic reviews of assessment procedures, such as RdSAP, to enable the latest empirical evidence on the effectiveness of measures to be reflected. DECC is undertaking research, for example on solid wall properties, to help ensure that savings estimates are as accurate as possible. This could be implemented by adjusting the RdSAP buildings physics calculation by an 'in use' factor – this would not adjust for comfort taking but for real world physical performance of measures. Draft "in use factors" would be based on recommendations made by a task group of experts set up by DECC. DECC would consult with industry and the research community on the emerging levels and the results would be included in the Government's response to the consultation document.
- Customers would be informed that the estimated savings assume no change in heating demand following the installation of measures. If households choose to consume some of their net bill saving in the form of higher heating demand, they would be aware that this may cancel out energy bill savings and it would deliver welfare benefits in the form of greater thermal comfort.
- For Green Deal improvers, net energy bill savings are highly likely to increase as time goes on. It is proposed that the assessment would use conservative assumptions for future energy prices – the Green Deal charge would remain constant over time in nominal terms. Most Green Deal measures would save energy for a number of years, during which it is expected that energy prices will rise. In the low DECC energy price scenario domestic retail gas prices are projected to increase by 48% between 2011 and 2020 in nominal terms.²⁰¹

Despite these factors, there remains a risk that the Golden Rule will be breached for a proportion of households. While the possibility of the Golden Rule being breached cannot be ruled out altogether, the probability of it being breached could be reduced by applying a precautionary downward adjustment to the estimated bill savings.

Two options have been considered:

- 1. do nothing except warn of the risks and reasons why bill savings could be lower than expected; or**
- 2. warn of the risks and apply a reduction in predicted bill savings of, say 10%, as a precaution to account for this variation and increase the probability that the Golden Rule will be met in practice; or**
- 3. Do nothing for a majority of Green Deals but apply a downward adjustment of 5% (or**

²⁰¹ Assuming a 2% rate of inflation per year to 2020.

similar) to the estimated energy bill savings for domestic Green Deal plans which are in excess of £10,000 (preferred option).

Option 1: Do nothing except warn of the risks and reasons why bill savings could be lower than expected.

Under this option the bill savings figure used for the calculation of the Golden Rule would reflect the expected energy bill savings. Improvers would also have had the sources of variation in realised savings accurately represented to them through the assessment process. They would be able to make an informed choice to commit to the Green Deal plan. The advantage of option 1 would be that it would enable a higher level of Green Deal finance to be raised by the Green Deal improver than if there is a precautionary downward adjustment as under option 2. This is in line with the aim of the Green Deal to enable the beneficiaries of energy efficiency measures to pay a larger proportion of the installation costs.

Option 2: Apply a downward adjustment of, say 5%, to the estimated energy bill savings

Applying a precautionary adjustment of, say 5%, to the expected level of bill savings would add an additional safety margin to the Golden Rule being met. However it should be noted that there is already a degree of caution inherent in the calculation of the Golden Rule where it is calculated using flat nominal energy prices over the entire period of the Green Deal plan. This creates a high level of confidence that actual bill savings will be higher than the Green Deal charge over the lifetime of the Green Deal measures. Projections are for nominal energy prices to increase substantially over the next decade (by 2020 under central projections, nominal retail gas prices are expected to rise by 52% and nominal retail electricity prices by 70% relative to 2011). The use of an additional precautionary downward adjustment would provide extra protection against damaging the reputation of the Green Deal – particularly in the short term where energy price volatility might see bill savings reduced for a short period.

Option 3: Do nothing for a majority of Green Deals but apply a downward adjustment of 5% (or similar) to the estimated energy bill savings for domestic Green Deal plans which are in excess of £10,000 (preferred option).

As noted in option 1 above, for a majority of Green Deal customers, the bill savings figure used for the calculation of the Golden Rule would reflect the expected energy bill savings. The assessment process and methodology used for estimating the energy savings would take account of variations in the realisation of savings, providing reasonable confidence the Golden Rule principle will be met. This option would however, provide an additional consumer protection mechanism for Green Deal plans offered to domestic customers, which are in excess of £10,000. Green Deal providers would be required to reduce the savings estimate by 5% (or similar) which will provide a greater savings margin and expectation that costs will be offset by savings, even if energy prices decrease or energy consumption of the bill payer fluctuates. This increased confidence could assist to significantly increase uptake of larger packages of measures. The £10,000 figure will be kept under review to ensure it remains realistic. The disadvantage of this option would be that it would reduce the amount of finance offered to customers considering larger Green Deals, over £10,000 by the

specified percentage, which could limit applicable measures and packages which could meet the Golden Rule principle.

Option	Impacts by main affected groups	
	Costs/Risks	Benefits/Advantages
1: Do nothing except warn of the risks and reasons why bill savings could be lower than expected. (preferred option)	<ul style="list-style-type: none"> Assessments might overestimate energy bill savings and repayment charges might outweigh bill savings. While there is a high degree of confidence that over the life of the Green Deal plan the Golden Rule would be met, there is a reputational risk in the first few years should energy prices fall. 	<ul style="list-style-type: none"> Low cost option Potentially increases consumer awareness that success of measures also depends on behavior
2: Apply a downward adjustment of, say 10%, to the estimated energy bill savings	<ul style="list-style-type: none"> Would reduce the amount of Green Deal Finance households can access, increasing the need for ECO subsidy. 	<ul style="list-style-type: none"> Provides safety margin and reduces risks of mis-selling Raises confidence in Golden Rule
3: Do nothing for a majority of Green Deals but apply a downward adjustment of 5% (or similar) to the estimated energy bill savings for domestic Green Deal plans which are in excess of £10,000 (preferred option).	<ul style="list-style-type: none"> Would reduce the amount of Green Deal finance which could be offered to customers considering larger Green Deals worth more than £10,000. 	<ul style="list-style-type: none"> Provides safety margin for those considering larger Green Deals and reduces the risk of mis-selling without restricting the amount of finance offered to a majority of customers. Raises confidence Golden Rule will be met which may help increase uptake of larger packages of measures.

19.1.2.4 Interest Rates

Domestic

Secondary legislation contains an option to prescribe or prohibit particular terms for the Green Deal finance package. There are risks that the Green Deal charge could exceed energy bill savings if, for example, the Green Deal charge were linked to floating interest rates and interest rates rise more quickly than fuel prices.

Two options have been considered:

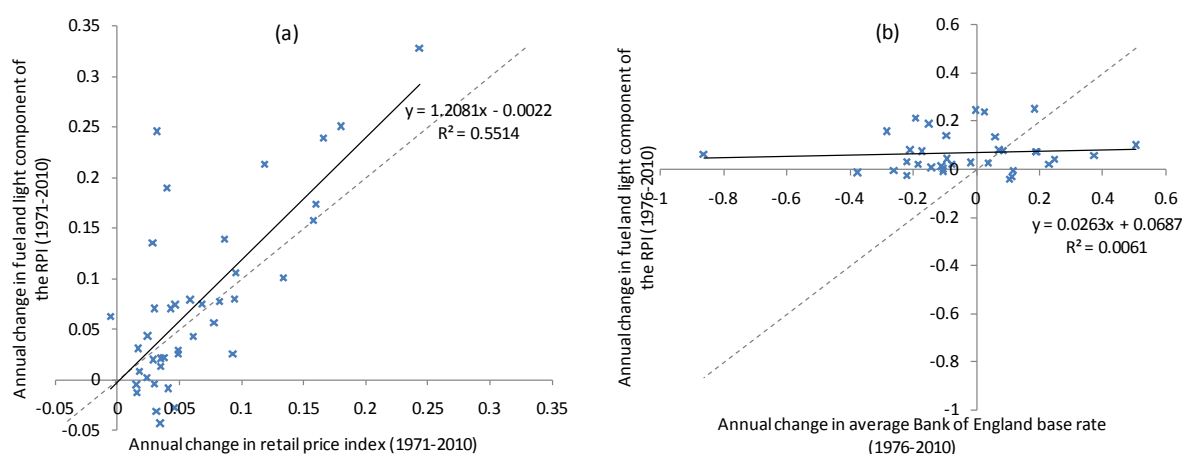
1. permit the market to determine the type of interest rate offered (do nothing); and
2. prohibiting all structures apart from those with the greatest likelihood of the charge being offset by savings in future years (preferred option).

Option 1: permit the market to decide which interest rate structures are applied to Green Deal packages.

This approach would let Green Deal providers offer interest rate structures they consider meet the demands of their investors and customers, such as fixed, floating or index-linked. In theory, this flexibility to offer interest rate products would increase the level of investment in the Green Deal.

However, additional flexibility would create the possibility that the Green Deal charge might increase unexpectedly and in a way that is out of step with increases in energy prices. This could present an increased risk to consumers that the Golden Rule is broken. For example, a Green Deal charge where the interest rate is linked to the Bank of England base rate would present a significantly increased risk. There is only a very weak correlation between the base rate and fuel prices (see Figure 45). Indices such as the Retail Price Index (RPI) or the Consumer Price Index (CPI) exhibit a higher degree of correlation with fuel prices. However, even the RPI and CPI increases do not always track fuel price rises.²⁰²

Figure 45: Correlations between annual percentage changes in the fuel and light component of the RPI, and the RPI and the Bank of England base rate²⁰³



Option 2: prohibit all Green Deal finance package structures apart from those with the greatest likelihood of the charge being offset by savings in future years

The interest rate structures which are most likely to meet the Golden Rule over the lifetime of the plan are either fixed rate, or link the interest element of the plan to an appropriate index of domestic retail energy prices. DECC proposed that this would be the fuel and light component of the Retail Price Index.

Allowing some flexibility has the advantage that in a scenario with increasing energy prices, a flexible deal may enable providers to offer more Green Deals with lower initial interest rates. For the sake of ensuring customer confidence, however, the preferred option is to prohibit all structures, apart from those which provide the greatest likelihood that expected savings would be equal to or greater than the expected costs over the lifetime of the plan for the domestic sector.

²⁰² In panel (a) of Figure 45 see the points that fall below the dotted line.

²⁰³ Source: DECC (2011) "Retail Price Index UK: fuel components in the UK/ relative to GDP deflator" Table 2.1.1, and Bank of England (2011) data series IUAABEDR

	Impacts by main affected groups	
Option	Costs/Risks	Benefits/Advantages
1: permit the market to determine the type of interest rate offered (do nothing);	<ul style="list-style-type: none"> • potential decoupling of Green Deal charges and fuel bill savings. • Increased risk that the Golden Rule would not be met in practice. 	<ul style="list-style-type: none"> • Enables customer choice • Enables market to develop innovative products • More measures installed
2: prohibiting all structures apart from those with the greatest likelihood of the charge being offset by savings in future years (preferred option).	<ul style="list-style-type: none"> • Restricting range of financial products might reduce Green Deal take-up • Does not cater to customers with higher risk appetite 	<ul style="list-style-type: none"> • No development cost for innovative products • Enhances consumer confidence

Non-Domestic sector interest rate structures

Two options have been considered:

1. permit the market to determine the type of interest rate offered (do nothing) (preferred option); and
2. prohibiting all structures apart from those with the greatest likelihood of the charge being offset by savings in future years.

Many of the same arguments apply to the non-domestic sector, however no restrictions appear necessary because businesses are more familiar with entering into credit arrangements and with assessing financial risks. It is also expected that non-domestic Green Deals would be shorter on average than those taken out in the domestic sector. This means that they are less likely to be passed on to subsequent customers so it becomes more appropriate for the initial improver to be free to choose the level of financial risk they are content to bear.

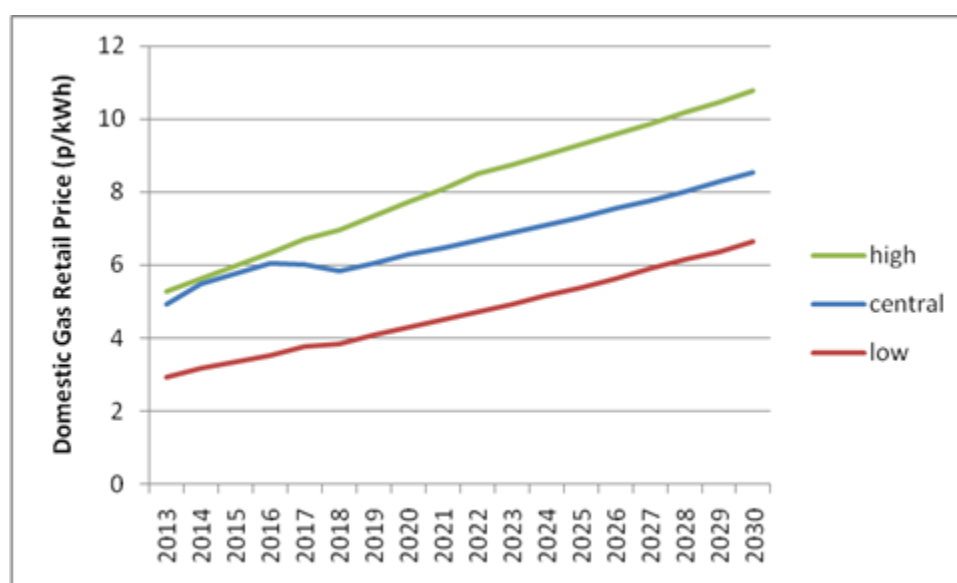
Option	Costs/Risks	Benefits/Advantages
Option 1: permit the market to determine the type of interest rate offered (do nothing)	<ul style="list-style-type: none"> • Potential decoupling of Green Deal charges and fuel bill savings. • Increased risk that the Golden Rule would not be met in practice. 	<ul style="list-style-type: none"> • Enables customer choice • Enables market to develop innovative products • More measures installed
Option 2: prohibit all structures apart from those with the greatest likelihood of the charge being offset by savings in future years (preferred option).	<ul style="list-style-type: none"> • Restricting range of financial products may reduce Green Deal take-up • Does not cater to customers with higher risk appetite. 	<ul style="list-style-type: none"> • Less risk that the Green Deal charge would outweigh bill savings.

19.1.2.5 Factoring Potential Energy Price Rises into the Charge

By permitting the level of the Green Deal charge to rise over time as energy prices rise, the amount of Green Deal finance which can be raised is increased, increasing the number of measures which meet the Golden Rule. A Green Deal charge which is flat in nominal terms over the life of the Green Deal plan would be highly likely to underestimate future energy bill savings (which are expected to rise not just in nominal but in real terms) and as a result, cost-effective measure would not meet the Golden Rule.

Figure 46 shows the DECC projections for retail gas prices²⁰⁴. In the central scenario, retail gas prices and electricity prices rise by 52% and 70% respectively in nominal terms between 2011 and 2020.

Figure 46: DECC future gas price scenarios in nominal terms used in this impact assessment²⁰⁵



The following three options have been considered:

1. For customers with a fixed rate Green Deal finance package, prohibit the Green Deal charge from rising above the nominal estimate of year 1 energy bill savings (preferred option)
2. For customers with a fixed rate Green Deal finance package, permit Green Deal providers to increase the charge by an annual inflation target (increasing the amount of principal paid off)
3. For customers with a fixed rate Green Deal finance package, permit Green Deal providers to increase the charge by the projected rise in energy prices (increasing the amount of principal paid off)

Option 1: For customers with a fixed rate Green Deal finance package, prohibit the Green Deal charge from rising above the nominal estimate of year 1 energy bill savings.

Prohibiting an increase in the Green Deal charge over time would rule out some measures that would meet the Golden Rule with a rising Green Deal charge. However, under this option there would be a high degree of confidence that the Golden Rule would be met over the lifetime of the

²⁰⁴ DECC (2010) "Interdepartmental Analysts Group toolkit" tables 4, 10 and 22.

plan and that as nominal energy prices rise the Green Deal improver would enjoy increasing energy bill savings. This is the preferred option.

Option 2: For customers with a fixed rate Green Deal finance package, Permit Green Deal providers to increase the charge by an annual inflation target (increasing the amount of principal paid off).

A charge that rose at 2% a year, in line with target inflation, would increase the Green Deal finance that could be raised on any particular measure by 16% compared to option 1 on a 20 year repayment plan. This would allow more measures to meet the Golden Rule and support the aim of the Green Deal to increase the proportion of the installation costs of measures paid for by the beneficiaries of the measures. Linking it to target inflation would mean that, in real terms, the projected charge would be flat over time. Because energy prices are projected to rise in real terms there would still be a high degree of confidence that the Golden Rule would be met in practice, however the risk of the Golden Rule being breached would be higher than under option 1.

Option 3: For customers with a fixed rate Green Deal finance package, Permit Green Deal providers to increase the charge by the projected rise in energy prices (increasing the amount of principal paid off)

Linking an increase in the Green Deal charge over time to projected energy prices would allow the largest amount of Green Deal finance to be raised of all the three options. This is because projected energy prices are expected to rise at a rate above the rate of general inflation. Under this option it would still be expected that the Golden Rule would be met over time. However because this option would allow the highest charges to be attached of the three options and there is uncertainty over future energy prices, this option would carry the highest risk that the Golden Rule would be breached in practice.

Option	Cost/Risk	Benefit/Advantage
1: For customers with a fixed rate Green Deal finance package, prohibit the Green Deal charge from rising above the nominal estimate of year 1 energy bill savings (preferred option)	<ul style="list-style-type: none"> Some measures that could meet Golden Rule would be missed 	<ul style="list-style-type: none"> In scenarios of rising prices, customers would enjoy increasing benefits Projected charge to stay level over time (in real terms)
2: For customers with a fixed rate Green Deal finance package, permit Green Deal providers to increase the charge by the annual inflation target (increasing the amount of principal paid off)	<ul style="list-style-type: none"> Risk of mismatch between inflation rates and energy prices which would lead to the repayment charge outweighing energy bill savings 	<ul style="list-style-type: none"> Would increase amount of Green Deal finance that could be accessed (by 16% on a 20 year Green Deal plan).
3: For customers with a fixed rate Green Deal finance package, permit Green Deal providers to increase the charge by the projected rise in energy prices (increasing the	<ul style="list-style-type: none"> Of the options, carries the greatest risk that repayment charges outweigh energy bill savings. 	<ul style="list-style-type: none"> Allows highest amount of Green Deal finance to be accessed.

amount of principal paid off)		
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19.1.2.6 Allow cash-back incentives?

The Energy Act 2011 allows for Green Deal Providers to advance money to customers in specified circumstances. The rationale is that “cash-back” incentives could encourage take-up of the Green Deal. There is a question of whether there should be a maximum limit set on the amount that can be offered as a cash incentive.

Three options have been considered:

1. limit cash backs to the lower of 5% of the total cost of the Green Deal finance package or £150 (preferred option);
2. Prohibit cash back of any kind; or
3. permit unlimited cash backs subject to compliance with the Golden Rule .

Option 1: Limit cash backs to the lower of 5% of the total cost of the Green Deal finance package or £150

Cash-back and voucher schemes are common in many markets. The proposed cap would be set with a view to compensating the householder for the inconvenience of having measures installed, and it would also help Green Deal providers reimburse customers for the cost of the assessment.

Using general market practice as a comparator, it is proposed to cap cash advances to the consumer to the lower of £150 or 5% of the total cost of the Green Deal package, subject to compliance with the Golden Rule. The Green Deal code of conduct would provide guidance on the use of cash back incentives.

Option 2: Prohibit cash back of any kind.

This option would prohibit cash-backs but would let providers offer incentives such as store credits or vouchers. Prohibiting cash-back could be more equitable to future occupants, given that the Green Deal charge they pay might have been increased to repay the cash-back paid to their predecessor. However, this option offers no cost advantage compared to option 1.

Option 3: Permit unlimited cash back subject to compliance with the Golden Rule

Without a cap on cash-backs, customers could install the most cost-effective measures, or measures with high levels of ECO subsidy and within the limits of the Golden Rule take a relatively large sum of cash from the Green Deal provider. Later occupants could either end up paying a higher Green Deal charge, or pay the Green Deal charge for a much longer period or a combination of the two.

This option could be open to abuse and carries a risk that it leads to significant reputational damage for the Green Deal

Option	Cost/Risk	Benefit/Advantage
1: limit cash backs to the lower of 5% of the total cost of the Green Deal finance package or £150 (preferred option)	<ul style="list-style-type: none"> subsequent tenants would be charged for this benefit 	<ul style="list-style-type: none"> could be used to pay for assessment (overcoming customer inertia)

2: Prohibit cash back of any kind;	<ul style="list-style-type: none"> Limits flexibility for Green Deal providers to generate demand for the Green Deal 	<ul style="list-style-type: none"> Greater protection for future occupants from paying for cash back received by Green Deal improver.
3: permit unlimited cash backs subject to compliance with the Golden Rule	<ul style="list-style-type: none"> Open to abuse 	<ul style="list-style-type: none"> Could induce customers to act

19.1.2.7 How should unexpected costs be treated?

It is inevitable that unexpected problems would be discovered in a proportion of households after Green Deal work has commenced. It is important to protect vulnerable customers from unexpected costs during an installation whilst also ensuring Green Deal finance would not be used to repair known property defects and to pass the costs onto future bill payers.

Three options have been considered:

- 1. Permit Green Deal providers to include unexpected costs up to the limit of the Golden Rule with the consent of the bill payer. If the customer is not prepared to pay the residual, the fabric of the property must be restored to its original state by the installer (preferred option)**
- 2. Do nothing - the Green Deal plan remains as initially agreed; or,**
- 3. require Green Deal providers to pay for all unexpected costs.**

Option 1: Permit Green Deal providers to include unexpected costs up to the limit of the Golden Rule with the consent of the bill payer. If the customer is not prepared to pay the residual the fabric of the property must be restored to its original state by the installer (preferred option)

This option would let Green Deal providers include costs in Green Deal finance up to the limit the Golden Rule principle allows (with the consent of the bill payer). The Golden Rule would serve as the natural cap in this situation. In cases where the unexpected costs could not be fully wrapped into Green Deal finance, the consumer would be asked to agree to cover the excess cost. If the consumer did not wish to cover such costs the Green Deal Provider would need to ensure the fabric of the property was restored to its original state and the Green Deal plan would not go ahead.

The limit imposed by the Golden Rule would discourage customers from seeking a Green Deal simply to pay for property upgrades unrelated to energy efficiency improvements. This option would also help to keep the cost of finance low as Green Deal providers only take minimal liability in the event unexpected costs are incurred.

Option 2: Do nothing - the Green Deal plan remains as initially agreed.

Preventing alteration of the terms of the Green Deal plan would guard against potential misuse of the Green Deal, such as using Green Deal finance for repairs rather than energy efficiency, an exclusion could also limit legitimate take-up of the Green Deal. Exclusion of all unexpected costs would create a risk to Green Deal take-up, as the contingency of incurring unexpected costs would be with the customer. This disincentive would weigh most heavily on vulnerable households, who

are the ones most likely to benefit from the Green Deal's low cost funding mechanism. This option would not introduce further regulatory burdens as it would be governed by existing consumer protection laws.

Option 3: require Green Deal providers to pay for all unexpected costs.

This option would incentivise Green Deal providers to attempt to detect unexpected costs before installation works begin. However, mandating Green Deal providers to pay for all unexpected costs would increase the cost of finance for all, as Green Deal providers are likely to spread the costs across all Green Deal plans. Customers conceivably would have an incentive to use the Green Deal to rectify property defects if they were able to get a Green Deal Provider to begin installation work, knowing that once work began providers would be liable for unexpected costs of correcting defects.

The Consultation invites stakeholders to provide information on current market practice in cases where unexpected costs are discovered after building works begin and how market practice might be adapted to the Green Deal market.

Option	Costs/Risks	Benefits/Advantages
1: Permit Green Deal providers to include unexpected costs up to the limit of the Golden Rule with the consent of the bill payer. If the customer is not prepared to pay the residual the fabric of the property must be restored to its original state by the installer (preferred option)	<ul style="list-style-type: none"> Higher costs owing to providers/installers need for insurance or to pay the excess for remedial work 	<ul style="list-style-type: none"> Reduced risks for consumers
2: Do nothing – the Green Deal plan remains as initially agreed.	<ul style="list-style-type: none"> Increased costs for customers facing unexpected costs 	Providers/installers do not face risk of unforeseen costs
3: require Green Deal providers to pay for all unexpected costs	<ul style="list-style-type: none"> Providers would face higher costs 	<ul style="list-style-type: none"> Incentive for providers to ensure careful assessments

19.1.3 Measures

Green Deal customers would need to know which measures are eligible for Green Deal finance. The Green Deal must also maintain flexibility to discriminate between products offering superior performance and to admit new and innovative products. This section examines these issues, while section 19.1.4 on consumer protection covers decisions relating to ensuring that installed measures perform as expected.

The options discussed in this section relate to:

- the measures likely to be within the scope of the Green Deal;
- whether to promote packages of measures;
- how to recognise new measures in the Green Deal framework; and

- how to recognise enhanced product performance in the Green Deal framework.

19.1.3.1 Scope of the Green Deal

A Green Deal Measure is an “improvement” made to a property which has been financed through the Green Deal. This can include part-financing, where a customer has chosen to pay for some of the work themselves. **A “measure” means the type of improvement that can be made to a property, for example, loft or cavity wall insulation. “Product” means the branded product(s) actually installed.**

The Green Deal is based on the key principle that some cost-effective energy efficiency improvements to properties pay for themselves through the reduction they deliver on energy bills. Measures which have been “recognised” as being able to improve the energy performance of buildings and generate fuel bill-savings can qualify for finance. A second requirement for a measure to be financed through the Green Deal finance is that they have been recommended during the Green Deal Assessment. Because the assessment is bespoke and takes into account the individual characteristics of the property, this helps to prevent measures which are inappropriate for that property being installed.

Consideration is required of whether greater clarity is needed for the Green Deal market of which specific measures qualify for inclusion in a Green Deal plan. There are alternative options to determine the “pool of measures” which can be recommended and have the potential to meet the Golden Rule.

Four options have been considered:

1. **use the Golden Rule alone to dictate what is financed through the Green Deal (“Do nothing”);**
2. **specify high-level criteria to determine qualifying measures ;**
3. **specify a list of qualifying measures, but not the long list of products that would fall within the measures category (preferred); or**
4. **Government to specify all products that can be installed with Green Deal finance;**

Option 1: Use the Golden Rule alone to dictate what is financed through the Green Deal

Option 1 allows the broadest range of measures to be financed through the Green Deal. It would also future-proof the Green Deal so that new measures and products would have no barrier to be included in the Green Deal. This option would not incur additional administrative costs.

There would be disadvantages however. There would be a lack of clarity about which measures could attract Green Deal finance. Legal disputes could result over whether a Green Deal plan is valid. Under this option, customers might be offered different measures by different providers. Lack of clarity would potentially create customer confusion and undermine take-up. Moreover, if the market is unclear which measures are covered by the Green Deal, there would be less incentive for the supply chain to invest in capacity.

Option 2: Specify high-level criteria to determine qualifying measures

Option 2 improves clarity by setting high-level criteria on the types of measures that can be installed. For example, one such criterion would be that only measures which are “fixed” or non-portable

could be financed through the Green Deal. This would help to prevent people removing measures or taking them when they move property, meaning the future occupant is not left to pay for a measure for which they are not receiving a benefit.

However, similar to option 1, it is extremely difficult to be clear about which measures fall within high-level criteria and which do not – other than to specify. This would create uncertainty and again, pass all the risk to the Green Deal Provider that a plan could be deemed invalid.

Option 3: Specify a list of qualifying measures, but not the long list of products that would fall within the measures category (preferred)

This option essentially specifies which measures qualify. This means at the level of “cavity wall insulation” or “flue gas heat recovery device” – not the level of the individual product. This option has the benefit of setting out clearly the broad scope of the Green Deal but without stifling innovation at the product level²⁰⁶. It also means that the measures which have the potential to save energy and carbon, and reduce fuel bills, can be specified. Although it is important to make clear that it would not be a requirement for a qualifying measure to be capable of making fuel bill savings in every type of property and in every circumstance.

The disadvantage of this option is that it would require regular review of the list of measures to add new measures to the list (see 19.1.3.3 for analysis on adding measures to the Green Deal).

Option 3 is the preferred option, because it provides clarity about the scope of the Green Deal but does not stifle product innovation. For domestic buildings, a statutory instrument would set out the **qualifying measures**²⁰⁷ (See Annex G).

Option 4: Government to specify products that can be installed with Green Deal finance

This option would create absolute clarity as to which products would be qualify for the Green Deal but would require constant review and could create delays in new products being officially “recognised” in the framework. Given the large number of products on the market, maintaining a central list would incur significant administration costs. These administrative costs are estimated at £27,000²⁰⁸ to create such a list and £20,000 per year to maintain.

Option	Costs/Risks	Benefits/Advantages
1. Use the Golden Rule alone to dictate what is financed through the Green Deal (“Do nothing”)	GD consumers and business – legal costs associated with disputes Supply chain and society – less certainty limits development of supply chain and therefore take-up	GD consumer – maximum choice for consumer
2. Specify high level criteria to determine qualifying measures	Similar impacts to option 1. Potential for less consumer choice	
3. Specify a list of qualifying	Specification would need	Supply chain and society - clarity

²⁰⁶ However, see section 19.1.3.4.

²⁰⁷ Reduced Standard Assessment Procedure

²⁰⁸ Based on 90 days work per year at £300 per day.

measures, but not the long list of products that would fall within the measures category (preferred)	updating on a regular basis to allow for the inclusion of innovative measures into the Green Deal.	on measures qualifying for the Green Deal finance reduces uncertainty ensuring supply chain is developed leading to higher take-up with associated consumer and societal benefits
4. Government to specify products that can be installed with Green Deal finance	Government - admin costs associated with creating and maintaining a product list, estimated at a present value of £199k (over 10 years) Supply chain and society - Could stifle innovation GD consumers – least consumer choice of the options	Supply chain and society - clarity on products qualifying for the Green Deal reduces uncertainty ensuring supply chain is developed leading to higher take-up with associated consumer and societal benefits

19.1.3.2 Promoting packages of measures

The Green Deal aims to encourage the installation of as many packages of cost-effective measures at one time as possible. There are significant benefits of bundling measures into a package, as it can reduce hassle and transaction costs as well as making deeper cuts in energy consumption²⁰⁹. This section looks at options for promoting packages of measures:

Three options are considered:

- 1. allow consumers free choice about which recommended measures to install (“Do nothing”);**
- 2. impose legal requirements on those taking out Green Deals to carry out all measures that meet the Golden Rule; or**
- 3. promote but not require the installation of as many recommended measures as possible (preferred).**

Option 1: Allow consumers free choice about which recommended measures to install

This option may hinder cost effective carbon abatement, as concurrent installation of several measures may avoid hassle costs of installation being borne more than once.

Option 2: Impose legal requirements on those taking out Green Deals to carry out all measures that meet the Golden Rule

This option could result in a greater number of packages of measures being installed. However, this could also reduce take-up because some consumers may be put off by more comprehensive packages. For instance, this option might dissuade those who would have taken out a Green Deal for one measure, or a few measures, because they do not want to install all the measures that meet the Golden Rule. For instance, a householder might be dissuaded from upgrading their loft insulation because of a requirement to insulate all their solid external walls.

²⁰⁹ However, it is recognised that this approach may not be suitable for all Green Deal customers.

Option 3: Promote but not require the installation of as many recommended measures as possible.

This option would encourage consumers to consider the installation of the full package of cost-effective measures. A “packages” approach has the potential to deliver significant energy efficiency improvements and reduces the risk of duplicating costs should the additional measures become more desirable in the future. Where there are highly cost-effective measures within a package, these measures may generate ‘headroom’ within the Golden Rule which can be used to cross-subsidise other less cost-effective measures. Allowing “cross-subsidisation” between measures in a package would increase the number of measures installed and overall benefits (see below). There is however a risk that cross-subsidisation allows households to cross subsidise cost ineffective measures within a Green Deal package.

Option 3 is preferred because it should encourage a larger number of cost-effective measures to be installed. This option would also require Green Deal providers to explain to customers the different possible options for paying for packages, and future occupants to have full disclosure of the measures and charges associated with the measures.

Table 52: Measures packages

The table below shows that taking out a package of measures including cost-effective loft and cavity wall insulation reduces the amount of self finance that is required to install double glazing.

Measure(s)	Cost	Est. Annual savings	Life time (Years)	Repayment period (years)	Green Deal finance available	Self finance?
Loft top up and CWI	£658	£71	42	30	Full + headroom	No Charge of £45 p.a. lower than savings
Double Glazing	£4500	£100	20	20	£1216	£3284
Loft top up, CWI and Double Glazing	£5158	£171 for first 20 years, £71 for 21 st to 30 th year	Mixed as above	Mixed as above	£2190	£2968

*Assumes a 6% interest rate.

**These savings may be overstated. Overall savings may be lower as the savings attributable to each additional measure may reduce as the energy performance of the building improves. In both scenarios all measures pay for themselves within their operational lifetime (however, double glazing requires a customer contribution).

Option	Costs/Risks	Benefits/Advantages
1. allow consumers free choice about which recommended measures to install (“Do nothing”);	Society – long term carbon emissions reduction targets not met most cost-effectively.	GD customers - benefit from more innovative products and potentially greater savings from measures designed in the future Society-Does not constrain

		Choice. No constraint on GD uptake
2. Impose legal requirements on those taking out Green Deals to carry out all measures that meet the Golden Rule.	Reduced Green Deal take-up amongst consumers who do not wish to install all measures which meet the Golden Rule.	Society – potentially more cost-effective carbon abatement.
3. promote but not require the installation of as many recommended measures as possible (preferred)	Society – less certainty that whole house approach economies of scale benefits are realised compared to option 2. GD Consumer – encourages more consumers to max out their golden rule constraint and leave less head room to future proof savings.	Potentially increased take up of packages

19.1.3.3 Recognising new “measures” in the Green Deal Framework

The Green Deal framework should be capable of recognising entirely new measures coming onto the market in an efficient manner. This section suggests three options related to this objective.

Three policy options are considered:

- 1. do not allow new measures to be added to the Green Deal framework (“Do nothing”);**
- 2. use the existing mechanism in SAP to recognise new measures (preferred option); or**
- 3. Government requires new measures to be added to RdSAP.**

Option 1: Do not allow new measures to be added to the Green Deal framework

This option means only the measures already listed in the statutory instrument of qualifying energy improvements would be eligible for Green Deal finance. This option would reduce the scope for the Green Deal to expand and would arbitrarily limit scope to certain existing measures. It would mean the Green Deal is not future-proofed, and new measures which do not currently exist which could make a significant impact on carbon targets are not included²¹⁰.

Option 2: Use the existing mechanism in SAP (Appendix Q) to recognise new measures and add these to the list of qualifying improvements

This option would provide a familiar gateway to market entry, utilising an existing testing methodology and process for inclusion and assessing performance. SAP (and by default RdSAP) admits new measures via “Appendix Q,” a process whereby an organisation applies for inclusion in SAP.²¹¹ Subject to test results, the measure is included in SAP.

²¹⁰ SAP currently adds two to three new measures each year. At this rate, between 2013 and 2022 (the end of the third carbon budget) approximately 30 innovative measures would be excluded from the Green Deal.

²¹¹ Currently the Building Research Establishment administer this process.

However, organisations could view the Appendix Q process as time consuming and costly. Estimates are that it currently takes between six to twelve months to complete the process at a cost of £15,000-30,000.²¹² However, this would not be an additional cost created by the Green Deal.

This option would mean the organisation responsible for managing SAP has responsibility for determining which measures are likely to qualify for Green Deal finance. A Government approval and/or appeals process may need to be created to help administer this fairly, and to review the list on an annual basis²¹³.

For non-domestic properties a similar appendix Q process is being developed.

Option 2 is preferred because it builds on existing mechanisms and allows for performance to be checked before organisations gain recognition for new measures. Compared to option 3, option 2 would have lower administrative costs as it would avoid duplication of a framework which is already in place.

Option 3: Government requires new measures to be added to RdSAP.

This option by-passes the Appendix Q application process of Option 2 and would see the Government selecting which measures are added to RdSAP. The organisation responsible for managing RdSAP (or SBEM) would then need to gather evidence on the performance of these measures and model them. The benefits are that costs of the process may be similar to option 2, but would be funded by the exchequer, and as a result remove the cost-burden on individual companies. This would reduce a barrier to market entry for small and innovative manufacturers.

However, this option is not as responsive to changing markets as option 2 and creates an extra level of unnecessary bureaucracy. Government would still need to conduct a regular call for new measures and the performance data related to them. The SAP/RdSAP owner would still need to verify and model the information.

Option	Costs/Risks	Benefits/Advantages
1. Do not allow new measures to be added to the Green Deal framework ("Do nothing")	Does not incentivise innovation in the supply chain.	
2. Use existing mechanism in SAP to recognise new measures (preferred)	Government - admin costs in setting up a review and appeals process Business - costs to each company completing the Appendix Q process, estimated at £15-30k per measure, would not be additional to option 1	Society - allowing new measures to be added to the Green Deal could increase benefits to society from e.g. reduced emissions Supply chain and society – allowing measures to be included in the Green Deal in future provides an incentive for innovation
3. Government requires new measures to be added to RdSAP	Government - admin costs in setting up a review and appeals process and	Society - allowing new measures to be added to the Green Deal could increase benefits to society

²¹² Based on BRE averages and a case study of a company currently going through the Appendix Q process.

²¹³ If three applications to Appendix Q per year are refused, and each is appealed, this would require approximately 20 working days to process. At a cost of £300 per day this would equate to £6,000.

	<p>duplication of current processes in place</p> <p>Business - costs to each company to submit evidence</p>	<p>from e.g. reduced emissions</p> <p>Business - possible additional benefit from reduced barriers to entry for small companies associated with the cost of the Appendix Q process</p> <p>Supply chain and society – allowing measures to be included in the Green Deal in future provides an incentive for innovation</p>
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19.1.3.4 Recognising enhanced product performance

The estimated energy, financial and carbon savings associated with installing recommended measures are calculated within RdSAP for domestic properties, relying on standard characteristics of the measures in question²¹⁴. As there is no differentiation between products' performance, it prevents potentially high performing products from being eligible for greater amounts of Green Deal finance. Failure to recognise this could stifle innovation in the supply chain - a key policy objective for the Green Deal. Options have therefore been considered for the recognition of differential performance of products.

Four options have been considered:

- 1. exclude product differentiation within the Green Deal ("Do nothing");**
- 2. allow manufacturers to self-certify the enhanced performance of their products and provide Green Deal Providers with this information;**
- 3. build on the existing Product Characteristics Database to recognise the differentiated performance of products and give Green Deal Providers access to the information; and**
- 4. commence a competitive tender exercise to allow all potential software providers to increase the range of options and ensure value for money (preferred option).**

Option 1: Exclude product differentiation within the Green Deal

Excluding product differentiation would mean that product manufacturers would not be credited within the Green Deal framework for enhancing the performance of their products. This would reduce the incentives for manufacturers to invest in research and development activities.

Option 2: Allow manufacturers to self-certify the enhanced performance of their products and provide Green Deal Providers with this information

This option would create risks to the Green Deal financial framework by permitting savings estimates which may not have been verified to be used in the Golden Rule calculation. Manufacturers could take a short term view and exaggerate the savings from their product to allow greater access to

²¹⁴ The estimates are based on assumptions about standard thermal characteristics (U values) of the building fabric for a property of that age, and the effect on this U value of adding measures. These "default" savings estimates are for standard or average performance measures.

Green Deal finance for its installation. This could increase their sales and profitability but creates a risk for the integrity of the Green Deal market.

Option 3: Build on the existing Product Characteristics Database to recognise the differentiated performance of products and give Green Deal Providers access to the information

This option makes use of a database already linked to SAP (but not to SBEM), to assess the energy performance of a domestic building more accurately by inputting data into the model about the actual product type which has been installed. This option would mean extending the database to cover product differentiation for the full range of measures that qualify for Green Deal finance. The database would then need to be adapted so that it is able to generate the energy, financial and carbon savings associated with a product. The Green Deal Provider could then use this information in the Golden Rule calculation.

This option has the benefit of making use of an existing database and using the same methodology and modelling assumptions that create the savings estimate for the measure in RdSAP. The cost of modifying the database is unknown at present, but would form part of standard Government procurement and contractual arrangements for updating the Product Characteristics Database.

Option 4: Commence a competitive tender exercise to allow all potential software providers to increase the range of options and ensure value for money

As with option 3, option 4 would create a database. However, option 4 opens up the market to the provider who can demonstrate they are able to deal with a high number of differentiated products quickly and administer the process with the greatest value for money. The overall cost may be higher than option 3, but these additional costs could be offset by lower operating costs once the database is up and running (a possible dividend of the competitive tendering).

Options 3 and 4 would be voluntary. As a result any costs incurred by the manufacturer²¹⁵ to add their product to the database would be optional. However, the benefits of adding the product to the database are likely to be high for the company concerned as it allows consumers access to Green Deal finance that reflects the higher performance of the measure.

Option	Costs/Risks	Benefits/Advantages
1. exclude product differentiation within the Green Deal ("Do nothing")	Supply chain – reduced incentive for innovation GD consumer – high performing products will not be able to generate greater access to Green Deal finance. Society – Lower availability of Green Deal finance would reduce take up.	Supply chain - No associated administrative costs.
2. allow manufacturers to self-certify the enhanced performance of their products	GD consumer – risk of supplier overstating savings to increase initial sales. In	Supply chain – increased demand for better performing products. Incentive to invest in innovation

²¹⁵ Potentially around £30,000 if equivalent to the cost of adding a new measure to SAP.

and provide Green Deal Providers with this information	the long run suppliers would be incentivised to be competitive, however confidence in the GD market may suffer. Supply Chain – Administrative costs of self certification	GD consumers – more product choice fitting within golden rule assessment. Society – increased GD uptake providing confidence in market is not reduced to suppliers overstating performance.
3. build on the existing Product Characteristics Database to recognise the differentiated performance of products and give Green Deal Providers access to the information	Supply chain – potentially higher costs to maintain the database than option 4.	Supply chain – no/little additional set up costs. Benefits from option 2 are also applicable with increased certainty of GD uptake not being suppressed by suppliers overstating performance reducing confidence in GD market.
4. Commence a competitive tender exercise to allow all potential software providers to increase the range of options and ensure value for money (preferred option)	Supply chain – High set up costs.	Supply chain – potentially lower costs to maintain the database than option 3. Benefits from option 2 are also applicable with increased certainty of GD uptake not being reduced by suppliers overstating performance and thereby reducing consumer confidence.

19.1.4 Customer Protection

The options discussed in this section relate to:

- Whether and how to certify Green Deal advisors;
- how to ensure work is protected by appropriate guarantees and warranties;
- how to ensure products perform as expected;
- whether and how to accredit installers;
- whether to accredit providers;
- modifications of the Consumer Credit Act in relation to the Green Deal;
- what consent is required; and
- what information needs to be disclosed and how it is disclosed;

19.1.4.1 Certifying Green Deal advisors

Confidence in Green Deal assessments would be at risk of being undermined unless customers have confidence in the professionals delivering assessments. There are options for the certification of advisor services:

Three options have been considered:

- 1. leave it to the market (“Do nothing”);**
- 2. extend existing EPC assessor certification regime; or**
- 3. introduce UKAS accreditation of certification bodies (preferred).**

Option 1: Leave it to the market

This option not only has the disadvantage that customers would not have the means to judge whether they are receiving good quality advice, but also that the assessment process would fail to meet installers' needs for a robust assessment process to undertake their work. Lack of trust would create a drag on market expansion.

There may also be impacts on competition if customers look to larger, more well-known firms or brands to provide the assessment service in the absence of a common standard of quality recognisable to customers.

Option 2: Extend the existing EPBD assessor certification regime

Under this option, the EPBD framework could be adjusted to bring the needs of the Green Deal market within its scope. Currently, the government approves certification bodies – so-called “accreditation schemes” - which in turn approve individual assessors. Government defines a set of operating requirements and monitors compliance.

However, respondents to DCLG's and DECC's joint call for evidence on the EPBD regime wanted to see improvements in the training, accreditation and quality control relating to EPC assessments, and were keen to ensure the robustness of the Green Deal assessment. To ensure the most effective monitoring of Advisors and the assessments they produce, Green Deal may benefit from independent third party assurance.

Option 3: introduce UKAS accreditation of certification bodies

This option proposes that the United Kingdom Accreditation Service²¹⁶ (UKAS) accredits certification bodies who would provide third party assurance against an agreed specification for Green Deal Advisor services. UKAS are able to commit to establishing an accredited certification system by April 2012.

The certification market is expected to be competitive. For example, the Microgeneration Certification Scheme (MCS) has nine certification bodies, where fees vary between £450 and £1,800 per year.

Option	Costs/Risks	Benefits/Advantages
1. No mandatory accreditation of	<ul style="list-style-type: none">• Installers – additional	<ul style="list-style-type: none">• Advisors - low training costs

²¹⁶ The United Kingdom Accreditation Service was established in 1995 by Government to be the national independent accreditation body. Its value as a flexible but robust process that can be applied to a wide variety of assessment, approval or evaluation tasks has gained wide recognition by Government and business and now has an international reputation. Although a not for profit private company, under a Memorandum of Understanding with BIS, UKAS must operate in the public interest.

How individuals or services are assessed depends on the nature of the scheme and standard used for certification. For example, using ISO 17024, each individual's competence must be assessed by the certification body, or competence demonstrated through an approved national qualification scheme that has an aligned assessment strategy (for example in the case of Gas Safe). Using EN 45011 ensures that companies have processes in place to ensure the individuals recruited are competent and the service they deliver is of high quality.

certification bodies	assessment costs	
2. Extend EPC certification regime	<ul style="list-style-type: none"> • Installers – occasional additional assessment costs • Advisors – acquire and maintain certificate. Cost of £700k (PV)²¹⁷ • Advisors - initial training costs²¹⁸. Cost of £900k(PV) 	<ul style="list-style-type: none"> • Customers – better informed decisions, however some variation across different certification bodies
3. UKAS accreditation of certification bodies (preferred)	<ul style="list-style-type: none"> • Installers – acquire and maintain UKAS accredited certificate – costs of £1.5m (PV)²¹⁹ • Advisors - initial training costs – costs of £900k(PV) • Installers – low additional assessment costs 	<ul style="list-style-type: none"> • Customers – better informed decisions • Green deal take up – greater consumer confidence in assessments

19.1.4.2 Guarantees and warranties

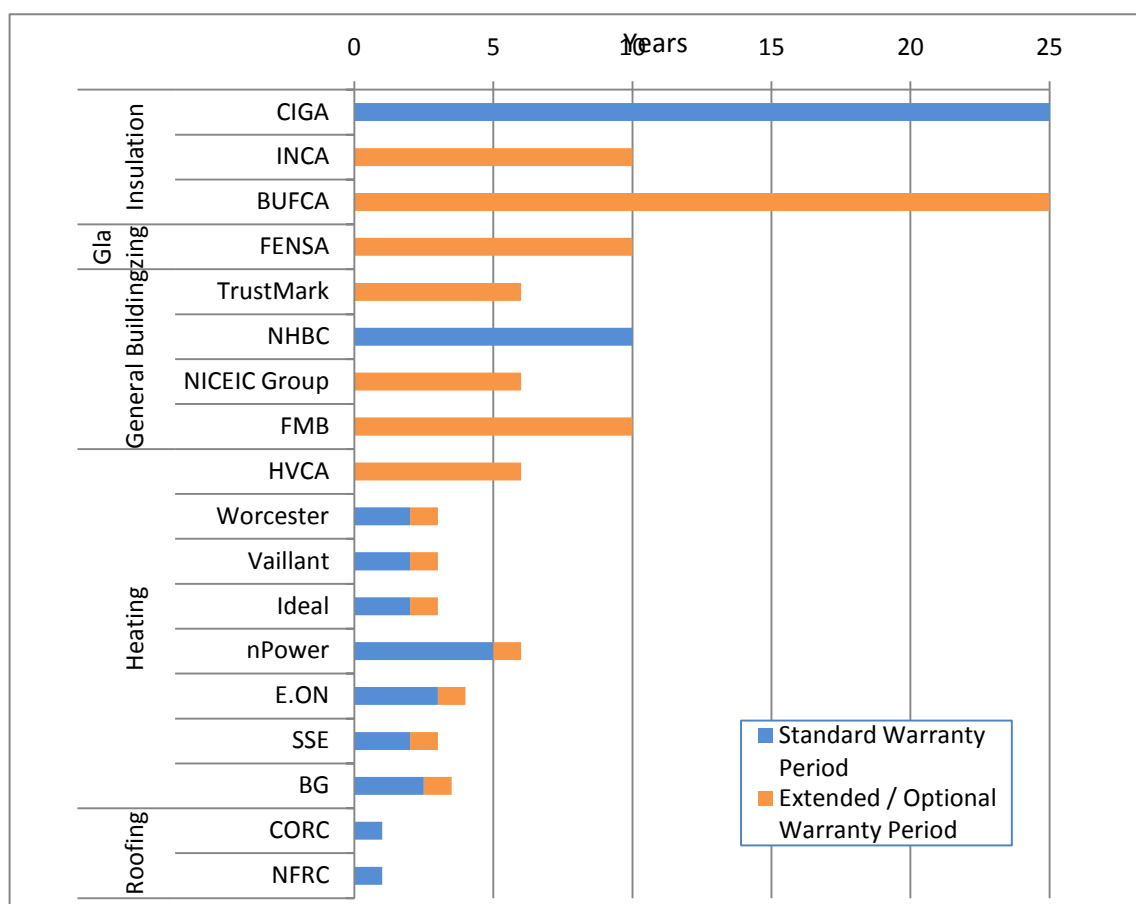
Warranties covering measures which are eligible for the Green Deal vary in their length and would not, in all cases, provide protection for the life of the plan. In addition, some new technologies in the market are still to establish proven protection mechanisms for customers for long term arrangements. Figure 47, below, provides information on the available warranties in the market.

²¹⁷ Based on an assumption of £150 certification cost per adviser. See annex A for details of assumptions underlying estimates of numbers of assessors.

²¹⁸ Based on an assumption of £400 training costs per assessor over and above those that would have been needed for EPC training. See annex A for details of assumptions underlying estimates of numbers of assessors.

²¹⁹ Based on an assumption of £1,000 certification cost per adviser. See annex for details of assumptions underlying estimates of numbers of assessors.

Figure 47: Warranty and Guarantee Periods for measures



Without warranties covering measures for the lifetime of a Green Deal plan customers would face a risk that measures would stop working but they would continue to be liable for a Green Deal charge. Despite best practice, in some instances energy efficiency products or systems may see a drop off in performance or even stop working altogether. While this risk may have a small impact on a householder's lifetime wealth or a business's overall finances, it could have a significant impact on Green Deal take up if individuals perceive a risk that they would make a loss on taking out the Green Deal package. The finding that individuals are loss averse would suggest that the risk of product or system malfunction would disproportionately reduce take-up.²²⁰ Guarantees which run for the repayment term of the Green Deal finance would reduce the risk that the householder or business experiences an overall loss from taking out a Green Deal finance package but increase the cost for consumers. The challenge is how best to provide customers with assurance without adding disproportionate costs onto any Green Deal Plans. It is recognised that this is a difficult area, and therefore, whilst we do have a preferred option we are exploring this issue more fully in the accompanying consultation and are continuing to work with stakeholders on it.

Four options have been considered:

1. Set no requirements and allow customers to make a choice on the level of warranty they want ("Do nothing");
2. Set minimum standards on the level of warranties which Green Deal providers should

²²⁰ Kahneman, D. & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47, 263-291

offer as part of the Green deal plan.

3. **Require Green Deal providers to issue a blanket insurance backed warranty for the length of the repayment period and let providers decide how they cover this within a set framework (preferred option).**
4. **Set specific requirements of the warranty to be offered by the Green Deal Provider.**

Option 1: Set no requirements and allow customers to make a choice on the level of warranty they want

Under this option, DECC would leave guarantee plans as a purely contractual matter between Green Deal Providers and their customers. While there is a fair argument for consumer choice, the implications for a property's future occupants must be considered. These occupants need to be confident that they are benefitting from the remaining Green Deal charge they take over, and insurance cover may be more costly than maintaining an existing warranty. This may cause adverse publicity or deter people from moving into properties with existing Green Deals.

Option 2: Set minimum standards on the level of warranties which Green Deal providers should offer as part of the Green Deal plan

This option would require DECC to set a minimum standard of guarantee which should be offered as part of the Green Deal plan. The requirement could set a minimum time period for which the measures and installation should be guaranteed. For example, this could be 5 years for the products and 2 years for the installation. The costs of these minimum requirements would be included within the Golden Rule. If there was demand, the Green Deal provider would then be able to offer extended guarantees or service contracts, the costs of which would be financed separately by the customer. This would help to ensure the costs were kept to a minimum whilst providing cover for the period of time when faults are most likely to occur. It also enable the customer to make an informed choice about the level of guarantee they wish to pay for. This option does, however, increase the risk of people having to pay for measures which are no longer producing all or any of the benefit expected. This would increase the chances of costs exceeding savings throughout the lifetime if the plan. Customers may also be unwilling to take on the charge when moving into a property if there is no guarantee in place. This could lead to customers insisting the charge is paid off upon sale, or rental values on properties with Green Deal decreasing. This in turn could decrease take-up.

Option 3: Require Green Deal providers to issue a blanket insurance backed warranty for the length of the repayment period and let providers decide how they cover this within a set framework

This option would require Green Deal Providers to issue adequate assurance for the Green Deal period. Green Deal providers would be free to extend Green Deals beyond the period covered by guarantees by offering their own additional guarantee. Installers, manufacturers and advisors would continue to maintain their current indemnity levels, but Green Deal providers would have an incentive to sub-contract with businesses operating to the highest standards.

For consumers, this option offers simple and effective protection. However, customers would be exposed to risk in cases where a Green Deal Provider ceases trading. Therefore, accreditation of

providers would include insurance cover to match the period of guarantees. Consequently, providers are likely to wish to recoup the costs of providing this guarantee, and this may push up costs.

Option 4: Set specific requirements of the warranty to be offered by the Green Deal Provider

This option would mean that Green Deal Providers to offer guarantees with specific requirements. Examples of these could include varying warranties by recommended lifetimes of measures and linking repayment period to that recommendation; another option would be to have an insurance backed warranty to cover the Green Deal charge for the lifetime of the plan so in the event of measure failure or failure to repair the measure, the Green Deal Provider can choose between repair, replacement or paying off the remaining charge, whichever the most cost effective option is. A combination of these two proposals could ensure that costs are kept to a minimum whilst providing maximum protection.

For consumers, these options would be suitable as they would effectively guarantee the measures for the lifetime of the plan. However, there is a risk that this could fall outside of the Golden Rule or add burdensome costs to the Green Deal Provider which could then be passed on to the consumer.

Option	Costs/Risks	Benefits/Advantages
1. No requirements on lengths of warranties	<ul style="list-style-type: none"> • Future occupants of improved buildings – may be responsible for Green Deal charges related to measures that are at (unknown) risk of failure, in addition to potential costs of repair / replacement. • Potential costs to Green Deal reputation (and long term take up) if customers are dissatisfied with quality 	<ul style="list-style-type: none"> • Installers / manufacturers / Green Deal providers – may use cheaper materials or spend less time securing installation and low costs of repair/replacement. • Higher Green Deal take up due to lower costs (at least in the short-term)
2. Minimum standards on level of warranties	<ul style="list-style-type: none"> • Future (long-term) occupants of improved buildings – may be responsible for Green Deal charges related to measures that are at (unknown) risk of failure, in addition to potential costs of repair / replacement. 	<ul style="list-style-type: none"> • Occupants of recently improved homes – cover for the period when faults are most likely • Higher Green Deal take up due to lower costs (however potentially higher underperformance of measures in the long-term)
3. Require each party to warranty each element (products, materials, advice) for the duration of the plan	<ul style="list-style-type: none"> • Installers, advisers, manufactures – costs of longer guaranteed • Lower Green Deal take up due to higher costs related to guaranteed services • Consumers – uncertainty 	<ul style="list-style-type: none"> • Consumers and future occupants – protection against paying for measures at a time that they provide no benefit.

	about guarantee given different parties involved; risks of one or more parties going out of business in the long term	
4.Set specific requirements of the warranty to be offered by the Green Deal Provider	<ul style="list-style-type: none"> • Costs involved for Green Deal Provider which would be passed onto consumer reducing the number of measures meeting the Golden Rule. • Linking repayment period to length of warranty would potentially result in a number of complex warranties being provided to one customer for different measures. • Linking the repayment period to warranty period could make some measures ineligible under the Golden Rule 	<ul style="list-style-type: none"> • Consumers and future occupants will be protected against paying for measures which no longer provide a benefit. • Higher Green Deal uptake due to extra protection. • Future bill payers will be protected to the same level as original improvers, removing the risk of future occupants requiring the plan to be paid off before buying the house.

19.1.4.3 Product Assurance

Products installed with Green Deal finance should be safe, durable and perform as intended.. Therefore, there is a need for assurance of product quality as well as performance. There are options for providing greater assurance of product quality and performance.

Three options for product assurance were considered:

- rely on existing product standards (“Do nothing”);
- require comprehensive testing and third-party verification for all Green Deal products; or
- rely on existing standards and legislation, fill gaps and improve compliance (preferred option).

Option 1: Rely on existing product standards (“Do nothing”)

This option would rely solely on existing product standards and make no new requirements. Some form of regulation, testing guidance or standard covers all products falling within a category of eligible measure, however the testing and certification requirements are at varying levels.

This option has the benefit of presenting no additional burden to industry, allowing all products currently on the market for relevant measures to participate in the Green Deal and requiring no action to be taken before launch by any party. However Green Deal customers would have no greater assurance of the quality of performance of products than now. The Green Deal framework in particular relies on products lasting for their operational lifetime and performing as intended in order to help customers realise expected fuel bill savings.

The current product legislative landscape contains gaps which could result in products being installed where the reliability and performance is not assured. For example, external wall insulation is a system of components. At present there are no mandatory requirements for systems testing²²¹ in the UK, although it is carried out routinely by system suppliers. Failure to systems test could result in systems being installed where the parts are not compatible, such as the render and the insulation boards, resulting in failure or other problems such as condensation and mould.

Option 2: Require comprehensive testing and third-party verification for all Green Deal products

This option would be that the Green Deal Code of Practice requires new full “third party testing” and verification against a new Green Deal standard and the issuing of a unique “Green Deal stamp” to Green Deal products which meet the standard. Products could not be installed without such a stamp.

This would have the benefit that there would be certainty over which products could be installed with Green Deal finance and the additional testing would provide increased confidence in the quality and performance of the products. However, this option would present a very high burden on business, duplicating a lot of existing effort undertaken for mandatory certification such as European CE marks²²². It would also contravene the Construction Products Directive which harmonises testing methodologies in some cases.

The cost to industry of requiring bespoke Green Deal testing and certification could be around £24 million. This assumes there are 32 eligible measures, with 30 products in each category and the total cost of testing and certification for each product is £25,000²²³. Informal consultation with industry has confirmed that there would be insufficient time before the proposed Green Deal launch for in-situ third party testing of all products to take place.

Option 3: Rely on existing legislation, maintain standards and improve compliance

This option balances assured product performance with minimal additional burdens to business. The approach would rely on existing legislation and maintain standards as far as possible, and improve compliance.

Option 3 would require (in the Green Deal Code of Practice) that all products installed through the Green Deal must meet existing legal obligations, for example, those set out in Building Regulations. In addition, products covered by EU legislation on CE marking must have the CE mark. CE marking declares the characteristics of a product, including for example flatness, weight bearing and thermal performance. Many products already have CE marking. In any event, from summer 2013, all products or materials covered by EU legislation relating to CE marking will need to have mandatory CE marking in the UK. The Green Deal does not therefore create additional costs to manufacturers.

Thirdly, this option would require “system testing” and third party certification from a UKAS accredited (or equivalent) facility for measures which are made up of a series of components such as external wall insulation. Evidence gathering suggests that around 14 to 16 External Wall Insulation

²²¹ Although existing manufacturers do routinely carry out systems testing.

²²² <http://www.ce-marking.org/what-is-ce-marking.html>

²²³ The assumptions on testing and certification costs are based on averages for the Appendix Q process and the Microgeneration Certification Scheme.

systems have already been tested and approved in Great Britain. The process can take between 1 and 4 years²²⁴ and the cost is on average £30,000. Requiring systems testing at the outset for all Green Deal composite products would help prevent Green Deal Providers from bearing the costs of replacing and repairing systems, keeping down the cost of warranties and guarantees. It would also ensure the Green Deal installations are not below standard already being set in the market.

The measures which should be considered as a “system” would be a question for the consultation.

This option does not create new standards, but would require installers to use products which manufacturers have declared meet the requirements of the Green Deal Code of Practice. The Green Deal oversight Body would list these products as part of their role. This process will help to improve compliance, clarify for the purposes of warranties that checks have been made, and make it easier for installers to know which products are “Green Deal ready”.

A similar methodology would be adopted to the CERT model which requires that a proportion of listed products are spot-checked for compliance. Assuming a random sample of 50 products per year are checked, and it takes two days for each product at a cost of £600 (manufacturer’s time plus auditor’s time), the annual cost would be £30,000.

The cost of checking and inputting data for a 1,000 products per year could be around £600,000, split between the Oversight Body (physically registering the products) and industry checking and verifying compliance with the Code²²⁵. The cost borne by manufacturers should not be beyond checks that would normally be required to comply with existing legal requirements. There would be a need for companies to supply the Oversight Body with sufficient information to list the products.

Option 3 is the preferred option. Although more costly than option 1, it would provide an additional level of confidence and assurance which is judged to be necessary for the Green Deal market.

Option	Costs/Risks	Benefits/Advantages
1. rely on existing standards	<ul style="list-style-type: none"> Manufacturers of high quality products – may lose the ability to signal the quality of their products Risk to Green Deal customers of measures failing to perform for the lifetime of the plan – especially for “systems” such as external wall insulation 	<ul style="list-style-type: none"> Manufacturers – no additional costs of product assurance
2. Require comprehensive third-party verification	<ul style="list-style-type: none"> Manufacturers costs of testing all products – £24m Reduced short-term Green Deal take-up owing to higher costs of products 	<ul style="list-style-type: none"> Green Deal providers – reduced costs of guaranteeing products Increased long-term Green Deal take-up owing to greater confidence in products

²²⁴ Construction Products Association Green Deal Team Product Assurance Gap Analysis.

²²⁵ This assumes 1 day’s work for the company and 1 day for the Oversight Body. In reality the cost may be much lower.

3. Rely on existing product standards, with additional requirements for “systems” not covered by existing standards (preferred)	<ul style="list-style-type: none"> • Manufacturers of testing “systems” - £6.7m²²⁶ • Costs of spot-testing compliance £30k per year (£250k PV) • Manufacturers - registration costs £600k per year (£5m PV) • Reduced short-term Green Deal take up – owing to higher costs of products 	<ul style="list-style-type: none"> • Green Deal providers – reduced costs of guaranteeing products • Increased long-term Green Deal take up – owing to greater confidence in products
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19.1.4.4 Accredited Installers

The quality of the installation of measures can have a significant impact on the level of energy savings achieved from measures. This section considers decisions for how to achieve high quality standards of Green Deal installations through the introduction of mandatory accreditation.

In autumn 2010, the Office of Fair Trading (OFT) commissioned TNS-BMRB to conduct research on consumer and business attitudes and behaviours in the Home Renovation and Improvement (HR&I) sector.²²⁷ This report drew on the TNS-BMRB research and, building on the insights provided, identifies key issues to be addressed in the HR&I sector.²²⁸ Consumers spend around £27 billion a year in this sector²²⁹, with most consumers initiating at least one HR&I service within the last two years. The sector plays a crucial role in maintaining the quality of the UK housing stock and in the achievement of overall societal objectives (including in relation to the environment, quality of life and economic growth). The economic relevance of, the number of complaints made by consumers relating to, and the potential financial and non-financial detriment (including inconvenience and distress) associated with problems in this sector combine to make the HR&I sector a particular focus for the consumer protection community.

The sector gives rise to high levels of consumer complaints. In the year to April 2011, Consumer Direct received some 70,000 consumer complaints about general home improvements, maintenance and repairs, with an additional 15,000 complaints specifically about the (window and conservatory) glazing sector. Moreover, when service levels fall below standard, the financial detriment, distress and inconvenience caused can be significant. In 2008, the OFT found that when a consumer experiences a problem in this market, the average financial loss they suffer is £533.5230. This detriment can have long term effects. For example, it deters consumers from effectively engaging with the sector in the future.

²²⁶ Assumes 25% (8 of the 32 measures categories) described above could be classified as “systems”. With 30 products per measure category, less 15 systems already accredited, at £30,000 per test.

²²⁷ OFT: Home Repairs and Improvements, June 2011 (http://www.offt.gov.uk/shared_offt/markets-work/home-repairs/OFT1343.pdf)

²²⁸ www.offt.gov.uk/shared_offt/markets-work/home-repairs/Research-Report-TNS-BMRB.pdf

²²⁹ Estimate on the basis of house price data from Halifax

²³⁰ OFT992, 'Consumer detriment: Assessing the frequency and impact of consumer problems with goods and services'.

Three policy options are considered:

1. let the market set standards (“Do nothing”);
2. ensure compliance with Green Deal standard by requiring accreditation of every individual installer; or
3. ensure compliance with Green Deal standard by delivering Green Deal accreditation through existing certification bodies

Option 1: let the market set standards (“Do nothing”);

This option would allow installers to develop their own standards. While some organisations would want to maintain their good reputation and aim high, there would be fewer incentives for the market as a whole to raise quality standards, which are variable. This would be a particular risk where it is difficult for customers to distinguish between high quality and low quality installers (creating an information asymmetry).

The absence of an accreditation scheme would increase consumers’ search cost and act as a drag on take-up for the Green Deal. It is also possible that consumers in a market without transparent accreditation standards would tend to place more trust in large firms, and that competitive conditions favouring larger over smaller firms would reduce competition.

Option 2: Ensure compliance with Green Deal standard by requiring accreditation of every individual installer

This option would require each installer to undergo individual, specific training and accreditation, imposing a material cost burden on individuals. Mandating a distinct new accreditation process in practice could create a barrier to entry for many small firms, especially SMEs and micro businesses. This issue is of particular relevance in the installation sector where micro businesses comprise a large proportion of the market.

UKAS charges on average £10k per application. It does not matter if this is a company or individual. This high fixed cost for accreditation would present a barrier to entry for small businesses and create a competitive advantage for larger firms for whom the cost would be a smaller proportion of their turnover.

As a comparator, Gas Safe scales their charges according to the size of the business, although economies of scale remain, with lower costs per active person for larger firms.

Table 53: Certification Costs through Gas Safe

Number of active people	Fees per company
1	£400 to £950
10	£400 to £950
20	£1,000 to £2,000
100	£2,500 to £7,000

Option 3: Ensure compliance with Green Deal standard by delivering Green Deal accreditation through existing certification bodies

Option 3 proposes that the existing institutional market framework for accreditation and certification is used. This option would provide for certification bodies to update their training standards to comply with new Green Deal standards. Certifying bodies' costs for introduction of Green Deal training standards would be spread across a large number of existing members, thus reducing the cost on individuals.

This approach has the advantage of reaching scale quickly; some 900,000 installers are already members of certification bodies so rollout of new standards would occur via a familiar route for certification bodies as well as their members.

Under this approach accreditation costs would be levied on certification bodies, who, in turn, would pass on to those they certify through their existing fee structures. The table below sets out how these costs might be levied for some of the key certification bodies if it is assumed they pass costs on proportionally. Assuming a UKAS fee of £10,000, in most cases the costs would be minimal. For some bodies the cost is significant (e.g. British Urethane Foam Contractors Association at £555) but these bodies represent large companies.

Table 54: Cost Summary for certification bodies and trade associations

Name of Body	Number of members	Additional cost of accreditation per member p.a.	Existing membership fee p.a.
General Building			
Royal Institute of British Architects (RIBA)	35,000	£0.28	£56 - £296 pa
Royal Institute of Chartered Surveyors (RICS)	100,000	£0.10	unknown
Chartered Institute of Building Services Engineers (CIBSE)	17,000 worldwide but most in UK	£0.58	£198 pa for standard member
Federation of Master Builders (FMB)	12,000	£0.83	unknown
National Federation of Builders (NFB)	1,500 (mainly larger firms)	£6.66	linked to company turnover - start up - £495 pa £1.5 - £3.5M - £3235 pa
Construction Industry Council (CIC)	500,000	£0.02	unknown
Confederation of Roofing Contractors	3,000	£3.33	unknown

(CORC)			
National Federation of Roofing Contractors (NFRC)	1,000 businesses	£10	unknown
Institute of Roofing (IOR)	1,200	£8.33	£47 - £142 pa
Sustainable Building Association (Association for Environment Conscious Building or AECB)	1,500	£6.66	£60 - £300 pa
Scottish Building Federation (SBF)	700 companies	£14.28	Unknown
Construction Industry Training Board / Construction Skills	30,000	£0.33	n/a
Construction Line	18,000 suppliers	£0.55	From £90 pa based on turnover
Trustmark	11,000 firms 30+ scheme operators	£0.90	Unknown
National House Building Council (NHBC)	18,000 house builders and developers	£0.55	Reg. fee £500 - £750 then annual fee based on no. of homes being built
Federation of Plastering and Drywall Contractors (FPDC)	160 contractors	£62.50	unknown
NICEIC Group	25,000 contractors	£0.40	unknown
Insulation			
National Insulation Association (NIA)	21 manufacturers, 1,000 individual installers	£9.79	£955 - £3765 depending on membership type
Insulated Render & Cladding Association (INCA)	11 system designers, 37 installers & 10 suppliers	£172.41	£300 application fee then £1250 - £3350 pa
British Urethane Foam Contractors Association (BUFCA)	13 contractors / installers & 5 product suppliers	£555.55	unknown
Heating			

Chartered Institute of Plumbing and Heating Engineers (CIPHE)	12,000 incl 260 manufacturers	£0.83	£50 - £400 pa
Renewables & Microgen			
Microgeneration Certification Scheme (MCS)	1,500 installers	£6.66	unknown
Solar Trade Association (STA)	200	£50	
Renewable Energy Association (REA)	600 firms	£16.66	£242 - £16,800 depending on turnover
Ground Source Heat Pump Association (GSHPA)	79	£126.58	unknown
Renewable UK	600+ corporates	£16.66	unknown
Combined Heat and Power Association (CHPA)	100+	£100	unknown
Federation of Environmental Trade Associations	400 manufacturers, suppliers installers & contractors	£25	unknown
Glazing			
Glass & Glazing Federation (GGF)	500 corporates	£20	£300 - £65,000 depending on turnover
Fenestration Self Assessment Scheme (FENSA)	9,000+	£1.11	Dependent on services

Option	Costs/Risks	Benefits/Advantages
1. Let market set standards	<ul style="list-style-type: none"> Firms: may lack incentives to raise quality standards Customers: would incur search costs to find high quality installers Small firms: without accreditation, it might be more difficult to win credibility in the market vis-à-vis large firms 	<ul style="list-style-type: none"> Firms: avoids imposing additional costs of doing business
2. Require accreditation of every individual installer	<ul style="list-style-type: none"> Small firms: imposing costs on every individual installer would be more expensive for microbusinesses with low turnover than for larger firms 	<ul style="list-style-type: none"> Consumers: would be able to rely on uniform quality level
3. Require accreditation through existing certification bodies	<ul style="list-style-type: none"> Certification bodies with smaller number of members would have higher additional cost per member (e.g. for BUFGA £555.55) 	<ul style="list-style-type: none"> Firms: costs would be spread widely Dissemination of new standards would occur through familiar routes For individual installers: cost implications would be relatively small

19.1.4.5 License Providers

Clause 3 of the Energy Act 2011 gives the Secretary of State powers to make a scheme in the framework regulations to authorise persons to act as Green Deal providers and regulate the conduct of those providers. Clause 4 requires that, in order for a Green Deal plan to be valid, it must be offered by someone who is authorised to act as a Green Deal provider.

The key benefit of accrediting Green Deal providers would be to help protect Green Deal consumers, for example by ensuring providers have a valid Consumer Credit Act (CCA) licence and that there would be suitable provisions in place in case of insolvency. This in turn would give investors confidence that Green Deal providers would be offering the levels of customer service required to help ensure the cost of finance is low.

Two options for licensing have been considered:

- 1. Do not require a licence ("Do nothing")**
- 2. Require providers to be licensed (preferred option)**

Option 1: Do not require a licence ("Do nothing")

Under this option, anybody could act as a Green Deal provider, regardless of whether appropriate provisions were in place to protect customers for the length of the Green Deal plan. This option could potentially increase reputational risk for the Green Deal.

Option 2: Require providers to be licensed

A licensing process would give greater certainty that a Green Deal provider would be a suitable company to provide finance and manage ongoing liabilities. The licensing process would be able to include certain checks, such as ensuring that the provider complies with the provisions of the Consumer Credit Act 1974 for businesses that engage in credit services to customers.

The Green Deal oversight body would be responsible for licensing Green Deal providers and issuing the Green Deal quality mark to licensed providers.

Option	Costs/Risks	Benefits/Advantages
1. No licensing requirements (Do nothing)	<ul style="list-style-type: none">• Consumers – Higher risk of insufficient protection• Risk of poor Green Deal reputation leading to lower take-up	<ul style="list-style-type: none">• Consumers - Greater competition amongst providers
2. Require licensing of providers (preferred option)	<ul style="list-style-type: none">• Providers – Initial and ongoing licensing costs	<ul style="list-style-type: none">• Customers – Greater consumer confidence in providers• Customers – Protection against insolvency of providers• Aids Green Deal reputation leading to higher take-up

19.1.4.6 Modifications of the Consumer Credit Act in relation to the Green Deal

Existing legislation already contains certain protections. In particular, the Consumer Credit Act (CCA) would apply to the majority of Deals. The Act regulates various elements of a credit arrangement, including:

- Clear pre-contract information and advertising to customers;
- Statements and information to customers once an agreement is up and running;
- Ongoing forbearance for customers with difficulty paying; and
- Allowing customers to repay early in part or in full.

However, due to the innovative nature of the Green Deal not all the requirements of the CCA were suitable for it. So, the following amendments were made in primary legislation:

- An exemption for suppliers from the need to hold an OFT license; suppliers already have an OFGEM license and are already regulated by OFGEM in how they collect payments from customers.
- An exemption for Green Deal Providers from the requirement to send arrears notices to customers; this exemption prevents customers from receiving arrears notices from both suppliers (who will be chasing payment as part of the energy bill) and from Green Deal Providers at the same time.
- A change to the Consumer Credit Act allowing the annual credit statements for Green Deal Plans to be issued by someone other than the Green Deal Provider. It is not proposed that it is required that another party provides these statements, but this legal change leaves this

option open, subject to agreement between the Green Deal Provider and a third party who is able to perform this function.

- An extension to the exemption for business credit so that the majority of non-domestic Green Deal plans are taken out of the scope of the Consumer Credit Act, in order not to split the non-domestic market and to avoid a situation in which some non-domestic Green Deals would be covered by the CCA and some would not.
- Early repayment; a power has been put in the Energy Act to allow extra compensation to be claimed by Green Deal Providers, up to the limit which the Consumer Credit Directive (the European Directive that the UK Consumer Credit Act derives from) allows.

To ensure that customers receive appropriate protections when suppliers are collecting payments it has been proposed that a small number of supply licence conditions specific to the Green Deal are introduced. These will require that suppliers must:

- collect payments in line with relevant OFT guidance on debt collection; and
- write to Green Deal customers in arrears no later than 14 days after a second missed payment.

It is not envisaged that these proposals will result in suppliers making major changes to their existing processes as it is understood that these practices are already undertaken by suppliers.

19.1.4.6.1 Early Repayment

The Consumer Credit Act restricts the compensation that a creditor can charge a customer who is repaying early to either 1% or 0.5% of the principal repaid early.²³¹ A power has been taken in the primary legislation to allow this limit to be amended if desired.

The following options were considered:

- 1. Apply compensation terms for early repayment as stipulated by the CCA (Preferred option for most Green Deal plans) ('do nothing')**
- 2. Prohibit any compensation for early repayment**
- 3. Permit compensation up to what is permitted under the Consumer Credit Directive, (Preferred option for Green Deal plans of longer than 15 years duration)**

Option 1: Apply compensation terms for early repayment as stipulated by the CCA

The CCA is intended with short term credit arrangements in mind and the long term commitments of the Green Deal market are outside of its intended scope. Therefore, whilst this option is preferable, due to the high level of consumer protection provided, for Green Deal plans of short duration stakeholders share the view that the level of compensation allowed for under the CCA might be inadequate in some cases. This is especially so given that Green Deal Plans might extend for periods of over 15 years, whereas the Consumer Credit Act is designed for financial commitments of much shorter periods. Application of this option in all cases could deter finance providers from entering the market, since consumers could take advantage of the opportunity to repay early whenever interest rates decline, whilst leaving lenders with interest rate mismatches between their Green Deal finance on the one hand and their own funding on the other. The compensation caps set by the CCA risk may be insufficient to cover this shortfall.

²³¹ Depending on whether the remaining period is less or more than one year.

Option 2: Prohibit compensation for early repayment

This option would disadvantage providers even further. There is no ostensible reason why Green Deal finance providers should be entitled to less compensation than finance providers in short term credit markets.

Option 3: Permit compensation up to what is permitted under the Consumer Credit Directive, (Preferred option)

The Green Deal will be a long term contractual arrangement and during this contracted period householders may wish to repay ahead of schedule when their circumstances change. If interest rates have declined in the intervening period since the Green Deal began, the provider would not be in a position to replace this lending without reducing the interest rate to reflect general market conditions. In such cases, the provider would suffer a shortfall in interest income, given that the provider would continue servicing the interest payable on his funding at an unchanged rate whilst earning a reduced interest rate on his lending. The risk of loss on the part of the provider is a particular issue where a customer seeks early repayment on a Green Deal plan of long duration.

Were finance providers unable to seek compensation for their loss in income, they would either not enter this Green Deal market at all, or only do so by factoring in the expected opportunity losses into interest rate margins. Either response would risk limiting growth of the Green Deal market.

Given this risk, Government has taken a power in the primary legislation that allows Green Deal Providers to claim up to their loss as compensation in the event of early repayment, as allowed under the Consumer Credit Directive. It is proposed that this power is used in relation to Green Deal plans of more than 15 years duration, where a Green Deal Provider has set out clearly in the Terms of the Plan that this compensation may be payable. The draft Statutory Instrument on the CCA, attached to the Consultation Document that accompanies this Impact Assessment, sets out the calculation that the Green Deal Provider would have to use to calculate the compensation they are entitled to in these circumstances.

Green Deals which are not regulated under the Consumer Credit Act

The Consumer Credit Act regulates credit provided to individuals, and consumers. It does not apply to credit arrangements of over £25,000 which are provided wholly or predominately for business purposes. It also does not apply to credit arrangements of less than £25,000 which are provided wholly for business purposes.

Certain other provisions under the Consumer Credit Act have been evaluated as to whether they might be appropriate for Green Deal plans which fall outside the scope of the Act. Three key Consumer Credit Act provisions would appear applicable to all Green Deal Plans:

- A statement of account at least once a year;
- A statement of account on request; and
- Information regarding whether the Green Deal package has an option to repay early, and on what terms.

It is important that customers receive regular statements of account which summarise the current Green Deal balance and the outstanding payments to be made. The ability of a customer to request Green Deal information statements is also important, especially in the context of new customers who may not have the details of the original agreement to hand. A requirement on Green Deal Providers to issue to any Green Deal customer a statement of account on request is necessary as the agreement passes to future bill-payers who may not have access to the original Deal otherwise.

Green Deal providers servicing customers who do not fall within the Consumer Credit Act can choose whether or not to allow customers to repay their Plan early. It is proposed to require all Green Deal Providers to clearly explain if early repayment is possible, and any terms and conditions which apply, e.g. setting out what compensation, if any, would be payable in the event of early repayment. This provision would enable customers to make an informed choice whether they want to sign up to a Green Deal that allows early repayments or not.

Option	Costs/Risks	Benefits/Advantages
1. Apply compensation terms for early repayment as stipulated by the CCA (Preferred for Green Deals < 15 years)	<ul style="list-style-type: none"> Providers – Compensation levels potentially inadequate (0.5% to 1% of principal) Consumers – Providers' risk premiums potentially passed on through higher interest rates 	<ul style="list-style-type: none"> Consumers – Low compensation payments Consumers – High level of protection from CCA
2. Prohibit compensation for early repayment	<ul style="list-style-type: none"> Providers – Risk of interest income losses resulting from early repayment Consumers – Providers' risk premiums potentially passed on through higher interest rates Green Deal take-up likely to be lower 	<ul style="list-style-type: none"> Consumers – Zero compensation payable on early repayment
3. Permit compensation up to what is permitted under the Consumer Credit Directive, (Preferred for Green Deals > 15 years)	<ul style="list-style-type: none"> Consumers – No financial benefit of early repayment 	<ul style="list-style-type: none"> Providers – Compensation charges are potentially commensurate with costs. Greater certainty. Consumers – Lower interest rates on finance

19.1.4.7 Consent

A Green Deal customer would have to confirm they agree to the Green Deal charge, and that all consents and permissions have been obtained for installing the measure. Express consent to the charge would be required from the current bill payer and from the owner of the property (where different). The requirement on the Green Deal applicant to confirm they have obtained any necessary consents may provide sufficient proof of consent to the measure. However, to ensure

consistency across the Green Deal and to give additional protection to future owners and bill payers, there is the option to require through secondary legislation additional evidence of consent.

Two options have been considered:

- 1. Require the Green Deal Improver to confirm on the Plan that the appropriate consents to installing the measure have been granted; or**
- 2. Require the Improver to confirm that consents to the measure have been obtained (as option 1), and require the Improver to supply evidence from relevant parties showing that consent has been given – Preferred Option**

Option 1: Require the Green Deal Improver to confirm on the Plan that the appropriate consents to the measure have been granted

The Improver would have to seek necessary consents for installing the measure(s) and confirm, via a signature on the Plan, that consents has been granted. No further evidence would be required, placing minimal burden on the Improver or Provider. The disadvantage of this option is that if at a future date the consents were challenged, a lack of supporting documentation may make it harder to demonstrate that a particular consent had been genuinely obtained.

Option 2: Require the Improver to confirm that consents to the measure have been obtained (as option 1), and require the Improver to supply evidence from relevant parties showing that consent has been given – Preferred Option

In addition to confirming that consent has been obtained, option two would require the Green Deal applicant to give the Green Deal Provider written evidence of consent. The Provider would be required to attach this evidence to the Green Deal Plan as an annex. This documentation may include a consent notice from a freeholder, or a local planning authority decision notice. Requiring Providers to maintain complete records of consents would ensure consistency across the Green Deal and would provide an audit trail of consent, giving additional protection to future owners and bill payers.

A Green Deal applicant would usually receive written confirmation from parties giving their consent. Passing copies to the Provider would add a minimal additional burden. Green Deal Providers, too, would expend minimal additional effort if required to store consent papers as an annex to the plan, given they are already required to store a copy of the Plan. Therefore, the overall additional burden of this option would be expected to be low. DECC would welcome feedback during the consultation on the additional burden imposed by this option.

Option	Costs/Risks	Benefits/Advantages
1. Improver confirms consents have been obtained	<ul style="list-style-type: none"> Future owners and bill payers – Low protection from future challenges to consent 	<ul style="list-style-type: none"> Consumers and providers – Lower administration costs
2. Improver confirms consents have been obtained and supplies evidence (preferred option)	<ul style="list-style-type: none"> Consumer – Small additional cost from supplying documents of consent Provider – Small additional costs from storing evidence 	<ul style="list-style-type: none"> Future owners and bill payers – Greater protection resulting from clear audit trail

	of consents	
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19.1.4.8 Disclosure and acknowledgement

Disclosure Taking out a Green Deal plan would commit energy consumers to long term contracts that in many cases would outlast their tenure in a property. These contracts would then bind the subsequent occupants of the property. One of the fundamental concepts enabling the Green Deal mechanism to work is that the responsibility to pay the charge attached to the energy meter would transfer from one energy bill payer to another. This ensures that the person paying for the Green Deal measures is also the person benefiting from them.

Decisions are required to protect both parties when property rights transfer from an existing occupier to a new one. An arrangement is needed so that new occupants would be made aware of the requirement to service the Green Deal charge, and those vacating a property would wish to have their successor acknowledge that awareness so that disputes are precluded.

To make this happen, privity of contract must be broken to allow parties who were not signatories to the original contract to be bound by it. Domestic Green Deals will also be covered by several Directives for consumer protection including the Consumer Rights Directive, the Unfair Commercial Practices Directive and the Consumer Credit Act, which will have an impact on the formulation of the Green Deal terms. These regulations mean that the Green Deal must be both disclosed and acknowledged to the future bill payer.

In order to comply with the relevant Directives and to ensure future bill payers are required to pay the Green Deal charge, it is important that prospective future bill payers are aware of this obligation before they choose to take on the property and therefore the energy bill. There are two ways that this is achieved in the Green Deal: through disclosing to any future bill payer that a Green Deal charge is attached to the property and through securing an acknowledgment from a future bill payer that he or she would be responsible for paying the charge.

Two documents would be key to achieving these two conditions: the EPC and the contract for sale or rent of the building. These documents would ensure information passes to new bill payers and serve as a record that the information was provided. Both of these documents are already required when a property changes hands and the disclosure and acknowledgement of the Green Deal is built on existing structures and legal requirements. The additional burden of the Green Deal requirements is therefore expected to be low. DECC would welcome feedback during the consultation on this assumption.

19.1.4.8.1 Disclosure

Two options for disclosure have been considered:

- 1. Use the existing framework of the EPC (preferred Option);**
- 2. Use the Green Deal Plan**

Option 1: Use the existing framework of the EPC – Preferred Option

When a Green Deal is taken out for a property, the Green Deal Provider would arrange for the EPC to be updated to disclose information on the Green Deal, such as, which energy efficiency measures

were installed and the amount of the charge. This would be updated over time to reflect any changes to the information, such as under or over payments.

The Energy Performance of Buildings Directive (EPBD) already requires that an EPC is provided to prospective owners or tenants when a property is transacted, providing a natural trigger point to alert potential future bill payers to the Green Deal charge. By complying with the EPBD, the current bill payer responsible for disclosing the Green Deal will automatically comply with this obligation to disclose. This option therefore places the least burden on participants in the Green Deal, particularly customers.

Option 2: Use the Green Deal Plan

The Green Deal Plan would be produced when the Green Deal is confirmed, once the measures have been installed and the customer has signed off the work. This document would contain comprehensive information covering all aspects of the Green Deal taken out. This document could be used to disclose the Green Deal, removing the need to include Green Deal information on the EPC and get it updated to reflect changes in circumstances.

Unlike the requirement to provide an EPC upon transaction under the EPBD, there is no natural trigger to remind the bill payer to disclose using this method. This would make failure to disclose far more likely, leading to more disputes and undermining confidence in the Green Deal. This also presents significant additional burdens in the transaction process because a new document would need to be provided to the new bill payer that is not currently part of the existing transaction process.

Option	Costs/Risks	Benefits/Advantages
1. Use the existing framework of the EPC (preferred)	<ul style="list-style-type: none"> Consumers - Cost of updating EPC with Green Deal information 	<ul style="list-style-type: none"> Consumers – Little additional burden during transactions, since already required under EPBD Future bill payers – High likelihood of disclosure
2. Use the Green Deal Plan	<ul style="list-style-type: none"> Future bill payers – Higher disclosure failure rates Reputation risk for Green Deal Bill payers – Additional burden of supplying and obtaining Green Deal Plan 	<ul style="list-style-type: none"> Consumers – No need to update EPC. Green Deal Plan supplied regardless.

19.1.4.8.2 Acknowledgement

Along with ensuring that a Green Deal plan is disclosed, the current bill payer would also be responsible for securing the future bill payer's acknowledgement that he or she is bound by the terms of the plan and required to pay the charge associated with it. This would make sure that future bill payers are aware of their responsibilities and protect current bill payers by confirming that future bill payers accept the conditions of the Green Deal attached to the property. This would need to be done by getting an acknowledgement in writing from the future bill payer.

Two options have been considered for acknowledgement:

- 1. Place a clause in contracts for transaction (preferred option)**
- 2. Use a separate bespoke statement**

Option 1: Place a clause in contracts for transaction – preferred option

Where a contract for sale, rent or license is created, DECC would work with relevant stakeholders to ensure an appropriate form of acknowledgement can be included in existing processes (e.g. contracts for sale or rent). This would be the case in the majority of transactions, and so this approach should ensure a high level of compliance.

Under this preferred option additional burdens would be low, particularly once the Green Deal becomes established and acknowledgement becomes part of the normal process of transacting property. DECC would work with stakeholders to develop the most effective and least onerous strategy for incorporating this into standard practices.

Option 2: Use a separate bespoke statement of acknowledgement

Acknowledgement could also be achieved using a separate statement that sits outside the contract for sale, rent or license. Indeed, where no contract exists this would be necessary anyway. This would ensure that acknowledgement provisions are the same for transactions with contracts and for transactions that are conducted without contracts, but again could hinder compliance because there is no natural trigger to secure acknowledgement.

This would also be a more costly option as a separate document would be needed just for the Green Deal in every transaction. There would also be a greater likelihood of disputes resulting from a higher level of non-compliance. This would damage the reputation of the Green Deal over time.

If this approach were only used for transactions without contracts, there would be relatively few cases proportionally, therefore the potentially higher rates of non-compliance would only affect a small subset of Green Deal properties.

Option	Costs/Risks	Benefits/Advantages
1. Place a clause in contracts for transaction (preferred)	<ul style="list-style-type: none">• Parties involved in property transactions – Small cost of introducing additional clause in contracts	<ul style="list-style-type: none">• Consumers – High compliance and clarity of handing over responsibility for repayment
2. Use a separate bespoke statement of acknowledgement	<ul style="list-style-type: none">• Property owners – High cost of producing additional document• Greater risk of reputational damage to the Green Deal• Consumers - Lower compliance due to lack of trigger point	<ul style="list-style-type: none">• Property owners – No additional burden for those transactions without contracts

19.1.5 Institutional Arrangements

The arrangements and options discussed in this section relate to:

- the body overseeing and accrediting organisations in the Green Deal's supply chain;
- what sanctions would be available to ensure standards are high;
- how the Green Deal charge should be collected by energy suppliers;
- how the Green Deal charge should be transferred to the Green Deal providers;
- how energy suppliers should be compensated for their extra administrative costs; and
- whether to allow small energy suppliers to opt out of the collection mechanism.

19.1.5.1 Options for the oversight body

A number of oversight functions have been identified (see bullets below under the Oversight of Advisors, Oversight of Installers and Oversight of Provider headings). These functions are essential for the smooth operation of the Green Deal market. It is not feasible for the market to run without this oversight role in place. Power were taken in the Energy Act (2011) and the Secretary of State has decided independent oversight is required. The diagram below sets out graphically the proposed functions for the oversight body in the context of the accreditation regime discussed earlier in this Impact Assessment.

Government policy is to outsource functions that might more appropriately and cost effectively be operated by private companies. It is estimated that the cost per annum of carrying out the functions will be up to £6m and this has been taken into account in the aggregate costs of the options. In the initial years of Green Deal this charge will be met by public expenditure. However, when confidence in the Green Deal is in place it is expected that the charge would be met by contributions from those advisers, installers and providers wishing to operate under the Green Deal scheme.

19.1.5.2 Oversight of Advisors

In addition to the proposed accreditation framework put in place to support Green Deal advisors, there are a number of important functions that must be put in place to ensure effective operation of the Green Deal assessment framework:

- Maintaining a central register of practising advisors and those whose status has been revoked;
- Issuing a Quality mark to approved certification bodies and their advisors;
- Managing contracts with UKAS to accredit [those bodies certifying] advisors;
- Ongoing management and updates of the scheme standard for advisors;
- Managing the advisor functions within the code of practice, including recommendations to DECC for updates;
- Provision of data/information to the Green Deal Advice contractor (details of approved advisors)
- Provision of annual performance monitoring (meeting standards, complaints reporting, etc)

19.1.5.3 Oversight of Installers

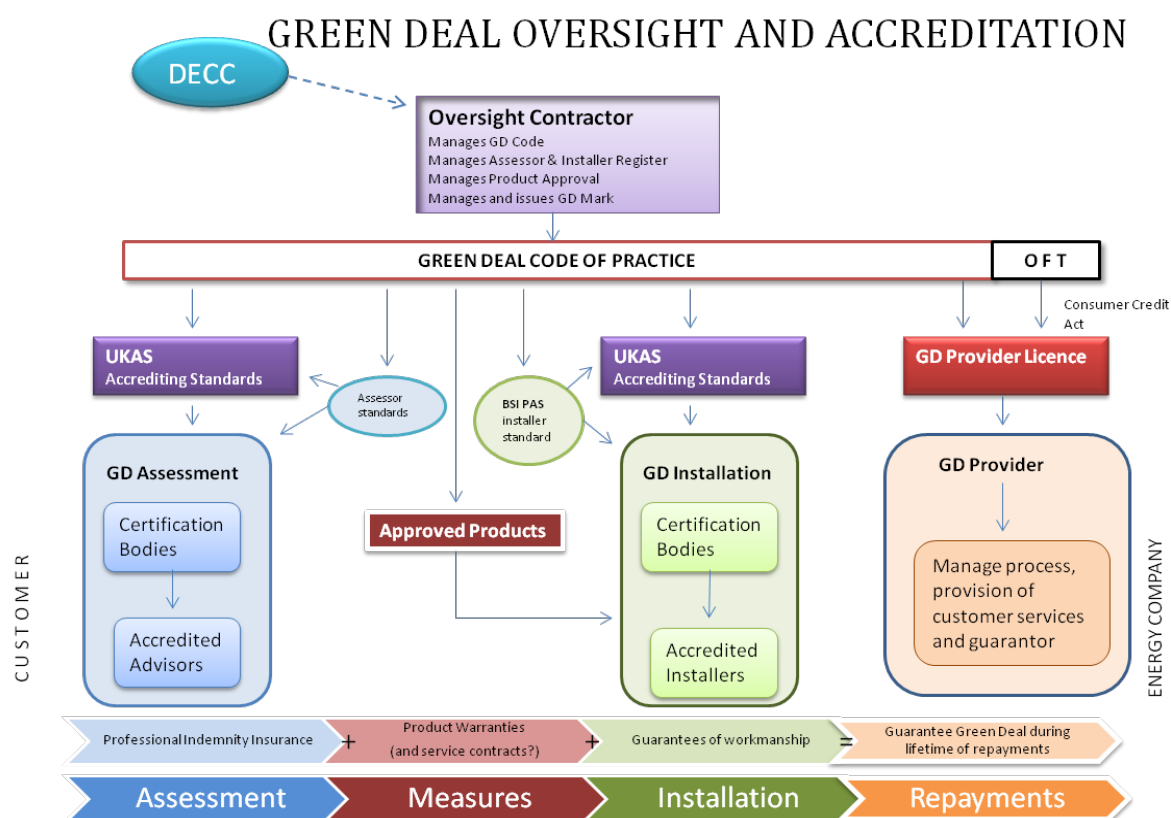
Certain administrative functions set out in the framework regulations need to be implemented to ensure compliance with the Energy Act 2011. These functions include:

- Registering installers
- Issuing a Quality mark to approved installers
- Managing contracts with UKAS to accredit installers
- Managing the BSI PAS 2030 standard, including bi-annual reviews
- Managing the installer functions within the code of practice, including recommendations to DECC for updates
- Provision of data/information to the Green Deal Advice contractor (details of approved installers)
- Provision of annual performance monitoring (meeting standards, complaints reporting, etc)

19.1.5.3.1 Oversight of Providers

- License Green Deal providers.
- Keep a register of all authorised Green Deal Providers (and deregistered providers).
- Issue Green Deal quality mark to Green Deal providers and ensure compliance with the Code of Practice.
- Compile an annual report on the Green Deal, based on returns from Green Deal providers.

Figure 48: Functions for the Oversight body in the Accreditation Framework



19.1.5.4 Oversight of finance providers and contracts

There is a need for an oversight of Green Deal providers to ensure they are meeting their ongoing requirements for the lifetime of Green Deal plans.

Existing Oversight role of the Office of Fair Trading

The Office of Fair Trading (OFT) is the licensing authority for consumer credit businesses and provides consumer protection to their customers.

The OFT not only assesses whether a business is fit to carry out credit activities before issuing a licence, but also monitors licensed businesses over time to ensure they comply with the required standards. The Green Deal would be a type of consumer credit and so Green Deal providers offering Green Deal plans to domestic customers would be required to hold a valid Consumer Credit Act licence. Therefore the OFT would need to monitor Green Deal providers.

The OFT takes a risk-based approach to monitoring credit business and devotes greater resource to high risk areas. The OFT has several means to act against noncompliant companies, ranging from communication programmes across a sector, to imposing additional requirements for holding a licence or as a last resort revoking a licence.

Therefore, the OFT will play a key role in the oversight of Green Deal providers. However, certain additional oversight functions, such as managing a register of providers and managing the Code of Practice, are not part of the OFT's remit.

The oversight body would carry out this range of administrative oversight functions, as well as ensure compliance with the Green Deal code. It is proposed that the OFT and the oversight body should have a Memorandum of Understanding to set out their terms of cooperation.

19.1.5.5 Sanctions

Sanctions might be required to secure compliance with the various obligations placed on both participant businesses and on building owners and to enable customers and Green Deal Providers to seek redress in the event of non-compliance.

These following obligations could require sanctions for non-compliance:

- To comply with the provisions of the Green Deal Code of Practice, framework regulations and requirements for the Green Deal Arrangements Agreement;
- Ensure that the appropriate consents are in place before confirming a Green Deal Plan and installing measures on a building; and
- Disclosure to a subsequent bill payer that there is a Green Deal Plan on a building.

Two options have been considered:

1. Do not provide for the Secretary of State to place sanctions on Green Deal market participants ("Do nothing"); or
2. Provide for the Secretary of State to place sanction on Green Deal market participants (preferred option).

Option 1: Do not provide for the Secretary of State to place sanctions on Green Deal market participants for non-compliance

Options that would impose no additional sanctions would not provide an incentive for:

- Property owners to ensure they got the necessary consents;
- Property owners to disclose the Green Deal; or
- Green Deal Providers to meet and maintain the standards set out in the Green Deal Code of Practice and framework regulations. They would be able to continue to trade to the detriment of customers and the supply chain, undermining standards, consumer protection and public confidence in the scheme.

In addition, Green Deal Providers and investors' interests would not be protected. Without the credible threat of sanctions for non-compliance, levels of non-compliance would be expected to be higher thus creating greater potential for disputed Green Deal Plans and loss of confidence in the Green Deal market. Where Green Deal plans are disputed, the liability to pay the Plan instalments, or indeed to repay the outstanding amount, would be left for the courts to determine. The costs of finance would be increased by Green Deal providers to reflect this risk, particularly if there was greater uncertainty over the mechanism for transferring the Plan between bill payers.

Option 2: Provide for the Secretary of State to place sanction on Green Deal market participants for non-compliance

Option 2 would enable the Secretary of State to place sanctions on Green Deal Providers and their customers in the event of any breach, when this breach is to the detriment of a customer or other market participant.

The Green Deal would be led by the private sector and can be characterised as a club with its own rules that members agree to abide by. In this sense the Green Deal would rely on the principle of co-regulation with the private sector. However, this co-regulation approach that develops an accreditation framework and standards to be used by Certification Bodies would still rely on the Secretary of State to impose sanctions where these bodies are not able to. This would help to ensure compliance and that there are consequences for breaches.

The sanctions that would be imposed under the option 2 would do two things. They:

- protect the consumer in that their liability to pay Green Deal Plan installments might be cancelled or suspended; and
- protect Green Deal Providers and investors interests by requiring compensation to be paid to them, by the party found to be at fault.

It is proposed that the Secretary of State would be able, in the event of non-compliance with obligations, to:

- require a Green Deal Provider to suspend or cancel the liability of a bill payer to make payments under a Green Deal Plan;
- require a Green Deal Provider to refund any such payments that have already been made;
- require a seller, a landlord or licensor or another person to pay compensation to a Green Deal Provider in respect of any such suspension, cancellation or refund.

- impose a civil penalty on Green Deal Providers (once existing regulatory mechanisms have been exhausted). Sanctions will be imposed through a stepped process leading to a fine capped at £50,000);

The first line of redress for any Green Deal customer, whether the first improver or a subsequent bill payer, would always be to the Green Deal Provider for the Plan at that property.

Appeals

The law requires that if a sanction is imposed by the Secretary of State or a delegated public body, then there should be a right of appeal. In this sense there is no option and the Bill provides for the right of appeal to a court or Tribunal.

While it is ultimately for the judiciary to decide the court or tribunal that should hear such appeals, the preferred option is for appeals to be heard by the First Tier Tribunal, which would provide the appropriate specialist input, compared with the lay magistrates or County Court Judges. This has been agreed by the Ministry of Justice, subject to the development of appropriate procedures.

Numbers of sanctions and appeals

While difficult to do with confidence, an estimate can be made of the number of sanctions and appeals that might arise from the domestic owner occupied sector (a primary source of demand for the Green Deal in the early years).

The numbers of sanctions issued by the DECC SoS for breaches of the disclosure and acknowledgment obligations, and thus the number of appeals, would depend on a number of factors:

- how frequently a Green Deal improved property is transacted in the market - the average length of occupancy in the owner occupied sector is 12 years⁶⁶. However the average tenure of the 'first-movers' in the Green Deal market might not reflect that of the property market as a whole;
- the rate of compliance with the EPC requirement by owners of Green Deal improved buildings. It would be in the interests of both GD Providers and their customers to ensure the disclosure obligation is met, compliance would be expected to be higher than for non-Green Deal properties. EPC compliance in the domestic, owner-occupied sector is currently around 90%. But the disclosure obligation would require prospective tenants or buyers to receive the EPC early in the transaction process. DECC are working with DCLG to ensure this is achieved;
- the right to appeal would be tightly defined. The Energy Ombudsman would investigate disputed Green Deal Plans and report to the DECC SoS. The grounds for appeal would be strictly limited. It is envisaged that any appeal would require the payment of a fee and that the appeal would award costs. It is anticipated that the appeal route for Green Deal sanctions would be self-financing.

Based on these 3 factors, it is estimated that the number of appealed sanctions with regard to the disclosure and acknowledgement obligations would be in the low-hundreds per year by 2020. For consents, the Green Deal would not impose any new obligations in relation to obtaining necessary consents and DECC are not aware of any issues in the current market. Given this it would be expected that the number of sanctions, and therefore appeals, would be low. With regard to Green Deal Providers, sanctions would always be a last resort, after internal complaints procedures and the extensive existing regulation including the Ombudsman services. Therefore, it is anticipated that the

numbers of sanctions, and appeals, would be low as there is a natural incentive for Green Deal Providers to comply with the Green Deal Code of Practice and framework regulations to protect payment flows, consumers and their brand reputation.

Option	Costs/Risks	Benefits/Advantages
1. Do not provide for the Secretary of State to place sanctions on Green Deal market participants (“Do nothing”)	<ul style="list-style-type: none"> costs of resolving disputes via the courts cost of higher level of risk for Green Deal providers and others Lack of easy access to redress for consumers 	
2. Provide for the Secretary of State to place sanction on Green Deal market participants (preferred option).	<ul style="list-style-type: none"> Small administrative cost of running a sanctions regime 	<ul style="list-style-type: none"> Risk to investors is minimised Greater confidence in Green Deal market - boost to take up

Payment collection mechanism

It is proposed that the Green Deal uses, as far as possible, the existing infrastructure of energy companies to collect Green Deal payments and channel them to finance providers. The costs of setting up a standalone remittance scheme, parallel to the existing scheme for paying energy bills, would not only be very expensive, but also uncouple in the householder’s perception the link between energy bills and the Green Deal. The use of energy bills to collect the Green Deal charge also should ensure the risk of default is comparable to the historically low risk of default on energy bills.

The right arrangements need to be found to give energy suppliers an incentive to process Green Deal charges, whilst also compensating them for their costs in so doing. It is also important that the involvement of energy suppliers as conduits for Green Deal payments should limit the additional burden placed on smaller suppliers.

19.1.5.6 Collection of the Green Deal charge

It is proposed that the requirements on energy companies would be implemented through a combination of licence modifications, changes to industry agreements and the establishment of a new multiparty agreement between energy suppliers and Green Deal providers. Those requirements that are implemented via energy licence modifications would be enforceable by the industry regulator, the Office of the Gas and Electricity Markets (Ofgem). This would ensure the enforcement tools available are strong, thereby giving the financial markets confidence that the Green Deal charge would be collected and passed on to the Green Deal finance provider. However, the collection of the Green Deal charge would involve costs being imposed on energy companies. These would ultimately be passed onto either Green Deal customers or energy consumers more generally. The Government is committed to minimising these costs as part of the wider commitment to ensuring energy costs are as low as possible and to minimising the regulatory burden on business. These costs might also be offset by the administration fee revenue received from Green Deal providers.

19.1.5.6.1 System Costs

Energy companies' billing systems would need to be changed to ensure the efficient collection of the Green Deal charge and the transfer of funds to Green Deal providers. There are options for how the Green Deal charge is collected.

Three billing options were considered:

- 1. Collection via the gas bill only.**
- 2. Collection via the electricity bill only (preferred option)**
- 3. Collection via either the gas or electricity bill.**

The table below outlines the estimated I.T. system costs of collecting the Green Deal charge using these options.

Table 55: I.T. system costs to energy suppliers of collecting the Green Deal charge

	Option 1 – cost of changing gas suppliers' billing systems²³²	Option 2 – cost of changing electricity suppliers' billing systems	Option 3 – cost of changing both gas and electricity suppliers' billing systems
High	£22.5 million	£22.5 million	£32.0 million
Average	£15.1 million	£15.1 million	£20.7 million
Low	£7.9 million	£7.9 million	£11.8 million

Source: energy companies²³³

The table above shows that both option 1 and 2 would incur the same, lowest, cost. Other criteria must be used to determine the best option. The Government is committed to ensuring the greatest number of premises as possible would have the possibility of installing energy efficiency measures via the Green Deal. It is therefore appropriate to use this criterion for examining option 1 and 2. This information is stated in the table below.

Table 56: Premises and properties which would be covered under different collection options

	Option 1 – collection via gas bill only	Option 2 – collection via electricity bill only
Domestic properties	22 million	26.3 million
Non-domestic premises	0.9 million	2.7 million
Total	22.9 million	29 million

Source: energy companies

Option 2 covers a greater number of premises in Great Britain (4.3 million homes in Great Britain are off the mains gas grid) and therefore permits a greater number of households and business to have

²³² Estimates of costs for Option 1 are inferred from costs of Option 2.

²³³ These cost estimates are in line with corresponding estimates for cost of upgrading billing systems in the water industry. These costs do not include estimates for the non-domestic market.

access to Green Deal finance. Additional qualitative benefits include (i) the lower seasonal variance of electricity consumption (under option 1 the Green Deal charge could be a significant additional cost to gas consumers in the summer months when gas consumption is low), (ii) the likelihood that in the future, moving towards the targets for reductions in greenhouse gas emissions by 2050, there would be a rise in the use of electricity for space heating requirements and an overall reduction in gas consumption (the need to switch away from gas might complicate option 1), (iii) the fact that in the energy industry gas systems are more complex than electricity systems slightly increases the delivery risks (thus favouring option 2) and (iv) gas prepayment meters are less easily adapted to the collection of the Green Deal charge than electricity prepayment meters again slightly increases the delivery risks (thus favouring option 2).

It is recognised that for customers who use gas for space and water heating, collecting the Green Deal charge via the electricity bill could break the 'cognitive link' between the charge and their bill savings. Due to this we are proposing introducing billing and statement changes that would require the Green Deal charge information to be stated alongside the predicted savings from the assessment. This should help retain the 'cognitive link' between the Green Deal charge and the savings. Given the other changes we are introducing the costs of these additional measures should be minimal. Taking account of the system costs, coverage, qualitative benefits and the changes we are introducing to strengthen the cognitive link, option 2 is therefore the Government's preferred option.

Option	Costs/Risk	Benefits/Advantage
1: Collection via the gas bill only.	<ul style="list-style-type: none"> Costs £8 to 23 million 	<ul style="list-style-type: none"> Access to 23 million properties
2: Collection via the electricity bill only (preferred option)	<ul style="list-style-type: none"> Costs £8 to 23 million 	<ul style="list-style-type: none"> Access to 29 million properties
3: Collection via either the gas or electricity bill	<ul style="list-style-type: none"> Costs £12 to 32 million 	<ul style="list-style-type: none"> Access to 29 million properties

19.1.5.6.2 Data Infrastructure

The Green Deal would be likely to create information and data that would need to be stored securely to protect customers' privacy and in a format that would be easy for electricity suppliers to access. Much of this data would be provided by Green Deal providers and would need to be held by electricity suppliers for billing purposes. A range of data would need to be stored for each Green Deal plan including the unique ID number for the Green Deal plan, the name, address and telephone number of the customer, the Meter Point Administration Number, the amount of the Green Deal charge, the length of the repayment term and the expiry date. This data infrastructure might also include the ability to facilitate the remittance of Green Deal payments, together with associated data, to Green Deal providers or nominated finance providers. Without this facility a scenario might arise in which individual energy companies would remit payment to individual Green Deal providers (a 'many to many' flow) which could increase costs due to the sheer number of interfaces between organisations.

The Green Deal would not affect a customer's right to switch to another electricity supplier that would be bound by licence conditions to collect the Green Deal charge. Therefore it would be important that data should be handled and stored so that it could be transferred between electricity companies easily and safely in order to minimise the risk of data corruption or data loss. The data should also be stored in a manner to facilitate the monitoring and evaluation of the Green Deal

scheme. There are options relating to how the data requirements created by the Green Deal would be met.

Three options were considered

- 1. Mandating electricity suppliers to hold the data in a central location accessible by all suppliers and Green Deal providers (preferred option)**
- 2. Procurement by Government and operated by concession**
- 3. Counterfactual: no centralised data infrastructure ("Do nothing")**

Option 1– Mandating electricity suppliers to hold the data in a central location accessible by all suppliers and Green Deal providers

Under option 1 the electricity suppliers would be required to create the necessary data infrastructure to hold the required data in a central location accessible by all suppliers and Green Deal providers. This requirement would be set out at a high level, in licences and codes, allowing suppliers to determine the optimum way of meeting the obligation. The cost of this option is estimated at between £2 million and £3 million for the industry as a whole, depending on the extent to which existing industry data infrastructure would be used. An additional facility to handle payment remittance could increase this cost by 50-100%. The cost would fall on electricity suppliers.

The option would not involve the transfer of Green Deal data when a customer switches electricity supplier as all suppliers would have access to the data. This would minimise the risk of data corruption or data loss. Also, it would ensure compatibility with existing energy industry data systems.

Option 2: Procurement by Government and operated by concession

Option 2 would be for Government to procure the data infrastructure and ensure that it would be operational prior to the launch of the Green Deal. Under this option a tender would be undertaken for the concession to operate the database in return for being able to charge a transaction fee to users (either electricity suppliers or Green Deal providers).

Given that the data levels would be the same whoever holds the data it can be estimated that the cost would be similar to option 1 (between £2 million and £3 million) but without the ability to reduce costs by using existing industry data infrastructure. This option would have reduced flexibility to alter the data infrastructure in response to changes in the energy industry, for example as a result of the roll-out of smart meters.

Option 3: Counterfactual: no centralised data infrastructure

Under option 3, electricity suppliers and Green Deal providers would hold data separately for each of their customers. The cost of this option is difficult to estimate but it could be assumed to be that the initial costs might be lower given that electricity suppliers and Green Deal providers would use their existing data handling infrastructure. However the on-going costs of data transfer could be much higher. Also there would be an inherent risk of data corruption every time a customer switches electricity supplier. The complete set of Green Deal payment data would need to be transferred from the existing supplier to the new supplier. This option would also not permit a centralised payment remittance facility as this would be dependent on the existence of a centralised data infrastructure. Furthermore the lack of a central data infrastructure could hinder the auditing, monitoring and evaluation process. Overall the cost of providing finance for the Green Deal would be likely to increase as a result of these risks. DECC would welcome feedback on the costs of this option.

Cost per Green Deal plan

Whilst the cost of updating electricity suppliers' customer databases and the cost of data handling are one-off costs there would also be ongoing costs associated with the collection of the Green Deal charge. The table below describes these ongoing costs and the estimated level:

Table 57: Ongoing costs per Green Deal plan

	Average cost estimate per green deal plan
Initiation of a new Green Deal plan including creation of a new data record	£2-£12
System maintenance	£1-2 per year
Billing costs for when a Green Deal property is vacant	£0.10-0.20 per year ²³⁴
Debt management in the absence of energy debt	£0.10-0.20 per year ²³⁵
Customer queries	£0.125-0.15 per year ²³⁶
Dispute resolution and complaint handling	£0.25-0.50 per year ²³⁷

Option	Costs/Risk	Benefits/Advantages
1: Mandating electricity suppliers to hold the data in a central location accessible by all suppliers and Green Deal providers (preferred option)	<ul style="list-style-type: none"> One off costs of £2 to 3 million plus ongoing costs per Green Deal customer 	<ul style="list-style-type: none"> Data safe and secure Data compatible with other industry data (should help in future marketing of Green Deal) Good basis for monitoring, evaluation and feedback into policy design
2: Procurement by Government and operated by concession	<ul style="list-style-type: none"> Same as option 1 	<ul style="list-style-type: none"> Data safe and secure
3: Counterfactual: no centralised data infrastructure ("Do nothing")	<ul style="list-style-type: none"> No upfront costs but higher ongoing costs than above options 	

²³⁴ Based on an estimated cost of around £2-4 to bill for the Green Deal charge during a vacancy period. If one estimates that 5% of properties have a vacancy period in any one year, the estimated annual cost would be £0.10-0.20.

²³⁵ Estimated to be similar to billing costs for vacant properties

²³⁶ Based on the cost of a 10 minute call to a electricity supplier call centre which DECC estimates to be £2.50-£3.00. On the assumption that 5% of Green Deal customers make a query each year. Figures supplied by energy companies.

²³⁷ Based on average staff time of 180 minutes to resolve a complaint which DECC estimates costs £50-100 and on the assumption that 0.5% of Green Deal customers lodging a complaint per year. Figures supplied by energy companies.

	<ul style="list-style-type: none"> • Greater risk of data loss and corruption than above options • Poor basis for monitoring of payment trends and feedback to Green Deal policy development 	
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19.1.5.7 Compensating energy suppliers for extra administrative costs

Energy suppliers will incur costs when collecting the Green Deal charge and passing the payment on to the Green Deal finance provider. Suppliers could be compensated for these costs.

Three options were considered:

1. Pass costs on only to Green Deal customers;
2. Allowing energy suppliers to spread costs across all electricity customers (do nothing); and
3. Combine options 1 and 2 (preferred option)

Option 1: Pass costs on only to Green Deal customers

There would be a strong rationale for ensuring that the costs of administering the Green Deal are paid for by Green Deal customers because they have received the benefit of a Green Deal. This would be a viable option for the ongoing costs and could be introduced using an administration fee to be added to the total cost of the Green Deal and included when calculating the “Golden Rule.” However, using the administration fee to cover the one-off costs for system changes and handling data is problematic. In particular, this expenditure occurs before the start of the Green Deal whereas an annual administration fee produces revenue over time and would last a number of years. So the expenditure pattern would not be aligned to the revenue pattern.

Determining the appropriate level of fee that recovered the costs of one-off system changes would be relatively difficult. Electricity suppliers are at various stages of their rolling IT upgrade programmes and it would therefore be difficult to determine the split between ongoing IT upgrades required in the absence of the Green Deal and those extra costs associated with IT upgrades needed for collecting the Green Deal charge. IT upgrade costs are also not linear but have economies of scale with marginal costs per change to database fields reducing as the number of changes increases. Using the administration fee to cover the total cost of upgrading electricity suppliers IT systems would result in Green Deal customers bearing costs that would have been expended even if the Green Deal was not introduced and therefore subsidising electricity customers without a Green Deal plan.

Secondly, the estimated cost of handling data created with each Green Deal plan could be covered by using existing electricity supplier IT systems and not necessarily through new IT infrastructure. Therefore it is not a cost that is certain to occur.

Option 2: Spread costs across all electricity customers

Allowing energy suppliers to spread all the costs, both the set up and ongoing administration cost, would be likely to lead to all electricity customers paying the costs of setting up the Green Deal mechanism which many of them do not benefit from.

Option 3: Combine options 1 and 2

For these reasons the Government’s preferred option is to socialise the one-off cost of changes to electricity suppliers’ billing systems and data handling across all electricity customers, but to allow an administration fee to be added to the Green Deal plan to cover that proportion of the ongoing

costs that may be recovered without excessively impacting Green Deal demand and (amongst other consequences) reducing the customer base through which costs would need to be recovered, requiring further increases in fees to do so. The socialised cost of the I.T. system changes would entail a one-off cost of less than £0.70 per household and business – but could be substantially less depending on the additionality of these costs. Socialising the costs also provides a major incentive for electricity suppliers to minimise costs given the liberalised electricity market in Great Britain.

Option	Costs	Benefits
1: Pass costs on only to Green Deal customers;	<ul style="list-style-type: none"> Some difficulty in setting an appropriate fee to recover upfront costs. However, on-going costs per Green Deal customer could be passed on (see option 3 below) 	
2: Allowing energy suppliers to spread costs across all electricity customers (do nothing)	<ul style="list-style-type: none"> All consumers likely to see a small rise in electricity bills 	<ul style="list-style-type: none"> Green Deal consumers costs are a little lower than option 1, so slightly higher take-up might be expected.
3: Combine options 1 and 2 (preferred option)	<ul style="list-style-type: none"> Risk that Electricity suppliers do not comply with the option so some policing will be required All consumers likely to see a small rise in electricity bills (smaller than option 2) 	Green Deal consumers pay ongoing costs of Green Deal – so more efficient outcome than option 2

19.1.5.8 Structure and Level of the Administration Fee

Three broad options were considered for the structure of the administration fee:

1. Flat fee (preferred option)
2. Proportional fee
3. Two-tier fee

Option 1: Flat fee

This option would consist either of a fixed amount per year for all Green Deal customers or a fixed amount per Green Deal finance arrangement which would then be divided by the length of the Green Deal plan. The key advantage of this option is that it most closely reflects the profile costs incurred by suppliers. It also benefits from simplicity. Customers would be able to easily understand it and it would be easy for electricity suppliers to administer. The main disadvantage with this option is the disproportionate impact on small value Green Deal packages, though the level of the fee is likely to be low enough to minimise this impact.

Option 2: Proportional fee

This could consist of a percentage of the total amount of Green Deal finance taken out in each Green Deal plan or it could consist of a percentage of the capital remaining in each Green Deal plan thereby reducing overtime. The main argument in favour of this option is the reduced impact on small value Green Deal packages. The main disadvantage is that there would not be a strong relationship to

actual costs incurred in collecting the Green Deal charge given the costs are not related to the value of the Green Deal plan.

Option 3: Two-tier fee

This could consist of two different levels for the administration fee (for example, a smaller fee for Green Deal plans where the total amount is below a certain threshold) in order to reduce the impact on small value Green Deal packages and also to reflect the proportion of the costs related to the one-off costs for each Green Deal plan. However, the main disadvantage would be the loss of simplicity for Green Deal customers.

Level of the administration fee

Given above cost estimates a £3 annual administration fee²³⁸ per Green Deal plan is proposed. Full cost recovery is not necessarily desirable for the working of the Green Deal as too high a cost passed through to Green Deal customers would restrict demand and necessitate even higher fees per customer to recover costs, as well as restricting the Green Deal's capacity to achieve its social objectives and the costs (socialised across energy consumers) of the ECO. The proposed fee level would provide an appropriate significant percentage which would represent 78% of ongoing costs, if actual costs are at the top of our estimated range, or full recovery of ongoing costs if actual costs are lower.

This payment to the electricity supplier would not necessarily be transparent to the consumer (as it would be part of the Green Deal provider's cost of doing business). The electricity supplier would separately invoice the Green Deal provider for the administration fee.

A review of the level of the administration fee would take place three years after the Green Deal's launch to take into account improved cost information once the Green Deal scheme has been established.

Option	Costs	Benefits
1: Flat fee (preferred option)	<ul style="list-style-type: none"> May be disproportionate for small value Green Deal packages £3 per Green Deal plan per year is proposed 	<ul style="list-style-type: none"> Closest reflection of actual costs to suppliers Simple Cheap to administer
2: Proportional fee	<ul style="list-style-type: none"> Weak relationship to actual costs incurred as collection costs are unlikely to be proportional to the amount of the charge 	<ul style="list-style-type: none"> Reduced impact on small value Green Deal packages
3: Two-tier fee	<ul style="list-style-type: none"> More complex approach, could reduce consumer take-up 	<ul style="list-style-type: none"> Reduced impact on small value Green Deal packages but arguably more efficient than option 2 as fee is a closer reflection of actual costs

²³⁸ As set out in Table 57, the £2-12 costs for electricity suppliers for the initiation of a Green Deal plan would be spread across the estimated average 15 year repayment term giving annualised set up costs of £0.13-0.80. Combined with the annual ongoing costs this gives an estimated total cost range of £1.17-3.85 per year per Green Deal customer. Actual costs could be at the upper end of this range, particularly if the volume of telephone calls regarding the Green Deal charge to electricity suppliers is larger or if the costs of debt collection are higher.

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19.1.5.9 Small supplier opt in/out

The objective of minimising the impact on smaller suppliers has been a major consideration in the examination of the options available for ensuring the collection of the Green Deal charge by energy suppliers. The intention is to minimise the competition impact, ensuring that the Green Deal does not impact on competition in the energy market or act as barrier to entry.

Some smaller electricity suppliers might not wish to participate in facilitating the Green Deal as the costs of facilitating such a scheme for their customers (even with a potential administration fee) might outweigh the expected benefits to the business. As a result DECC do not wish to distort the market through imposing regulations (and therefore cost burdens) on suppliers that would not otherwise be interested in facilitating Green Deals to their customers. The Government is therefore considering options in relation to whether all energy suppliers should have to collect the Green Deal charge.

Two options have been considered:

1. require all electricity suppliers to facilitate the collection of the Green Deal charge.
2. provide the option for smaller electricity suppliers to opt out of facilitating the collection of the Green Deal charge (preferred option).

Option 1: Require all electricity suppliers to facilitate the collection of the Green Deal charge.

Licence modifications would require all suppliers (irrespective of their size) to collect the Green Deal charge from their customers. This option would ensure that all electricity customers, without potentially having to switch suppliers, could be Green Deal customers. However this could place disproportionate costs on smaller suppliers.

Option 2: Provide the option for smaller electricity suppliers to opt out of facilitating the collection of the Green Deal charge.

Under option 2, smaller suppliers would have the option of participating in the Green Deal but if there was no business case for them to do so they would not be obliged to. Costs of complying with the Green Deal obligations would therefore only be taken on by small suppliers where they perceived an overall business benefit from participating in the Green Deal.

This option is consistent to the market-led nature of the Green Deal and the Government's wish to reduce burdens on businesses wherever possible. Government understands that for some smaller suppliers the costs of facilitating Green Deals for their customers might not be cost effective. If smaller suppliers were required to facilitate Green Deals this could have possible negative implications for competition in the supply market.

In defining a 'smaller supplier', the preferred option would be to align the definition of a smaller supplier for the purposes of the collection of Green Deal payments approximately²³⁹ to that proposed for ECO thus giving a threshold of 250,000 customer accounts (both domestic and non-domestic customers combined with dual fuel customers counting twice). This would ensure regulatory consistency thereby minimising complexity for business.

Option	Cost-burden on	Consistency with the Green Deal
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²³⁹ ECO does not include non-domestic energy suppliers

	suppliers	being a market led mechanism
All electricity suppliers (irrespective of size) required to facilitate the collection of the Green Deal charge	✓	✓
Optional participation for smaller electricity suppliers	✓✓	✓✓✓

Option	Costs	Benefits
1: require all electricity suppliers to facilitate the collection of the Green Deal charge.	<ul style="list-style-type: none"> Risk of disproportionate costs falling on small suppliers and discouraging market entry 	<ul style="list-style-type: none"> Facilitates maximum up-take of Green Deal
2: provide the option for smaller electricity suppliers to opt out of facilitating the collection of the Green Deal charge (preferred option).	<ul style="list-style-type: none"> Lower costs than option 1 	<ul style="list-style-type: none"> Potentially consistent with other exemptions

20 Annex G: Green Deal Qualifying Improvements

Air source heat pumps
Biomass boilers
Biomass room heater with radiators
Cavity wall insulation
Cylinder thermostats
Draught proofing
Energy efficient glazing
External wall insulation
Fan-assisted replacement storage heaters
Flue gas heat recovery devices
Ground source heat pumps
Heating controls (for wet central heating system and warm air system)
High efficiency gas-fired condensing boilers
High efficiency replacement warm-air units
High thermal performance external doors
Hot water cylinder insulation
Internal wall insulation
Lighting systems, fittings and controls
Loft or rafter insulation and loft hatch insulation
Mechanical ventilation with heat recovery
Micro combined heat and power
Micro wind generation
Oil-fired condensing boilers
Photovoltaics
Roof insulation
Room in roof insulation
Solar water heating
Under-floor heating
Under-floor insulation
Waste water heat recovery devices attached to showers

21 Annex H: Analysis of the implications of allocation: customer accounts versus an alternative approach

This annex sets out the analysis on the different ways in which the ECO could be allocated between energy companies. In the following discussion, it is assumed that energy companies pass costs on in the way that they are levied. The following 4 options for allocation have been considered :

- **Option 1: set up the ECO on the basis of the number of customer accounts** – this is the historical approach to setting supplier obligations relating to energy efficiency and fuel poverty on the basis of customer accounts (the *‘per customer account’* approach).
- **Option 2: Set the ECO on the basis of number of kWh of energy supplied** - for each kWh they supply, an energy supplier would be liable for a greater share of the obligation. As such, it is assumed that the cost of meeting the obligation would be passed on to consumers on a per kWh supplied basis (the *‘per kWh’* approach). Higher energy users would pay a greater proportion of the pass through costs than lower users.
- **Option 3: Set the ECO on the basis of a hybrid of customer accounts and number of kWh of energy supplied** – participating suppliers’ respective shares of the obligation would be based on number of kWhs supplied, but they would also be required to provide each customer account they hold with a credit first. This would place a greater weight on kWh of energy consumed at higher quantities, and would significantly limit the contribution paid by low energy users – particularly where the cost of low usage is covered by the credit. This approach is essentially the same as the ‘per kWh’ approach, but with a greater skew towards high energy users paying a greater proportion of the costs of an obligation (the *‘Hybrid’* approach);
- **Option 4: Set the ECO on the basis of the number of kWh of gas supplied** - participating suppliers’ respective shares of the obligation would be based on the number of kWhs of gas supplied only, and electricity accounts would not be taken into account, therefore spreading the cost of an obligation among only gas consumers. This would mean that those households using more expensive heating fuels (electricity, oil, LPG etc), would not be required to contribute to the obligation (the *‘gas kWh’* approach).

Each of these options is assessed against a number of criteria.

- Incentives to save energy – A fixed charge per customer affects the cost of connecting to energy supply; while an additional charge per unit of energy consumed would affect the *marginal* cost of energy use, which makes consuming *more* energy more expensive and incentivises households to conserve energy;
- The distribution of who pays – Energy needs, usage and ability to pay for energy bill increases vary between households and different forms of cost recovery could disproportionately affect some groups relative to others. For example, fixed charges per customer are likely to have a different impact on households that consume relatively small amounts of energy compared to an approach that adds a small charge to each unit of energy consumed;
- Households in or at risk of fuel poverty – Depending on the balance between the drivers of fuel poverty in different households (income, energy prices and required energy use), different forms of cost recovery are likely to have varying impacts on the risk of fuel poverty; and
- Administrative complexity – the approach should be simple to administer and implement. More complex approaches could increase the risk of making it difficult to accurately share the

obligation between participating energy companies, and potentially increasing the administrative cost of the scheme.

Consequently the objective is to set the ECO allocation in a way that:

- balances the incentive to conserve energy and install energy efficiency measures, while minimising the impact on the risk of fuel poverty.
- minimises administrative complexity that could present risks to the delivery of the scheme and increase the costs of compliance; and
- an equitable distribution across household bills of the costs of the scheme.

Incentives to conserve energy

Spreading the cost of the obligation across all customer accounts would increase the average cost of using energy, but have little additional effect on how many units are consumed once a household judges that they are willing and able to pay the costs of using energy at all. The kWh-based approaches have a small effect on the marginal cost energy, as the cost of the obligation is linked to how much energy is used and not whether a household has a gas or electricity account. The 'Hybrid' approach initially *reduces* the average cost of using energy, and places a greater cost on each unit of energy consumed, therefore having the greatest impact on the marginal cost of energy.

Overall, the 'per customer account' approach is least desirable in terms of incentivising energy conservation as there is no link with usage. The 'per kWh' and 'gas kWh' approaches only affect the marginal cost of energy, therefore incentivising energy conservation. However, the 'Hybrid' approach is likely to provide the greatest incentive to conserve energy as it places the greatest weight on the marginal cost of each unit consumed.

Impact on risk of fuel poverty

The effect of each approach on the risk of fuel poverty²⁴⁰ would depend on; household income; the amount of energy required to adequately heat the home; and the prices faced by each household.

The impact of each approach would vary depending on the circumstances of each household. To illustrate the potential effects, Table 58 demonstrates the impacts on the fuel poverty ratios²⁴¹ of hypothetical households across a range of low incomes and required energy usage²⁴² scenarios. The results show that under the 'Low' scenario households with low required energy usage – those in smaller and/or more efficient homes – energy supplied based metrics have a smaller impact on the risk of fuel poverty than a 'per customer account' approach. The impact is broadly the opposite for those on low incomes with very high energy requirements, with supply-based approaches slightly preferable for the illustrative households in the 'Average' scenario.

²⁴⁰ For more details on the Fuel Poverty modelling methodology see:

<http://www.decc.gov.uk/assets/decc/Statistics/fuelpoverty/614-fuel-poverty-methodology-handbook.pdf>

²⁴¹ A household's fuel poverty ratio is defined as their fuel bill divided by their full net income. If a household has a fuel poverty ratio of greater than 10%, they are considered to be fuel poor.

²⁴² To determine whether a household is in fuel poverty, their *required* energy bill to reach an adequate level of warmth is calculated, rather than using *actual* energy usage data, so as not to bias against those households that are under-heating due to financial constraints.

Table 58: Assessment of potential impacts on risk of fuel poverty, by approach²⁴³

LOW SCENARIO (7,500 kWh Required To Reach Adequate Warmth)					
Household Income	Before Obligation	(1) 'Per Customer' Account*	(2) 'Per kWh' Approach	(3) 'Hybrid' Approach	(4) 'Gas kWh' Approach**
£5,000	10.5%	11.7%	10.9%	10.6%	11.0%
£10,000	5.3%	5.8%	5.5%	5.3%	5.5%
£15,000	3.5%	3.9%	3.6%	3.5%	3.7%
AVERAGE SCENARIO (15,000 kWh Required To Reach Adequate Warmth)					
Household Income	Before Obligation	(1) 'Per Customer' Account*	(2) 'Per kWh' Approach	(3) 'Hybrid' Approach	(4) 'Gas kWh' Approach**
£5,000	21.0%	22.2%	21.9%	21.7%	21.9%
£10,000	10.5%	11.1%	10.9%	10.9%	11.0%
£15,000	7.0%	7.4%	7.3%	7.2%	7.3%
HIGH SCENARIO (25,000 kWh Required To Reach Adequate Warmth)					
Household Income	Before Obligation	(1) 'Per Customer' Account*	(2) 'Per kWh' Approach	(3) 'Hybrid' Approach	(4) 'Gas kWh' Approach**
£5,000	35.0%	36.2%	36.5%	36.6%	36.5%
£10,000	17.5%	18.1%	18.2%	18.3%	18.3%
£15,000	11.7%	12.1%	12.2%	12.2%	12.2%

Key: Red = Largest negative impact on risk of fuel poverty, Amber = Neither best or nor worst impact on risk of fuel poverty, Green = Best outcome in terms of risk of fuel poverty.

* 'Per customer account' figures use an illustrative pass through cost of £58 for a dual fuel household.

²⁴³ Notes: Assumptions for all approaches are consistent with an obligation with total pass through costs of £1.3bn per year. The 'Before Obligation' base bill uses an assumed price per kWh of 7p; the 'per kWh' approach uses an estimated pass through cost of 0.29p/kWh of gas or electricity supplied; the 'Gas kWh' approach uses an estimated pass through cost of 0.37p/kWh of gas supplied; the 'Hybrid' approach assumes a credit per customer account of £15 (£29 for dual fuel), and a pass through cost of 0.44p/kWh of energy supplied.

****81% of the kWh in each 'Gas kWh' scenario are assumed to be gas, based on the average split of energy usage for a dual fuel household.**

Overall, the results do not favour a single approach across all households. The 'Hybrid' approach is broadly preferable across the range of low income households apart from those with very high required energy usage to reach an adequate level of warmth. These low income, high energy requirement households would already have a high required bill before the obligation is set, and a supply-based metric would increase the amount of income required to reach an adequate level of warmth more than a 'per customer account' approach. Fuel Poor households often have relatively high energy requirements because of poor energy efficiency or because of needing to spend significant amounts of time at home. For some of these households following a supply based metric is likely to increase the depth of fuel poverty.

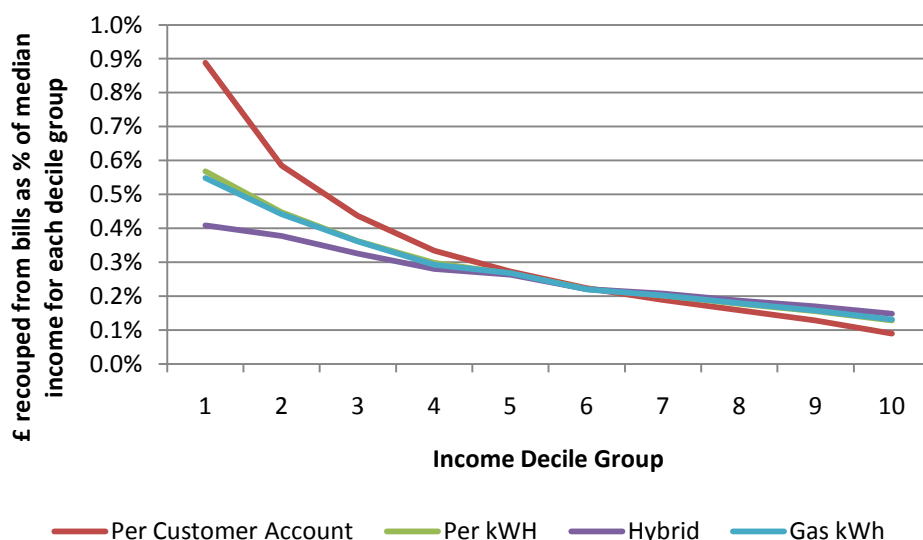
Distributional impact of cost pass through

Based on average energy consumption and income data from a CSE report to Ofgem²⁴⁴ and applying an illustrative cost of the ECO of £1.3bn per year, Figure 49 presents the cost pass through of the ECO in relation to their income – a proxy for a household's ability to pay across income deciles.

The approaches based on the quantity of energy supplied result in better off households paying a greater share of the obligation. This is because income is correlated with average energy use. In contrast, the 'per customer account' approach appears to be the most regressive of the four options, with the contribution to the obligation of lower income households representing a significantly greater proportion of their income than those with higher incomes. On average, the 'Hybrid' approach is the most progressive approach across income groups, but on average the 'per kWh' and 'gas kWh' approaches also result in a lower proportional contribution from lower income households. Households in the middle of the income distribution contribute broadly the same amount on average, regardless of the approach taken.

²⁴⁴ White, V., Roberts, S. and Preston, I. (2011). *Understanding 'High Use Low Income' Energy Consumers*, final report to Ofgem. Available: http://www.ofgem.gov.uk/Sustainability/Cp/CF/Documents1/High%20use%20low%20income%20energy%20consumers_Final%20Report%20Nov%2010.pdf

Figure 49: Distributional impact of cost pass through across income decile groups as a percentage of income, by approach



The impacts on average energy users do not show the impact on low income households who are above average energy consumers and the implications for those households that use electricity as their heating fuel.

There are estimated to be 1.4m households²⁴⁵ in the lowest two income decile groups, with above average (median) energy use. For these low income, high use households, the average contribution to the obligation is broadly similar across approaches, as coincidentally the obligation spread across units of energy supplied results in similar total contributions as the ‘per customer account’ approach. The exception is the ‘Gas kWh’ approach, which shifts costs away from electricity only households towards dual fuel consumers. However, the relatively small number of households with very high usage who also have low incomes are likely to be better off under a ‘per customer account approach’ rather than a kWh-based approach.

Overall, a kWh-based approach would have a more desirable distribution of the costs of the obligation for the majority of households, with results suggesting that the ‘Hybrid’ approach is the most progressive of these approaches. These results are also true for average low income, high use households and those households that use electricity for heating and non-heating purposes. Opting for a kWh-based approach would disproportionately impact the relatively small number of low income households with very high energy usage.

Households that use electricity for both heating and non-heating purposes generally face higher bills than those on the gas-grid, as the cost of electric heating is higher than using gas (partly owing to the lack of a carbon price on domestic gas use). Under a ‘Gas kWh’ approach these households would make no contribution to the obligation, and energy supplied metrics would be more progressive on average than a ‘per customer account’ approach. The ‘Hybrid’ approach is the most

²⁴⁵ White, V., Roberts, S. and Preston, I. (2011). *Understanding ‘High Use Low Income’ Energy Consumers*, final report to Ofgem – data underlying Figure 6. Available: http://www.ofgem.gov.uk/Sustainability/Cp/CF/Documents1/High%20use%20low%20income%20energy%20consumers_Final%20Report%20Nov%2010.pdf

progressive approach, with particularly low average contributions for households in the lower income decile groups. This is because on average these households are relatively low users of energy, and the credit assigned to all accounts offsets a high proportion of the relatively high cost incurred per kWh.

Administrative complexity

It is anticipated that given the prevalence of the 'per customer account' approach in recent supplier obligations, a continuation of this approach for the ECO would be relatively simple to administer. It would require no additional data collection to that which is already obtained for other obligations.

It is also anticipated that both the 'per kWh' and the 'Gas kWh' approaches would be reasonably straightforward to administer, as energy companies are currently required to report the amount of energy supplied on a monthly basis.

The 'Hybrid' approach combines aspects of both the 'per customer account' approach and the kWh-based approaches, and has not been implemented before. It might be reasonable to assume, therefore, that this approach would be more difficult to administer. However, in terms of data collection, this approach would require the collection of data on the number of customer accounts held by each participating supplier, which is already collected under other obligations, and frequent updates on the number of kWh of energy supplied – again which is currently collected on a monthly basis. The additional complexity might be in monitoring and rebalancing the obligation based on two separate components – customer accounts and energy supplied. More work to better understand this possible complexity is required, however an initial examination does not suggest that it should be ruled out as an option.

22 Glossary

Affordable Warmth	The Affordable Warmth obligation would be set in terms of heating cost reductions and targeted exclusively at an eligible group of low income vulnerable households living in private housing and identified through the benefits system. Eligibility would be similar to the CERT Super Priority Group.
BRE	The Building Research Establishment (BRE) is a former UK government establishment (but now a private organisation, funded by the building industry) that carries out research, consultancy and testing for the construction and built environment sectors in the United Kingdom.
BREDEM	BREDEM (BRE Domestic Energy Model) is a model for the calculation of the annual energy requirements of domestic buildings, and for the estimation of savings resulting from energy conservation measures.
BSI PAS Standard 2030	Publicly Available Specification (PAS) is a sponsored fast-track standard driven by the needs of the client organizations and developed according to guidelines set out by the British Standards Institute.
Building Regulations	The Building Regulations (specifically Part L) set the minimum energy efficiency standards that any newly constructed home must achieve. Revisions to Part L came into effect in October 2010 and these ensure that a house built today will be at least 40% more energy efficient than one built before 2002. There is an additional target for all new homes to be zero-carbon from 2016.
CERT	The Carbon Emissions Reduction Target (CERT) requires all domestic energy suppliers with a customer base in excess of 50,000 customers to make savings in the amount of CO ₂ emitted by householders. CERT, the third supplier obligation phase, was introduced in 2008. On 30th July 2010, CERT was extended from March 2011 to December 2012 with a new higher target and significantly refocused around supporting insulation.
CERT Super Priority Group	A set of households where at least one of the occupants is in receipt of one of a number of qualifying means-tested benefits (including Pension Credit and Child Tax Credit below an income threshold).
Climate Change Act (2008)	The Act makes it the duty of the Secretary of State to ensure that the net UK carbon account for all six Kyoto greenhouse gases for the year 2050 is at least 80% lower than the 1990 baseline. The Climate Change Act provides for a carbon budgeting system that caps emissions over five-year periods, with three budgets set at a time. The first three carbon budgets will run from 2008-12, 2013-2017, 2018-2022.
Climate Change Levy	The Climate Change Levy (CCL) is a tax on energy delivered to non-domestic users in the United Kingdom. Its aim is to provide an incentive to increase energy efficiency and to reduce carbon emissions.
Climate	Energy intensive industries may receive an 80% discount from the Climate Change

Change Agreements	Levy against agreed targets for improving their energy efficiency or reducing carbon emissions. Climate Change Agreements (CCAs) set the terms under which eligible companies may claim the levy reduction.
Community Energy Saving Programme	CESP targets households across Great Britain, in areas of low income, to improve energy efficiency standards, and reduce fuel bills. There are 4,500 areas eligible for CESP. CESP is funded by an obligation on energy suppliers and electricity generators. It is expected to deliver up to £350m of efficiency measures.
Competent Person Scheme	Competent Person Schemes (CPS) were introduced by the Government to allow individuals and enterprises to self-certify that their work complies with the Building Regulations as an alternative to submitting a building notice or using an approved inspector.
Consumer Credit Act	The Act introduces new protection for consumers and new regulation for bodies trading in consumer credit and related industries. Such traders must have full licenses from the Office of Fair Trading.
CRC Energy Efficiency Scheme	The CRC is a mandatory scheme aimed at improving energy efficiency and cutting emissions in large non-energy intensive public and private sector organisations. These organisations are responsible for about 10% of the UK's emissions.
DUKES	DECC publishes the Digest of UK Energy Statistics as a source of energy information. It contains a comprehensive picture of energy production and use over the last five years, with key series taken back to 1970.
Energy Act 2011	The Energy Act has been designed to provide for a step change in the provision of energy efficiency measures to homes and businesses, and make improvements to our framework to enable and secure, low-carbon energy supplies and fair competition in the energy markets.
English House Condition Survey/English Housing Survey	The survey collects information about people's housing circumstances and the condition and energy efficiency of housing in England. This includes a physical inspection of a sample of 16,150 occupied or vacant dwellings, which is spread over two years.
EPC	Energy Performance Certificates were introduced in England and Wales on 1 August 2007. Energy Performance Certificates present the energy efficiency of dwellings on a scale of A to G. The certificate includes recommendations on ways to improve the home's energy efficiency to save money.
Feed in Tariff	A policy mechanism offering long-term contracts to renewable energy producers, typically based on the cost of generation of each different technology. The tariffs are payments to anyone who owns a renewable electricity system, for every kilowatt hour they generate. Tariffs became payable in April 2010. The tariffs apply to

technologies in sizes up to 5 megawatts.

Living in Wales Survey	The Living in Wales Survey was carried out for the Welsh Assembly Government. It is the main source of information on households and the condition of homes in Wales. The annual survey was carried out from 2004 to 2008.
MPAN	A Meter Point Administration Number, also known as MPAN, Supply Number or S-Number, is a 21-digit reference used in Great Britain to uniquely identify electricity supply points such as individual domestic residences. The gas equivalent is the Meter Point Reference Number.
N-DEEM	The Non-Domestic Buildings Energy and Emissions Model (N-DEEM) is conceived by the BRE as an equivalent, for non-domestic buildings, of the BREHOMES model of the domestic stock which has been in use for similar purposes since the early 1990s.
NEED	DECC has constructed a National Energy Efficiency Data Framework to enable detailed statistical analysis of energy efficiency. The data framework matches the gas and electricity consumption data collected for DECC Sub-national energy consumption statistics and records of energy efficiency measures in the Homes Energy Efficiency Database (HEED) run by the Energy Saving Trust (EST).
Office of Fair Trading	The Office of Fair Trading is a non-ministerial government department of the United Kingdom, established by the Fair Trading Act 1973, which enforces both consumer protection and competition law.
OFGEM	The Office of Gas and Electricity Markets (Ofgem) is the government regulator for the electricity and downstream natural gas markets in Great Britain
RdSAP	The Reduced Data Standard Assessment Procedure is the Government's official procedure for the Energy Rating of dwellings. It is a part of the national (UK) methodology in calculating the energy performance of buildings.
Renewable Heat Incentive	The Renewable Heat Incentive in the first phase will offer long-term tariff support to the non-domestic big heat users. The second phase of the RHI scheme will see it expanded to include more technologies as well as support for households. This transition will be timed to align with the Green Deal.
RESA 2008	The Regulatory Enforcement and Sanctions Act (the Act) 2008 is part of the Government's commitment to implementing a regulatory system, at both a national and local level, that is risk-based, consistent, proportionate and effective.
SAP	The Standard Assessment Procedure (SAP) is the UK Government's recommended method system for measuring the energy rating of residential dwellings. It calculates the typical annual energy costs for space and water heating, and, from 2005, lighting. The CO ₂ emissions are also calculated.

SBEM	The Simplified Building Energy Model is a software tool developed by BRE that provides an analysis of a building's energy consumption.
Scottish House Condition Survey	An annual publication which combines 3 years' data to provide key analysis of the physical condition of Scotland's homes as well as the experiences of householders at Local Authority level.
Smart Meters	The rollout of smart meters will be a major national project. It will replace around 53 million gas and electricity meters. They will provide consumers with near real-time information about energy use, and more accurate bills.
Super Output Areas	Super Output Areas are a geography for the collection and publication of small area statistics. They are used on the Neighbourhood Statistics site, and are having a wider application across National Statistics. There are currently two layers of SOA, Lower Layer Super Output Area (LSOA) and Middle Layer Super Output Area (MSOA). The SOA layers form a hierarchy based on aggregations of Output Areas (OAs).
UK ETS	The UK Emissions Trading Scheme was a voluntary emissions trading system created as a pilot prior to the mandatory European Union Emissions Trading Scheme which it now runs in parallel with. It ran from 2002 and it closed to new entrants in 2009
UKAS	The United Kingdom Accreditation Service (UKAS) is the sole national accreditation body recognised by the British government to assess the competence of organisations that provide certification, testing, inspection and calibration services.
U-Values	The U-value is a measure of heat conductivity: the lower the value, the better the insulation. It measures the rate of heat transfer through a building element over a given area, under standardized conditions. It is defined as the rate of heat flow in watts (W) through an area of 1 square metre (m ²) for a temperature difference across the structure of 1 degree centigrade or Kelvin (K).