



# TECHNICAL REPORT

## Green Deal Incentives Research

Undertaken by GfK NOP

November 2012

# Contents

<b>1. Introduction .....</b>	<b>3</b>
<b>2. Target Audience .....</b>	<b>4</b>
<b>3. Research method.....</b>	<b>4</b>
3.1 Conjoint Overview .....	4
3.2 The Green Deal conjoint task .....	5
<b>4. Sample Selection.....</b>	<b>7</b>
<b>5. Questionnaire Design .....</b>	<b>8</b>
5.1 The conjoint section of the questionnaire.....	10
5.2 Piloting .....	17
<b>6. Fieldwork .....</b>	<b>19</b>
<b>7. Initial analysis.....</b>	<b>21</b>
7.1 Coding.....	21
7.2 Data tables .....	21
7.3 Conjoint analysis: Data cleaning.....	23
7.4 Analytical overview .....	23
7.5 The modelling process .....	25
7.6 Converting Preference to take up rates .....	25
7.7 Simulator .....	26

# 1. Introduction

In order to help reduce carbon emissions and improve domestic energy efficiency in Great Britain the Government is launching the Green Deal; an initiative which will enable households and businesses to make energy saving home improvements to their properties. The scheme helps customers pay for some or all of the improvements over time, through their electricity bill. Repayments will be no more than what a typical household should save in energy costs.

The launch of the Green Deal will be supported by the Green Deal Launch Cash-back scheme. The aim of this special time-limited ‘introductory’ offer is to boost early uptake of energy saving home improvements by offering cash-back for each measure that consumers install as part of the Green Deal process.

In early 2012, GfK NOP was commissioned to carry out research with the primary aim of providing DECC with evidence to inform the design of incentive packages to encourage early uptake of the Green Deal.

The objectives of this survey were to answer the following key research questions:

- What level of incentive is most effective in driving uptake of the Green Deal?
- What is the most effective type of incentive for driving uptake of the Green Deal?
- What are the relative differences in uptake of the Green Deal at different rates of interest?
- How does uptake vary when consumers are offered the opportunity to pay in full up front outside the Green Deal financing mechanism? (and receive an incentive after installing the necessary improvements).

## 2. Target Audience

The main target audience for the research was households in the following categories:

- **Owner occupiers:** whether owned outright or with a mortgage (including those on shared-ownership schemes)
- **Private renters.**

It is important to note that social housing tenants (Council or Housing Association) were excluded from the research because of complexities related to their tenancies and the way in which they will interact with the Green Deal.

Newer homes (post-1980) were included in the research since it was reasoned that although new-build properties do tend to have a number of energy saving home improvements installed, not all include all of the potential energy saving home improvements included in the Green Deal, and to exclude them systematically would lead to a biased sample.

Interviews were conducted with the person wholly or jointly responsible for financial decision making in the household (i.e. the person who owned or rented their property, or their partner).

## 3. Research method

All interviews were conducted face to face in respondents' homes. Interviews were conducted using Computer Assisted Personal Interviewing (CAPI) which means that the interviewers carried a laptop which controlled the questionnaire, the order questions were asked and routing, based on answers previously given. This was particularly important given the complexity of the questionnaire.

### 3.1 Conjoint Overview

In order to answer the research objectives, the research used a technique called conjoint analysis. Conjoint (or trade-off) analysis is used widely in quantitative research to measure the perceived values of specific product features, to learn how demand for a particular product or service is related to price, and to forecast likely uptake of a product or service before it is launched.

While direct questioning could be used, it is likely that such an approach would be removed from the real world and would, as a result, produce unreliable estimates.<sup>1</sup> The use of conjoint analysis removes the need for direct questions about respondent preferences, or which

---

<sup>1</sup> For example, car-buyers often over-emphasise features which they feel they *should* look for in a new car (e.g. safety or environmental performance) while under-stating those they do not want to admit to (e.g. performance, speed or image)

attributes of a product they consider to be important. It seeks to understand these questions by asking respondents to consider potential offers or packages jointly (hence 'conjoint').

The method works by decomposing the product into a number of attributes (e.g. incentive level, incentive type etc.), which are in turn broken down into a number of levels. It involves respondents trading-off these attributes against each other, by forcing them to indicate their preferences. From this information, it is possible to establish the relative importance of each of the attributes in driving uptake levels.

For the Green Deal research, conjoint analysis was used to understand the relative appeal of different incentive levels and incentive types, different payment options and different interest rate levels, to identify the offer most likely to lead to the greatest potential uptake.

The conjoint method used was called Choice Based Conjoint (CBC), which is now the most popular conjoint-related method. The main characteristic distinguishing CBC from other types of conjoint analysis is that the respondent expresses preferences by choosing from sets of concepts, rather than by rating or ranking them. This means that it more closely reflects decisions that consumers make in the real world – making this a more simple and natural task that everyone can understand.

A further strength of CBC is that it is possible to deal with interactions, for example different sensitivities to incentives such as price changes. Most conjoint methods are based on "main effects only" models that ignore the existence of such interactions. For instance, a main effect model would measure the impact of increased interest rate, assuming everything else is constant. An interaction effect would measure whether or not there is an added impact over and above the sum of the main effects, of an increase in interest rate and incentive amount when they occur together.

## 3.2 The Green Deal conjoint task

The key elements of the conjoint task included in this research were as follows:

- Respondents evaluated measures which they 'needed' (i.e. those which were appropriate for their home and were not already installed). Measures which were shown included:
  - Solid wall insulation (internal and external)
  - Cavity wall insulation
  - Loft insulation
  - Boiler installation or upgrade.
- Respondents tested packages which reflected likely costs and net savings based on an average three bedroom semi-detached property.<sup>2</sup>

---

<sup>2</sup> Costs and savings were calculated by DECC economists. Estimates of installation costs were taken from a DECC call for evidence, and a realistic illustrative level of Energy Company Obligation (ECO) subsidy was subtracted to give an estimate of what costs would fall to the consumer. The installation costs are illustrative for the purposes of this study. In the Green Deal / ECO market consumers will be offered a bespoke installation cost, and a wide range of ECO subsidy levels are likely to be offered to different households depending on a number of factors, including the size of the property.

- Respondents were able to access discounts and incentives both with and without the use of Green Deal finance.
- Respondents were shown prices after any relevant ECO subsidy<sup>3</sup> had been deducted for the measures (where applicable).
- Respondents were shown how long it would take for a household to pay for the improvements. These payment terms were set at 7 years for cavity wall insulation, or cavity wall insulation and loft insulation combined, and 20 years for the other measures.
- Respondents were shown interest rates ranging from 6% - 12%.
- Different forms and levels of incentive (ranging from 0% - 45% of the assumed installation cost to the consumer) were tested.

The screenshot below illustrates how the conjoint task was presented to respondents.

Measure	External Solid wall insulation	Internal Solid wall insulation and boiler installation or upgrade	Boiler installation or upgrade	Internal Solid wall insulation	External Solid wall insulation and boiler installation or upgrade
Cost of Measure	£7,275	£4,775	£2,500	£2,275	£9,775
Incentive amount	£2545	£240	£0	£1025	£4400
Incentive type / Who provides Incentive	Credit on energy bill	Credit to put towards other home improvement services	Not applicable	Cash payment from Government	Credit to put towards other home improvement services
Up front cost	Pay in full without using this finance package	Pay in full without using this finance package	£1,600	£0	£6,600
Interest rate	Not applicable	Not applicable	10%	10%	12%
Net saving per year	£250	£340	£5	£30	£0

<sup>3</sup> Under the Energy Company Obligation (ECO), households living in harder to treat properties (e.g. properties with solid walls) may be eligible for additional support towards the cost of the measures, which results in a discounted price for the customer.

## 4. Sample Selection

The sample was drawn using random location sampling methods: this was considered the most appropriate method for the survey because it offered reasonably robust sampling at a lower cost and more quickly than a random probability method.

A total of 2,050 interviews were conducted, with boost samples conducted in Wales and Scotland to ensure that at least 200 interviews were conducted in each country. This was considered the minimum sample size needed to enable robust conjoint analysis. The boost samples were weighted at the analysis stage to provide a representative sample of the target population in Britain (see section 7.2 for a description of the weighting process).

Fieldwork was completed across 186 sampling points in Britain; 148 in England and 19 in each of Scotland and Wales. Each sampling point took the form of two Output Areas<sup>4</sup> (OAs) within the same Parliamentary constituency, and interviewers were instructed to work for two days in each paired OA, with the aim of achieving an average of 11 interviews per sampling point.

The sample was drawn in the following stages:

1. **Selection of constituencies:** all constituencies in Great Britain were stratified by urban/rural indicator, social grade and size. A total of 186 constituencies were then selected with probability of selection proportional to the number of residents in each.
2. **Selection of OAs from the chosen constituencies.** OAs were selected at random, following stratification by age, gender, social class, and geodemographic profile (Mosaic classification) within each constituency. OAs with more than 30% social housing were removed from possible selection at this stage for fieldwork efficiency reasons<sup>5</sup>. Once drawn, the profile of the selected OAs was checked against the national profile to ensure that it was representative by the key variables noted above.

Once the initial selection had taken place, the process was repeated to find a second (or paired) OA in the same ward as the original one so that interviewers had two OAs to work in fairly close to one another. An equal number of substitute points were selected at the same time to be used if any of the original number were ineligible for any reason (e.g. inaccessible gated communities, military housing within closed bases).

3. **Selection of addresses within each sampling point:** Interviewers were provided with lists of addresses which they could approach for interview, and they recruited respondents to quota.

---

<sup>4</sup> An Output Area (OA) is the smallest area for which detailed 2001 Census results are available. OAs were created specifically for statistical purposes on the basis of data from the 2001 Census. OAs contain an average of 125 households and around 300 residents: the minimum size is 100 residents or 40 households. Where possible, OA boundaries were drawn to contain populations with homogenous characteristics, and around small, free-standing settlements. For more information on Output Area geography, please see [http://www.statistics.gov.uk/census2001/geo\\_methods.asp](http://www.statistics.gov.uk/census2001/geo_methods.asp)

<sup>5</sup> By excluding OAs containing more than 30% social housing, only 1.3% of all private housing stock in Britain was excluded from the survey.

Quotas were set on gender and working status interlocked (Men working full-time, men not working full-time, women working, women not working) and age. Quotas varied from sampling point to sampling point to reflect the profile of the area in which interviewers were working.

## 5. Questionnaire Design

The questionnaire was designed by GfK NOP in close collaboration with DECC. It used tried and tested questions from surveys such as the 2011 Green Deal survey of consumers, English Housing Survey (EHS), the Low Carbon Communities Challenge (LCCC) survey and the Home Energy Use (HEU) survey. Where necessary, demographic questions were taken from the ONS Harmonised Concepts for Social Surveys.<sup>6</sup>

This survey was also used to create a domestic customer segmentation so, in addition to the questions included for the purposes of this research, there were also a number of questions included to generate the segmentation. Details of the segmentation can be found in a separate report.

The basic questionnaire structure is shown over the page and a copy of the questionnaire is included in Appendix 1.

---

6

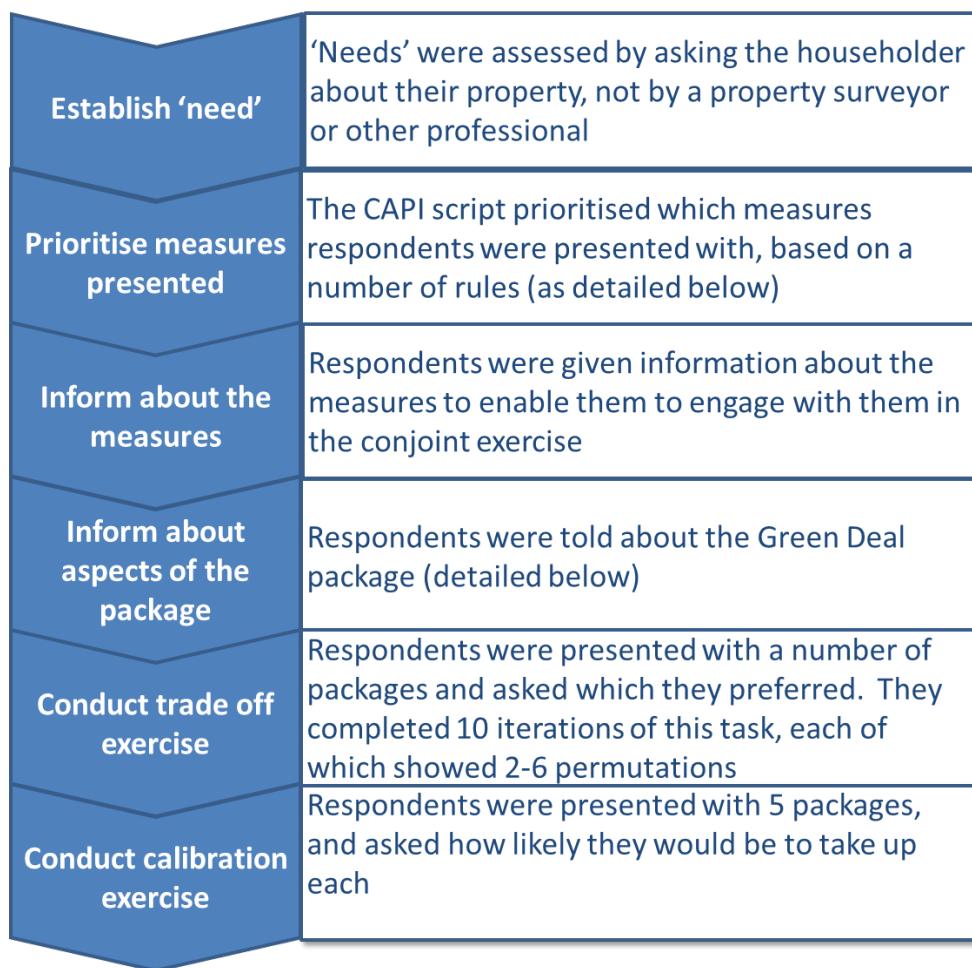
<http://www.ons.gov.uk/ons/guide-method/harmonisation/primary-set-of-harmonised-concepts-and-questions/index.html>

**Figure 1: Green Deal questionnaire**

## 5.1 The conjoint section of the questionnaire

The structure of the conjoint section is summarised below and described in detail after.

**Figure 2: Structure of the conjoint section**



### Establish need

In order to personalise the conjoint section and make it as relevant as possible, household 'need' was established based upon the structure of the property and whether energy efficient measures were already installed or not. 'Need' was assessed based upon questions asked of the householder during the interview, rather than being assessed by a building surveyor: there is therefore a chance that a householder may have given incorrect information, but this was felt to be the best option given the time and budget constraints on the research. If a householder did not know whether appropriate measures were installed in their property, for the purposes of the conjoint exercise, it was assumed that they were not: this is so that householders could make decisions on uptake of packages based on their own perception of what the property 'needed'.

Questions about the property were tailored to the individual respondent as follows:

- If the property did not have a loft they were not asked about loft insulation

- Respondents were only asked about insulation suitable for the walls in their home (i.e. if the property had cavity walls respondents were asked about cavity wall insulation)
- If respondents already had a condensing boiler they were not asked about this measure.

## Prioritise measures presented

A number of rules were set based on the number and type of measures that respondents were presented with:

1. **No measures ‘needed’**: If respondents had already installed all of the measures which were appropriate for their property they largely bypassed the conjoint section and were only asked one question to establish their general interest in the Green Deal and another to ask how they would pay for the improvements if they indicated that they were likely to take up the home improvement plan (this is shown as column 1 of the Possible combination of measures in Table 1 below).
2. **One measure ‘needed’**: If respondents only ‘needed’ one energy efficient measure in their home they were only asked about that measure.
3. **Multiple measures ‘needed’**: If respondents ‘needed’ more than one measure, the following priorities were set:
  - If respondents had both solid walls and cavity walls in their property they were only asked about solid wall insulation
  - Those ‘needing’ solid wall insulation were provided with two options: internal solid wall insulation or external solid wall insulation. Because of the differences in cost, the options for solid wall insulation were only ever presented in conjunction with boiler installation or upgrade (if the property also ‘needed’ a boiler) but not in conjunction with the lower cost loft insulation (as shown in column 10 in table 1)
  - Depending on need, cavity wall insulation was presented alone (column 5 in table 1) or in conjunction with loft insulation top-up (column 7 in table 1) and/or boiler installation/upgrade (columns 6 and 8 in table 1) as appropriate to the property.

The possible permutations are shown in table 1.

**Table 1: Combination of measures presented to respondents**

	Possible combination of measures											
	1	2	3	4	5	6	7	8	9	10	11	12
External solid wall insulation									Y	Y		
Internal solid wall insulation									Y	Y		
External solid wall insulation and boiler installation or upgrade											Y	
Internal solid wall insulation and boiler installation or upgrade											Y	
Cavity wall insulation					Y	Y	Y	Y				
Cavity wall insulation and improving loft insulation							Y	Y			Y	
Cavity wall insulation and boiler installation or upgrade						Y		Y				
Cavity wall insulation, boiler installation or upgrade and loft insulation											Y	
Improving loft insulation			Y	Y			Y	Y			Y	Y
Boiler installation or upgrade		Y	Y			Y		Y		Y	Y	Y
Boiler installation or upgrade and improving loft insulation											Y	Y

### Inform about the measures

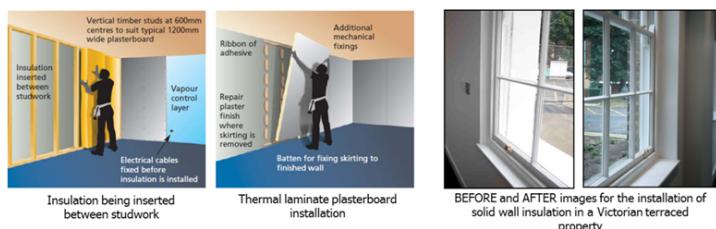
Once the CAPI programme had decided which measures respondents would be asked about as part of the conjoint analysis, they were presented with a short description of each measure, to enable them to make an informed choice. The descriptions were designed to reflect non-monetary ‘hassle’ costs associated with installation (e.g. reduced room space in the case of internal solid wall insulation). The description was presented on the computer screen, and interviewers read out the description as the respondent read along. Copies were also available on paper for respondents to refer to later if they wished.

The full set of descriptions is appended (Appendix 2), but the description used for internal solid wall insulation is shown below as an example.

### Solid wall insulation (Internal)

#### Description:

- For a warmer home, reduced energy usage and to prevent condensation.
- Homes built before or around 1920 can benefit from internal solid wall insulation.
- Internal wall insulation generally involves covering walls inside your home with plasterboard backed with insulating material.
- Requires renovating the internal walls of your house.
- Results in reduced room space (approx. 90mm. on the outside facing wall).
- The full cost of Internal Solid Wall Insulation is £6,000 for an average home
- If you took up the home improvement package, there would be a discount and the cost would be £2,275



The sheets included both the full cost of the measure and (if different), the cost of the measure to the consumer after any subsidy provided under the Energy Company Obligation (ECO) had been deducted. These figures were calculated based on an average 3 bedroom semi-detached property and were provided by DECC.

## Inform about aspects of the package

Having described the measures which were appropriate for their property, respondents were then given more detail about the ‘home improvement plan’<sup>7</sup> beginning with the following summary.

- The right improvements for your home would be recommended by an independent assessor
- The improvements should lead to savings on your energy bills.
- The expected savings on your energy bills should always be greater than the estimated cost of the improvements
- The improvements can be paid for by a new kind of loan, to the property, not to you. This means payments for the improvements would be made through your energy bills.
- If you move you would not be responsible for any remaining costs. Because the new resident would have the benefit of the improvements they would be responsible for paying the remaining costs through their energy bills.

Respondents were then given more detail about the different elements of the home improvements package. The following summarises the descriptions that respondents were given:

- Home Energy Assessment – A “skilled and accredited assessor” would provide details about improvements that could be made to their property (including costs and benefits).

<sup>7</sup> The questionnaire did not mention the Green Deal; it was only ever described as a ‘home improvement plan’. Instead the package was presented as a new way of paying for home improvements which are designed to make your home more energy efficient.

- Respondents were told that they could get any approved installer to make the improvements.
- Help with paying for the improvements – There may be help available from the Government to pay for the improvements. Help might include a discount or an incentive.
  - Paying for the improvements – Respondents were told that the cost of the improvements could be paid back through their energy bills, that consumers can move between suppliers. They were also told how long the repayments would last.
  - Net savings – Respondents were told that they could have lower energy bills as a result of the improvements.
  - Who pays? – You only pay for the improvements while living in that property. Any new residents would then pay for the improvements.
  - Interest rate – Interest rates for the financial package would be fixed.
  - How to pay – You can pay for improvements without using the finance package (savings, loans etc.) and may still be able to benefit from the discounted price and incentive where not using the finance package.

This information was presented to respondents on-screen, and to enhance comprehension respondents were asked to read along as the interviewer read out the detail of the package to them. The full text presented to respondents is detailed in Section F of the appended questionnaire.

### Conduct trade off exercise

Following the educative element of the questionnaire, respondents were asked to complete the conjoint exercise. As previously stated, they were presented with 10 iterations of packages.<sup>8</sup> Each iteration showed between 2 and 6 permutations (depending on the number of measures which respondents ‘needed’ in their property). The number of permutations was limited to 6 so as to avoid respondent fatigue while still maintaining full coverage of the options required subject to the priorities described in section 5.1.

The inputs to the conjoint analysis were decided in consultation with DECC and included both measures (i.e. improvements which could be made to the property), and aspects of the Green Deal financial package (i.e. cost, offer amount, offer type, interest rate etc.). The full list of inputs and levels is shown below in table 2.

---

<sup>8</sup> Within the 10 iterations of the conjoint task, one of the iterations was identical across all the versions created: this is known as a ‘holdout’ task. This task was not included in the analysis but was used internally by GfK NOP to validate the results.

**Table 2: Inputs to the conjoint analysis**

Attribute	Detail
Measures(s)	<p>Included four main measures:</p> <ul style="list-style-type: none"> <li>• Boiler installation or upgrade</li> <li>• Improving loft insulation</li> <li>• Cavity Wall Insulation</li> <li>• Solid Wall Insulation (internal and external)</li> </ul>
Cost of measure (£)	<p>This was cost to consumers of the measures after any subsidy provided under the Energy Company Obligation (ECO) had been deducted.</p> <p>ECO subsidy was only applied for packages including SWI.</p>
Offer amount (£)	<p>Incentive amount was calculated by DECC as a proportion of the cost of the measure. Offer amounts varied from 0% to 45% (of the assumed installation cost to the consumer) and were presented to respondents as actual cash values rather than a % amount.</p> <p>There was no capping of the incentive amounts.</p>
Offer type/who provides the offer	<p>Four incentive types included:</p> <ul style="list-style-type: none"> <li>• Cash payment from government</li> <li>• Council tax rebate</li> <li>• Credit to put towards other home improvement service</li> <li>• Credit on energy bill</li> </ul>
Upfront cost (£)	<p>This was the lump sum upfront payment that consumers would have to pay on the basis of the residual cost after the amount to be financed through the Green Deal was calculated. The amount was presented to respondents as a cash value.</p>
Interest rate (%)	<p>This was the rate of interest that consumers would pay for their Green Deal finance. It was a fixed rate at levels 6%, 8%, 10% and 12%. These were shown as a % rather than the effect of the interest on annual repayment.</p>
Net saving (£)	<p>This was the value of annual net savings that consumers might expect to see on their energy bills based on the package presented to them. It was calculated based on the costs to consumer, interest rates, repayment period and expected energy savings.</p>

The cost of the measures which were shown to respondents are detailed below in table 3.

**Table 3: Cost of measures shown to respondents**

Measure	Cost to consumer (after any relevant discount) £
External solid wall insulation	7,275
Internal solid wall insulation	2,275
External solid wall insulation and boiler installation or upgrade	9,775
Internal solid wall insulation and boiler installation or upgrade	4,775
Cavity wall insulation	500
Cavity wall insulation and improving loft insulation	800
Cavity wall insulation and boiler installation or upgrade	3,000
Cavity wall insulation, boiler installation or upgrade and loft insulation	3,300
Improving loft insulation	300
Boiler installation or upgrade	2,500
Boiler installation or upgrade and improving loft insulation	2,800

The possible cost of a Home Energy assessment and the length of the repayment period were not directly tested. However information was provided to respondents during the interview and/or via show cards about each of these elements of the scheme.

The task was structured as a ‘Dual Response None’ (DRN) exercise which means that each iteration was presented in two stages:

1. On each screen respondents were asked to choose one package (by clicking on the box showing their preferred package). This was repeated on each of the 10 screens. During this first stage respondents were not able to select ‘none of these’.
2. After selecting the best (or, indeed, the least worst) option respondents were then asked: “Taking into consideration all the features of the package that you have just chosen, if this home improvement package was available would you consider it?” At this stage respondents were able to select either yes or no.

The DRN method was chosen over a more standard conjoint design (which shows ‘none of these’ as an option on the first screen) because it avoids the issue of respondents choosing ‘none of these’ options at each screen. While this may reflect their real-world choice, it means that preference data would not be available to feed into the conjoint model. The use of DRN means that respondents do express a preference, even if they later say they would not consider the preferred package.

## Conduct calibration exercise

The final part of the conjoint section of the questionnaire was the calibration exercise. This is required to enable us to translate the preferences stated by respondents into realistic take-up rates and comprised one question about each of five different packages: “If these were available to you how likely would you be to take up this home improvement plan given the features offered?”

The calibration section presented respondents with 5 individual packages, made up of the attributes and levels they had seen in the main conjoint section. The packages were designed to include one which was considered to be very attractive, one which was very unattractive, and a range of others in between.

For each package, respondents were asked to indicate how likely they would be to take up the package, answering on a 5-point scale ranging from ‘Definitely would take up’ to ‘Definitely would not take up’.

The screenshot below shows an example of how this looked on screen for respondents.

Measure	External Solid wall insulation
Cost of measure	£7,275
Incentive Amount	£3,275
Incentive type	Cash payment from Government
Up Front Cost	£5,000
Interest Rate	6%
Net Saving per year	£85

## 5.2 Piloting

It is worth noting that the questionnaire was not subject to a formal piloting stage. This was primarily a function of timings, but it was decided that a pilot was unnecessary for a number of other reasons:

- The use of validated questions from a variety of sources meant that the questionnaire made best use of ‘tried and tested’ question wording
- Prior work on the 2011 Green Deal survey of consumers meant that it was already understood how best to communicate technical detail about the scheme and the measures which were included in the conjoint section
- The questionnaire was subject to internal expert peer review by researchers unconnected to the research.

- A small number of interviewers were accompanied at the start of fieldwork to ensure that the questionnaire was working properly and that respondents understood the task they were asked to undertake.

## 6. Fieldwork

Fieldwork was conducted between 15<sup>th</sup> February and 23<sup>rd</sup> March 2012.

To familiarise interviewers with the background to and objectives of the research, written briefing instructions including details of the Green Deal measures were sent to all interviewers working on the survey. Interviewers were instructed to familiarise themselves with the measures and their applicability to properties, and were invited to contact members of the research team if they had any queries specific to the survey or subject matter.

In completing fieldwork, interviewers followed the usual rules to maintain fieldwork quality. Which means that they:

- only completed one interview per household
- completed no more than 4 interviews in any one road, etc.
- completed no interviews with people known to the interviewer
- registered at a local police station before starting work, to enable them to provide reassurance to respondents if needed

The survey introduction was carefully worded to encourage as wide a range of potential respondents as possible to take part. The introduction was specifically worded to ensure that it did not put off people who were not interested in 'green' issues, and respondents were not told that the survey was on behalf of DECC until the end of the interview if they asked.

The survey introduction is shown in the box below.

452804	<u><b>CONTACT SCREENER CARD</b></u>	Feb 2012
<p>Hello, my name is _____ from GfK NOP, an independent research company.</p> <p>We are conducting a survey about people's homes on behalf of a government department. Your views will help to ensure that the government designs better policies that meet people's needs. We would really value your opinions.</p> <p>INTERVIEWER: ADD IF NECESSARY</p> <ul style="list-style-type: none"> <li>◆ The questions will take around 30 minutes to answer.</li> <li>◆ Your name and individual details will remain confidential to the research company and will not be revealed to anyone else without your permission</li> <li>◆ Your answers will be combined with other peoples who complete the survey and will not be linked to your name or address without your consent</li> <li>◆ The interview is being conducted on behalf of a Government department which has responsibility for some aspects of policy related to people's homes.</li> </ul> <p>INTERVIEWER: SHOW ID</p>		

A Contact Screener Card was provided which included all questions required to enable interviewers to establish eligibility.

In Wales, respondents were given the option of conducting the interview in Welsh, though no respondents took up this option.

Upon concluding the interview all respondents were handed a thank you leaflet, which contained contact details for GfK NOP in case there were any later queries. A large print version of this leaflet was also available.

As previously mentioned, interviewers were set quotas which were specific to the area in which they were working. Quotas were based upon profile information from the 2001 Census.

Table 4 shows the overall quotas that were set along with the number of interviews achieved in each cell. While the working status and country quotas achieved were broadly in line with those set the table shows that younger respondents were under-represented while older respondents were over-represented. These were corrected by weighting the data to the known profile of owner-occupiers and private tenants in Great Britain. The quotas were set to include a 5% 'overage', which would allow for a shortfall in the number of interviews in any area. The target number of interviews to be conducted was 2,000, and a total of 2,050 interviews were delivered.

**Table 4: Quotas (set and achieved)**

	Quotas set		Interviews achieved	
	N	%	N	%
<b>Aged 18-34</b>	584	29	371	18
<b>Aged 35-54</b>	777	39	743	36
<b>Aged 55+</b>	684	34	936	46
<b>Men Working</b>	624	31	582	28
<b>Men Not Working</b>	375	19	428	21
<b>Women Working</b>	595	30	528	26
<b>Women Not Working</b>	452	23	496	24
<b>England</b>	1,600	80	1,625	79
<b>Scotland</b>	200	10	218	11
<b>Wales</b>	200	10	207	10
<b>TOTAL</b>	2,000	100%	2,050	100%

# 7. Initial analysis

## 7.1 Coding

The final questionnaire contained two open-ended questions and 14 questions including ‘other’ answers which required coding. In order to get the most out of these open responses, codeframes were developed initially by executives working on the project with reference to the objectives of the question and, where applicable, maintaining consistency with the codeframes used on the 2011 study. These codeframes were checked at a senior level before being sent to DECC to be signed off.

GfK NOP’s team of experienced in-house coders were fully briefed by project executives in advance of starting work and the briefing included the objectives of each individual question, and other relevant material.

## 7.2 Data tables

Data tabulations were run to a specification agreed with DECC and included information about the key sub-groups to include as crossbreaks (e.g. sex, age, working status, property information, whether measures were already installed etc.)

In addition to standard demographic variables, a number of bespoke variables were created specifically for this research. These included:

- Super Priority Group – For the purposes of this research this was defined as households who fit into at least one of the following three groups:
  - Receive JSA or income support and have a household income below £16,999 and have someone aged 60+ or receive Disability Living Allowance or have children in the household or someone who has a long standing illness or disability
  - Receive a pension credit
  - Receive Child Tax Credits and have a household income below £16,999.
- Consideration group – A sub-group comprising:
  - “Need measures and have considered” – this group was made up of those who had considered installing at least one energy efficient measure in the last 12 months -
  - “Need measures but have no plans to install” – this group was made up of those who ‘needed’ at least one energy efficient measure but had no plans to install any
  - “Need measures but not aware” – this group was made up of those who ‘needed’ at least one measure but were not aware of measures they could benefit from
  - “Already installed measures” – this group was made up of those who had already installed all of the energy efficient measures which their property could benefit from.

The crossbreaks layout and definitions are shown in Appendix 3 of this report.

Interim tables were run while fieldwork was still ongoing in order to check the data, make any amendments ahead of the final dataset and to make the final delivery of data more efficient upon conclusion of interviewing.

Once data tables had been fully checked by project executives the achieved sample was weighted to the known profile of owner-occupiers and private renters in Great Britain.<sup>9</sup> The table below shows both the unweighted and weighted sample profiles of the cells which were weighted.

**Table 5: Final unweighted and weighted sample profile**

	Unweighted profile		Weighted profile	
	N	%	N	%
<b>Aged 18-34</b>	371	18	584	28
<b>Aged 35-54</b>	743	36	768	37
<b>Aged 55+</b>	936	46	698	34
<b>Men Working</b>	582	28	694	34
<b>Men Not Working</b>	428	21	298	15
<b>Women Working</b>	528	26	583	28
<b>Women Not Working</b>	496	24	462	23
<b>White</b>	1,867	91	1,841	90
<b>BME</b>	174	8	200	10
<b>England</b>	1,625	79	1,790	87
<b>North</b>	454	22	491	24
<b>Midlands</b>	380	19	545	27
<b>South</b>	791	39	754	37
<b>Scotland</b>	218	11	151	7
<b>Wales</b>	207	10	109	5
<b>Terraced</b>	570	28	584	28
<b>Semi-detached house</b>	706	34	615	30
<b>Detached house</b>	585	29	553	27
<b>Bungalow</b>	207	10	182	9
<b>Flat</b>	158	8	213	10

---

<sup>9</sup> Source: 2001 Census

The effective sample size was calculated. This describes the effect of the weighting on the accuracy of survey estimates. The effective sample size is dependent upon the size of weights applied to respondents: the further the weights deviate from 1, the smaller the effective sample size and the less accurate estimates will be. As would be expected, the majority of weights ranged between 0.5 and 1.5 and the lowest weight was 0.3 while the highest weight was 4.2.

The effective sample size for this survey was 1,670, or 82% of the interviewed sample size. This is normal for a quota based survey of this type and very similar to the effective sample size achieved in the 2011 Green Deal Consumer Survey. In both years, much of the impact of the weighting on the effective sample size resulted from weighting by home nation: that is down-weighting the boost interviews in Scotland and Wales to their natural proportions.

### 7.3 Conjoint analysis: Data cleaning

The conjoint data was subject to two stages of data cleaning.

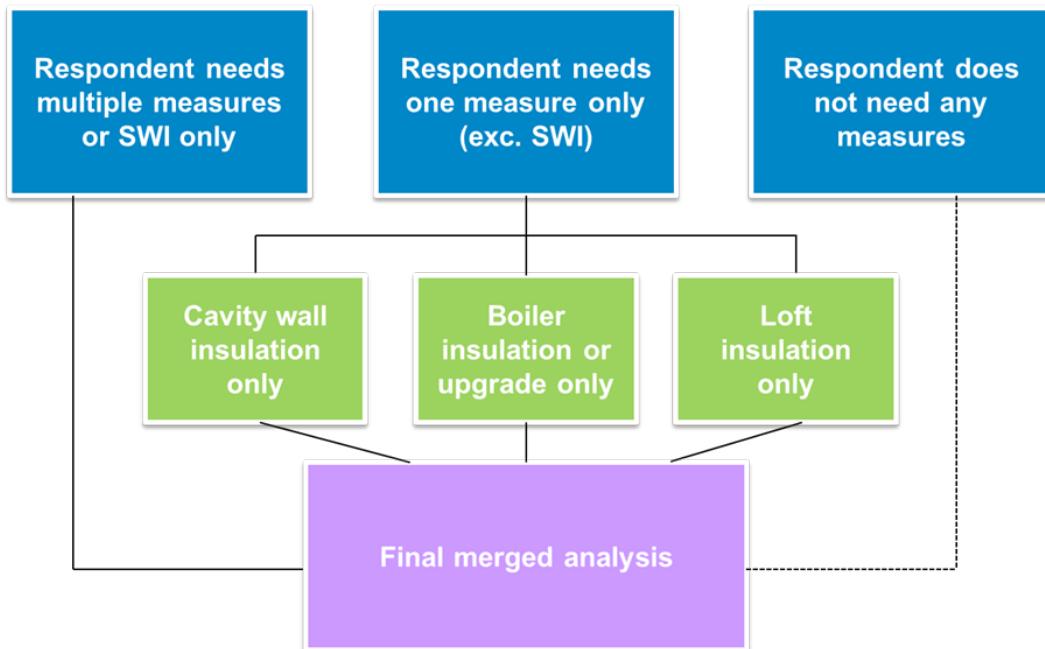
The first stage identified respondents who consistently selected the same position across the iterations in the conjoint section: for example, in all 10 tasks the respondent always chose the option presented at the furthest left on the screen. As the conjoint design is randomised it is extremely unlikely that a respondent giving full and considered answers would always choose the same position. Regardless of how many permutations respondents saw those who chose the same position in 7 or more of the 10 iterations were removed from the analysis.

The second stage of cleaning is conducted later in the analysis: using a ‘goodness of fit’ metric called Root Likelihood (RLH). RLH is computed by taking the  $n^{\text{th}}$  root of the likelihood, where  $n$  is the total number of choices made by all respondents in all tasks. RLH is therefore the geometric mean of the predicted probabilities. If there were  $k$  alternatives in each choice task and no information about part worths, it would be predicted that each alternative would be chosen with probability  $1/k$ , and the corresponding RLH would also be  $1/k$ . RLH would be 1 if the fit were perfect.

This is calculated based on the utility scores for each respondent. A low RLH indicates that respondents have not answered the conjoint tasks in a consistent manner. The possible range for RLH is from 0-1000 and if a respondent had a RLH below 250 it meant that their utility estimates were no better than chance, i.e. there was no pattern to their responses and they had effectively made random choices. A total of 75 respondents (4% of all respondents) had an RLH of less than 250 and were removed through this data cleaning process, so 1,975 cases were included in the conjoint analysis.

### 7.4 Analytical overview

Because of the need to only ask respondents about measures which their household could benefit from, the design of the conjoint analysis needed to bring together a number of different conjoint models into a final merged analysis.



In the design of the conjoint where a respondent ‘needed’ multiple measures, a ‘master’ design was set up that included all energy measures in each task. The design enabled analysis of the data in a number of ways, to:

- Assume that the respondent actually saw all measures from the ‘master’ design but simply did not select energy measures that were not shown
- Assume that the energy measures that the respondent saw were the only measures available and any measures that the respondent already has are discarded from the ‘master’ design.

The conjoint designs were fused together and treated as though they were a single design: in order to refine our design, we ran the analysis in both ways as shown above, and also ran the fused and unfused models to assess the best final model.

To suggest which model offered the best fit, a number of tests were employed. Within the 10 iterations of the conjoint task, one of the iterations was identical across all the versions created: this is known as a ‘holdout’ task. This task was not included in the analysis but was used to internally validate the results. There are two possible metrics with which to test the actual results (from responses respondents gave in task 6) versus the simulated results (from the conjoint simulator). These are:

**Hit rate:** The proportion of respondents for which the actual result and simulated result are identical. The higher the figure the more predictive the model is.

**Mean Absolute Error (MAE):** Across all metrics, the MAE is an average of the difference between the actual preference shares calculated for a package and the simulated shares for that package. The lower the figure the more predictive the model is.

The model and diagnostics were run twice, once including the ‘None of these’ option and once without it: both sets of outcome metrics are shown in Table 6. Overall these diagnostics represent excellent model fits and are extremely robust. While we cannot compare this directly with other studies (due to different numbers of ‘concepts’ being tested etc.) it is worth noting that as a rule of thumb a hit rate between 60 and 70% would be hoped for.

**Table 6: Diagnostic data for the final conjoint model**

Overall Hit rate (without None)	68%
Overall Hit rate (with None)	84%
Overall MAE (without None)	0.8%
Overall MAE (with None)	0.6%

## 7.5 The modelling process

The analysis was run using Sawtooth Software’s CBC/HB software which produced a utility score for each level tested within the conjoint grid, for every respondent. A utility is a measure of relative desirability or worth: the higher the utility, the more desirable the attribute level. Levels that have high utilities have a large positive impact on influencing respondents to prefer a package.

While respondents did not evaluate all ten measures (they only saw a maximum of 6) the software still calculated a utility score for all the measures because of the complex nature of the HB algorithm. To ensure that a measure cannot obtain any share from a respondent who did not evaluate that particular measure, the utility for a measure not evaluated was force coded to -99.

Where respondents evaluated only a single measure (because only one measure was ‘needed’ in their property), the utility associated with the measure would not be applicable, because they were not trading the measure off against itself. In these cases the utilities were force-coded so that the measure they evaluated had a utility of 0, while all other measures had a utility of -99.

Where respondents did not go through the conjoint section because they did not ‘need’ any measures, all levels in the conjoint were force-coded to -99, except the ‘None of these’ option which was forced coded as a 99.

A standard Share of Preference (SOP) simulation model was used to predict share for each package of measure and finance options. The SOP model calculated the probability of a respondent choosing a package and was based on the total utility for each package. Within the SOP model, a package with a high negative utility (i.e. a low desirability) has a 0% probability.

## 7.6 Converting Preference to take up rates

The output of the conjoint analysis calculated the preference/appeal of products or packages. However, it is important to recognise that these preference shares cannot be assumed to represent actual market share.

In order to obtain more realistic take up rates, all respondents were taken through a calibration exercise which asked them directly how likely they would be to take up a number of pre-defined packages.

The five packages presented were chosen to provide a good representation across all possible package combinations; one package was made up of the best features, another made up of the worst features and three packages in-between with varying levels of desirability. For example, a package classified as the best package may include the lower level of interest rate and highest incentive amount.

A further stage in the conversion of preference to take up rate involved the use of GfK NOP's "Truth" index or down-weighting index to convert responses to these calibration questions into a probability or propensity to take up each package. The "Truth" index accounts for the fact that not all respondents who say they will take up a package will actually go ahead and do so. For example, if a respondent says they will definitely take up the package, it is believed that only a certain percentage of those will actually do so. Weights employed in the Truth index have been calculated and refined over the years by re-contacting a sample of those asked about likelihood of purchasing products and asking if they did go on to make the purchase.

From the analysis of the main conjoint section the utility or desirability of the 5 packages was determined and the "Truth" index was used to estimate the proportion of respondents who would take-up each of the packages. Standard polynomial regression techniques were used to create an equation to estimate the take up rates for any potential package, using any combination of features and measures (including whether packages would be taken up in or out of the Green Deal finance package).

In terms of how it is implemented, for any simulation, the utility/desirability of each of the packages in the simulation are known and the regression equation generated allows an estimate of what percentage of those that prefer a package will actually go ahead and take up the package. This behavioural data is overlaid on to the original SOP calculations. For example, a particular package might have a share of preference of 20%; this package has a known utility/desirability of X and by entering this utility score into our the regression equation it is estimated that only 10% of these respondents will take up the package, thereby reducing the figure down to 2% (10% of 20%). All this analysis is done at the individual respondent level to enable robust estimates. This technique allowed conjoint SOP figures to be converted into more real-world take up estimates.

## 7.7 Simulator

The final outcome from the modelling was a simulator which enabled DECC to access the data and conduct 'what if?' experiments (i.e. varying the offer amount, offer type and interest rates to estimate uptake for different packages). All respondents (except those removed in the data cleaning process) were included in the simulator, regardless of which of the three routes they took ('needing' one measure, more than one measure, or none at all).

The simulator (shown below) allows users to amend the following attributes for each of the measures included in the analysis:

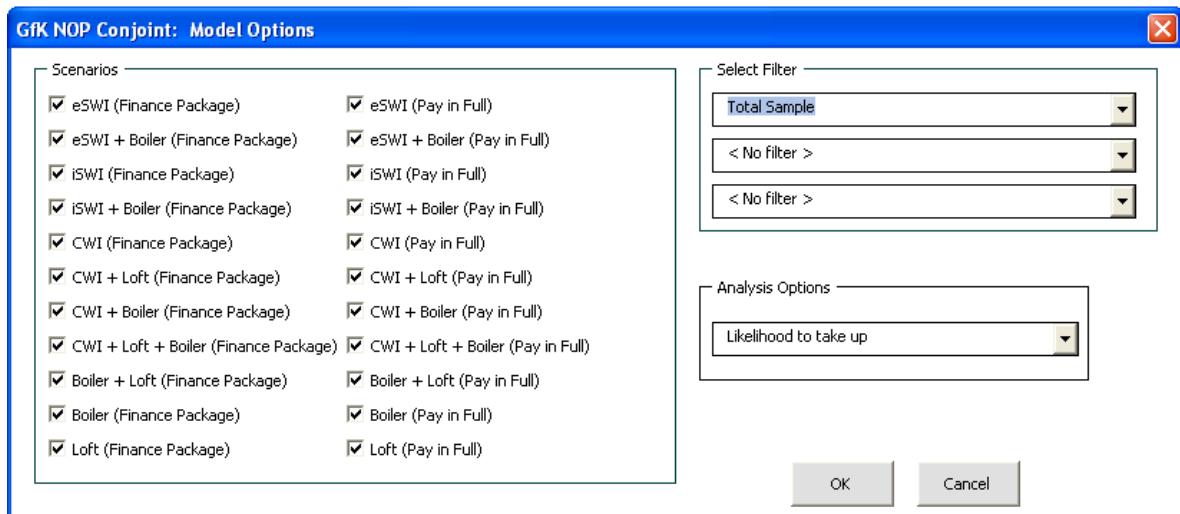
- Offer amount – by typing in a number between 0% and 45% (inclusive)
- Offer type /who provides the offer – by double clicking on that cell and choosing from the four options included in the conjoint exercise
- Interest rate – by typing in a number between 6% and 12% (inclusive).

The screenshot shows the ‘Total Purchase’ (i.e. uptake) figure and shows how this is broken down in terms of whether respondents indicated that the home improvements would be paid for using a Green Deal finance package (‘Purchase in GD’) or in some other way, e.g. respondents would prefer to pay from savings (‘Purchase out GD’). It also shows the total value of finance inside and outside of the Green Deal finance package.

Simulator					
Filter: Total Sample N = 1975		External SWI	External SWI + Boiler	Internal SWI	Internal SWI + Boiler
MODEL OPTIONS	<input checked="" type="checkbox"/> Cost of Measure	£7,275	£9,775	£2,275	£4,775
FILTER SUMMARY	<input checked="" type="checkbox"/> Offer Amount	45%	45%	45%	45%
SAVE AS BASE CASE	<input checked="" type="checkbox"/> Offer Type / Who provides offer	Cash payment from Government			
LOAD BASE CASE	<input checked="" type="checkbox"/> Up front Cost	£5,000	£6,600	£0	£1,600
ABOUT PROJECT	<input checked="" type="checkbox"/> Interest Rate	6%	6%	6%	6%
ATTRIBUTE GRID	<input checked="" type="checkbox"/> Net Saving	£84	£112	£84	£112
HELP	<input checked="" type="checkbox"/> Likelihood to take up	0.22%	0.03%	0.38%	0.06%
QUESTIONNAIRE		External SWI	External SWI + Boiler	Internal SWI	Internal SWI + Boiler
Purchase In GD	Cost of Measure	£7,275	£9,775	£2,275	£4,775
1.95%	Offer Amount	45%	45%	45%	45%
	Offer Type / Who provides offer	Cash payment from Government			
Purchase Out GD	Up front Cost	Pay in full without using finance package			
2.37%	Interest Rate	N/A	N/A	N/A	N/A
Total Purchase	Net Saving	£248	£340	£248	£340
4.32%	Likelihood to take up	0.16%	0.03%	0.26%	0.05%
					CWI
					£500
					45%
					Cash payment from Government
					Pay in full without using finance package
					N/A
					£134
					0.56%

By clicking on ‘Model Options’ users are able to tailor their ‘what if?’ scenarios by:

- Turning on/off different measures - By clicking to remove the ticks by certain measures (and bundles of measures) you are able to remove these (temporarily) from the simulator’s calculations. The list of measures/bundles is shown in two columns: on the left is each measure/bundle to be taken up using a Green Deal finance package and on the right is the same list of measures/bundles, but this time where respondents have indicated that they would prefer to take it up outside of the Green Deal finance package (labelled ‘pay in full’). The default setting is to include all measures for both with ‘finance package’ and ‘pay in full’ options.
- ‘Select Filter’ – the default setting is to analyse uptake by ‘Total Sample’, however it is possible to set a variety of different filters (e.g. Tenants only, 18-34 year olds only, those ‘needing’ loft insulation only etc.). There are three levels of filters available, enabling users to simulate uptake based on multiple criteria (e.g. owner occupiers in terraced houses, those ‘needing’ loft insulation and a boiler upgrade).
- ‘Analysis Options’ – the default setting is ‘Likelihood to take up’ and all figures included in our presentations and reports are given on this basis. The simulator also allows the user to toggle between these and Share of Preference (SOP) figures.



In order to look at uptake (or SOP) for all of the filters included in the simulator, users can click on the 'Filter Summary' tab. This produces an output similar to that shown below. This output can be exported into Excel. It is worth noting that when the filter summary is selected, any filters selected in the model options screen (shown above) are removed: the filter summary can only be run based on the full sample and not on any sub-samples.

Likelihood to take up	CWI (Pay in Full)	CWI + Loft (Pay in Full)	CWI + Boiler (Pay in Full)	CWI + Loft + Boiler (Pay in Full)	Boiler + Loft (Pay in Full)	Boiler (Pay in Full)	Loft (Pay in Full)	Total Purchase
<b>Total Sample</b>	0.56%	0.14%	0.08%	0.01%	0.06%	0.89%	0.13%	4.32%
Tenure: Non-tenants (inc shared ownership)	0.57%	0.14%	0.08%	0.00%	0.06%	0.95%	0.14%	4.00%
Tenure: Tenants	0.52%	0.15%	0.10%	0.03%	0.05%	0.74%	0.13%	5.42%
Gender: Male	0.78%	0.22%	0.14%	0.00%	0.04%	1.01%	0.10%	4.83%
Gender: Female	0.34%	0.07%	0.03%	0.02%	0.07%	0.79%	0.17%	3.85%
Age: 18-34	0.63%	0.15%	0.02%	0.02%	0.04%	1.00%	0.13%	5.77%
Age: 35-54	0.73%	0.19%	0.14%	0.01%	0.08%	0.82%	0.18%	4.50%
Age: 55-64	0.36%	0.09%	0.15%	0.00%	0.04%	1.02%	0.17%	4.00%
Age: 65+	0.25%	0.09%	0.00%	0.00%	0.06%	0.80%	0.04%	2.23%

## Notes on using simulator estimates

In using the estimates provided by the simulator, and presented in the associated research report, please note the following:

- Estimates are based on a new and complex concept. Although the Green Deal was explained to respondents during the survey, there are a variety of factors not included in the research that are expected to influence uptake. These include, marketing activity by Green Deal providers, reputation, word of mouth, whether the customer is at a key trigger point such as moving house or refurbishing their property, tailored advice, competitive activity and government awareness raising activities.
- Similarly, under a real Green Deal scenario consumers would be provided with information about the Green Deal from an accredited advisor, specific to their property and circumstances and any discussion around use of Green Deal finance would be supported with tailored financial advice. The research does not account for those who show no interest under survey conditions but could be persuaded if they reach an assessment stage in real life.

- For the purposes of the research, packages presented to respondents were broadly based on an average property type – an on gas grid, three bedroom semi-detached property. In reality there will be a range of house types and the packages available to these households may result in different patterns of uptake across different customer groups. For some house types, typically larger properties, the net savings will be higher and upfront costs lower, which might result in higher uptake. Conversely, for other property types the net savings might be lower and upfront costs higher. Typically, however, these households would likely be eligible for greater subsidy under the Energy Company Obligation.
- The option to pay outside of the Green Deal financing mechanism was limited to paying the amount in full upfront. The research did not offer the option to part fund though Green Deal finance, an option that may be appealing to some consumers.
- Estimates are a short term measure of uptake, based on the offer being available to everyone at one point in time. They provide a snapshot based on respondents' current financial, economic and household situation.
- Estimates are only based on the tested attributes and measures. When the Green Deal is launched the scheme will cover more energy saving home improvements than were included in the research.

Whilst the figures do not present a market forecast for uptake of Green Deal, they do provide an indication of the features which are most likely to drive uptake of the Green Deal and the relative differences in uptake depending on the level of different features (i.e. increasing interest rates, incentive levels etc.).

As highlighted in the main research report, the levels of uptake generated are shown for illustrative purposes. It is important to focus upon relative changes in uptake levels rather than absolute levels.

## Notes on significance testing

The figures produced by the simulator are probabilities rather than mean scores or percentages and so it is not generally appropriate to conduct significance testing on these estimates.

The probabilities are generated from a Hierarchical Bayes estimation as part of the SOP analysis, and from the application of the Truth Index and regression calculations associated with calibration. Because of this, the figures on which significance testing would want to be conducted are not single probabilities, but a composite of a number of probability scores.

The closest estimate to significance testing is to conduct a panel test on the percentage take-up level. This test assumes that you have asked a panel of respondents the same question multiple times, and you are testing whether the change in response to that question differs significantly from the first.

Based on the total sample included in the conjoint analysis (1,975 respondents), a difference of approximately 0.7 percentage points would be significantly different using this method, but **this should only be taken as a rough guide**.

# 8. Appendices

## Appendix 1: Questionnaire

Please click on the icon below to open the final questionnaire.



DECC Green Deal  
incentives and segme

## Appendix 2: Description of Green Deal measures

Please click on the icon below to open the description of Green Deal measures.



Measures to show on  
screen.ppt

## Appendix 3: Cross breaks and derived variables

Please click on the icon below to open the cross breaks and derived variables.



Cross break Layout  
and Definition.docx

© Crown copyright 2012  
Department of Energy & Climate Change  
3 Whitehall Place  
London SW1A 2AW  
[www.decc.gov.uk](http://www.decc.gov.uk)

URN: 12D/416