Department of Energy & Climate Change

Green Deal Assessment Mystery Shopping Research

Mystery shopping of customer experiences of Green Deal assessments with 48 households and analysis of variability across Green Deal Assessment Reports of 29 properties

Final Report

December 2014

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The views expressed in this report are those of the authors, not necessarily those of the Department of Energy and Climate Change (nor do they reflect Government policy).

Contents

Glossary of terms and acronyms

This report uses the following terms and acronyms:

CWI	Cavity wall insulation
DECC	Department of Energy and Climate Change
ECO	Energy Companies Obligation
EPC	Energy Performance Certificate
EWI	External wall insulation
GD advisor	Green Deal advisor
GD assessor	Green Deal assessor organisation (GDAO)
GD finance	Green Deal finance
GD installer	Green Deal installer
GD ORB	Green Deal Oversight and Registration Body
GD Plan	Green Deal Plan
GD provider	Green Deal provider
GD	Green Deal
GDAR	Green Deal Advice Report
HWU	Heriot-Watt University
OA	Occupancy Assessment
PV	Solar Photovoltaic
RdSAP	Reduced Data Standard Assessment Procedure
SWI	Solid wall insulation

Executive Summary

The Green Deal customer journey experience

In December 2013, ICF International was commissioned by DECC to carry out research into the customer's experience of booking and having a Green Deal assessment. This was done through a mystery shopping research exercise in which 48 recruited mystery shoppers booked multiple Green Deal assessments. The study team subsequently analysed the mystery shoppers' experiences of booking and having an assessment. In addition, the study team analysed the variation in the conduct of these assessments for 29 of the properties to identify the possible sources of such variations and to examine the implications of variations on assessment outputs. It should be noted that the research was not designed to be statistically representative of the entire UK housing stock, meaning that findings are specific to the sample. Further research would be needed in order quantify these findings for the wider population and fully understand its implications.

This study forms part of the evaluation of the GD and ECO programme that is being led by ICF International. However, this study examines the early part of the overall Green Deal customer journey: the experience of participants in this study in obtaining and carrying out a Green Deal assessment for an active consumer (one who proactively attempts to find a Green Deal assessor to undertake an assessment). The full customer journey is examined in another study undertaken as part of the evaluation of the GD and ECO programme.[1]

Study aim and research objectives

The aim of this study was to examine how Green Deal assessments are working in practice and to determine whether there is variation in the conduct of Green Deal assessments, to identify the possible sources of such variations and examine the implications of variations on assessment outputs. The evidence collected through this study also contributes to answering the following questions from the overall Green Deal and ECO evaluation programme:

- How is the supply chain developing? Is it geared up to meet the emergent level of demand? What are the implications of this?
- What are consumers' experiences of the customer journey? (What's working well and what are the obstacles at each stage?)
- To what extent is the supply chain sufficiently developed and responsive to meet the levels of consumer demand?
- Is the supporting infrastructure (IT), code of practice and framework regulations fit for purpose? What are the links to consumer protection?

[1] GfK NOP research on Green Deal customer journey. Available: https://www.gov.uk/government/collections/green-deal-assessments-research

- How does the Green Deal support consumer choice?
- How are different forms of legislation and codes of practice protecting consumers?
- How are the IT infrastructure, legislation and DECC-led systems supporting delivery of the Green Deal?

Study methodology and interpreting this report's findings

Forty-eight mystery shoppers, acting the role of Green Deal customers, each commissioned Green Deal assessments from four different Green Deal assessors. After each assessment the participants completed a questionnaire detailing their experience. Assessment data lodged by the assessors were retrieved from the central Energy Performance of Buildings (EPB) Register for analysis. A further round of assessments provided a set of independent 'reference' data for 29 selected properties.[2] The reliability and quality of the Green Deal Advice Reports (GDARs) produced after each assessment were assessed. Variation in the inputs to and outputs from the Energy Performance Certificate (EPC) and Occupancy Assessment (OA) were analysed, as was variation in the schedule of recommended measures provided to the mystery shopper.

The mystery shopping research took place from February 2014 to April 2014.

The research was not designed to be statistically representative of the entire UK housing stock, with sampled homes being those households willing and available to participate in the exercise. The findings in this report provide insights into the customer journey for 'active' GD customers in the areas that these properties were located in early 2014. The figures provided should not be used to quantify likely variation across all Green Deal or EPC-related energy assessments. The small sample of owner-occupier homes (29 dwellings selected for comparison in Chapter 4 of this report) means that the quantified results are specific only to that sample. The existence and widespread nature of recorded variation is likely to have implications for the design of future assessments, particularly as these inconsistencies were observed throughout the dataset and not just sporadically. However, further research would be needed in order quantify these findings for the wider population and fully understand its implications.

Key findings

Participants had problems finding a Green Deal assessor willing and able to perform an assessment. Participants experienced great difficulties in finding a Green Deal assessor that served their area and would be willing to provide an assessment. Numerous calls were required to secure a booking; some participants could not secure four assessments and therefore dropped out of the research. In addition, some shoppers reported a lack of interest or enthusiasm on the part of many assessors for undertaking assessments within the time frame required (February to April 2014). The information systems directing Green Deal customers to assessors available at the time of the research were not sufficiently accurate or localised to be useful.

The participants' experience of the assessments, once participants had found an assessor that was able to provide an assessment, was generally very positive. Participants felt that the inspection process was explained clearly by the assessors. Overall

[2] The Occupancy Assessment (OA) database only allows an 'OA' report to be lodged when it is linked to the exact EPC that was produced alongside the OA. The EPC database only exhibits the most recent EPC so only the EPC with the most recent date can be linked. As a result, if an Assessor did not lodge the OA and EPC immediately after the assessment date (which is not required by the GD code of practice) a subsequent GD assessor may lodge their 'later' EPC and OA afterwards and the earlier assessment can no longer be lodged. As such, although 48 properties had 4 assessments, the project team only had access to the data of 29 properties.

satisfaction with the Green Deal assessment itself was high. In most assessments participants were either extremely or fairly satisfied with the overall experience. There was little evidence from the research of inappropriate marketing of products and services during the assessment. The majority of assessments were not free and there were very few examples of charging being conditional upon future works.

There was a lack of consistency in the data, results and advice generated by different assessors for the same property. There was significant variation in the EPC and OA results produced by the different assessments conducted at individual properties. The range of EPC ratings spanned at least two EPC bands for almost two thirds of the dwellings analysed.

The analysis found many differences in the values recorded for key input variables at the same property. Input variation was observed with EPCs, particularly for total floor area and the energy efficiency rating of building fabric and technologies. The variation in the inputs to the EPC process contributed to the EPC rating varying by, on average, 11 points in each dwelling. The variation in the EPCs was carried across to the OA where it was augmented by further input variation, particularly with respect to the definition of internal temperature and heating schedule.

Assessors appear to have adopted a variety of approaches to the selection of measures, such that recommendations for the same property varied widely. There was variation in the recommended measures in both the EPC and OA made by different assessors for the same property. For example, the number of recommended measures for a single property varied between one and seven across the four assessments in two cases. The analysis suggests that the variation is likely to be attributable in part to the input variations described above but also to differences in the approach to the selection of measures. Participants' reports of their conversations with assessors suggest that the recommendations were not always based on a commonly-shared, consistent methodology. Some assessors recommended lots of measures to allow the occupier to consult more widely. Other assessors appeared to take the approach that measures should only be recommended if they were applicable to a particular occupant after a consultation process.

The research raises questions about the reliability of the information on which Green Deal customers are making choices about investments in energy efficiency. The mystery shoppers that participated in this research did not receive a fully standardised assessment experience, with common differences in whether (for instance) energy bill data were requested and Green Deal finance explained. They also did not receive consistent advice on the energy efficiency of their home or the measures that they should consider to improve it. Since an 'average' Green Deal customer would have only one assessment, this raises questions – if the variability observed in this study was replicated in assessments elsewhere (which this study is not able to determine) - about the reliability of the information that programme customers are using to inform their investment choices.

1. Background and Methodology

Green Deal Mystery Shopping

1.1. The Green Deal (GD) and Energy Companies Obligation (ECO) programme was launched in January 2013 in order to deliver carbon savings and reduce fuel poverty through energy efficiency improvements in domestic buildings. The scheme aims to enable consumers to make energy saving improvements to their properties without having to pay all the costs up front. The first step is to have a Green Deal assessment, which results in a Green Deal Advice Report which outlines the energy efficiency measures that can form a basis for the Green Deal Improvement Package. The assessment can only be carried out by an authorised Green Deal assessor.

1.2. ICF International (working with the support of GfK NOP, Heriot-Watt University and CADS HS[3]) was commissioned by DECC to carry out research to determine whether there is variation in the conduct of Green Deal assessments, to identify the possible sources of such variations and examine the implications of variations on assessment outputs. The project required the use of mystery shopping, follow-up assessments by independent assessors to 'ground truth' the results of the mystery shopped Green Deal assessments, and analysis of information on the customer experience and technical data collected during the various assessments. This study forms part of the broader evaluation of the Green Deal (GD) and Energy Companies Obligation (ECO) programme.

Research objectives

1.3. The aim of this study was to examine in depth the customer's experience of having a Green Deal assessment. It therefore considered the first two stages of the Green Deal customer journey (summarised in Figure 1.1): initial contact with the scheme, and the pre-installation assessment. The mystery shopping project provided insights into the experience of the early Green Deal customer journey for an **active consumer** - one who proactively attempts to find a Green Deal assessor (via the Energy Saving Advice Service – ESAS - or other means) to undertake an assessment.[4] From a research and evaluation perspective, if this group is unable to find an assessor or secure an assessment it is difficult to capture their experiences through survey work. Surveys that use the assessment population as the sample frame will not contact customers who have been unable to find an assessor/secure an assessment. As such, the data collected by this project provides valuable insight into the experience of this customer segment.

1.4. In addition, the study analysed variability seen in the Green Deal Advice Reports (GDARs) produced for individual properties. This was undertaken to better understand how the Green Deal assessments are working in practice, assess the reliability and quality of the outputs

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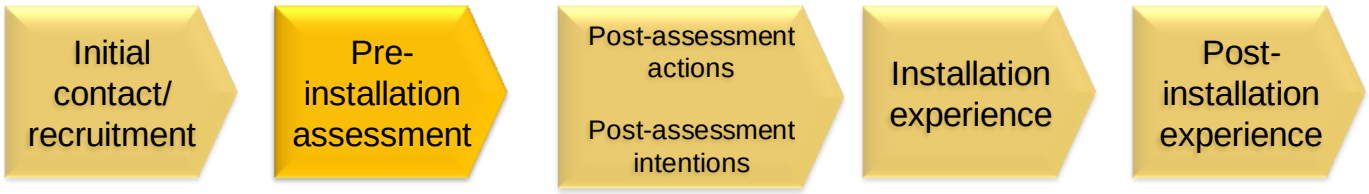
[3] CADS Housing Services, part of the CADS Group, delivers housing surveys for both the English Housing Survey (EHS) and the Scottish Household Survey (SHS). For this project, they provided qualified Green Deal Assessors to conduct the independent follow-up assessments described in Chapter 4.

[4] There are two other main categories of customer: 1) ECO, and 2) a consumer who receives a direct approach such as a phone call from a GD Assessor or marketing material through their door e.g. a passive customer – who doesn't have to actively look for an assessor.

produced, and identify aspects of the assessment process that can contribute to variation in the information and advice provided to consumers.

Figure 1.1: The Green Deal Customer Journey



Evaluation questions

1.5. The project addressed the questions shown in the following table:

Topic	Question
Customer experience of arranging the assessment	Whether… • It was easy to arrange/book assessments; • There were barriers to finding and booking assessors; • Customers had to pay for the assessment and, if so, how much.
Customer experience of the assessment itself	Whether… • The assessor arrived on time, showed their identification and acted in a professional and appropriate way; • The assessor covered all points that they should have done (e.g. did they ask to look in the loft if available? Did they ask all questions they were expected to ask? Did they actually take measurements or make assumptions based on information provided by the customer?); • The assessor clearly explained what they were doing, the outcomes of the report, next steps, etc.; • The assessor described Green Deal finance; • The Green Deal Assessment Report was provided in a timely manner or mystery shoppers had to chase to receive their report; • There was evidence of inappropriate behaviours (e.g. use of 'hard sell' tactics, inappropriate follow up calls, attempts to cross-sell other products and services without being invited).
The consistency of the results for a given property	Whether… • With all other factors remaining constant, repeat assessments varied depending on who undertook the assessment, and if so, how and why; • There was evidence that some assessment inputs (e.g. floor area, property age) varied more than others, how often, and how much; • Assessments were reliable, and if there was variability, how extensive it was;

	• The extent to which variations were systematic or random, and if they were systematic, what were the systematic sources of variation (by assessor type or property characteristics); • There was evidence on what was causing inputs to vary; • Combined Energy Performance Certificate (EPC) and Occupancy Assessments (OAs) gave the outputs that supported various policies that relied on these data; • There was evidence that the assumptions made in the assessment process adversely affected EPC and OA calculations.

1.6. The evidence collected through this project will also contribute to answering the following questions from the overall Green Deal and ECO evaluation programme:

- How is the supply chain developing? Is it geared up to meet the emergent level of demand? What are the implications of this?
- What are consumers' experiences of the customer journey? (What's working well and what are the obstacles at each stage?)
- To what extent is the supply chain sufficiently developed and responsive to meet the levels of consumer demand?
- Is the supporting infrastructure (IT), code of practice and framework regulations fit for purpose? What are the links to consumer protection?
- How does the Green Deal support consumer choice?
- How are different forms of legislation and codes of practice protecting consumers?
- How are the IT infrastructure, legislation and DECC-led systems supporting delivery of the Green Deal?

Study methodology

1.7. The goal of this project was for a group of mystery shoppers to arrange for Green Deal assessments to be carried out on their homes by four different assessors who would not be aware that they were participating in a research project.[5] The fieldwork took place between February and April 2014.

1.8. This project was not intended to provide results that are statistically representative. The findings in this report provide insights into the customer journey for 'active' Green Deal customers in the areas that these properties were located and at the time of the research. The figures provided should not be used to quantify likely variation across all Green Deal or EPC-related energy assessments.

1.9. GfK NOP recruited and managed the mystery shoppers. The recruited shoppers received detailed briefing instructions to ensure they knew what was expect of them and why. Shoppers were instructed to provide consistent information about their property throughout the project to all Green Deal assessors. Shoppers were also instructed to not reveal they were involved in a mystery shopping exercise, unless it was unavoidable to do so.

[5] The entire GD certified supply chain was notified, as required, via the Green Deal Oversight and Registration Body (GD ORB) that a mystery shopping exercise would be taking place.

1.10. Following the briefing, shoppers set out to arrange four Green Deal assessments to be conducted in their homes. Shoppers were advised to arrange:

- One with, or arranged through, the shopper's usual energy provider;
- One from the top 10 most active providers of Green Deal assessments;
- Two from other certified Green Deal assessment suppliers.

1.11. After each visit the mystery shopper completed a questionnaire detailing their experience (e.g. clarity of information provided, whether assessors explained Green Deal finance). The detailed methodology is provided in Technical Annex A. The questionnaire is available at https://www.gov.uk/government/publications/green-deal-assessment-mystery-shopping-research. A short pilot phase revealed that many shoppers encountered significant challenges when looking for Green Deal assessors using the GD ORB online search tool and in trying to secure four assessments in the timescales required for the study. Following the pilot, shoppers were advised to contact the Energy Saving Advice Service (ESAS) to obtain a list of Green Deal organisations in their area, rather than look to obtain the mix of assessors cited in paragraph 1.10. These issues were described in detail in a note issued to DECC on 14 March 2014 (see Annex C) and are discussed in Chapter 3 of this report. The challenges facing shoppers when booking assessments resulted in around 80 shoppers pulling out of the project at various stages.

1.12. In total, 46 shoppers completed four assessments by the end of the fieldwork (compared to the original goal of 50). Two other shoppers were only able to complete two assessments, and these assessments are included in the analysis. Chapter 3 of this report (on the customer journey experience) is based on the 182 questionnaires completed for assessments done up to 1 April 2014 (at which point no further questionnaires were analysed). Chapter 4 of this report (analysis of variability across GDARs) is based on 29 properties selected for a further round of assessments to provide a set of independent 'reference' data.[6] Throughout this report, these mystery shoppers are referred to as 'participants'.

1.13. The table below summarises the target and achieved participation and assessments:

Parameter	Number
Target no. of households	50
Target no. of assessments	200
Actual no. of households that participated	48*
Actual no. of assessments	188

Note: * Of those 48, 46 shoppers completed four assessments. Two were only able to complete two assessments.

[6] During the course of the project it was found that a single dwelling can only have one 'active' GDAR at any time. If an assessor tries to upload a GDAR which is older than a GDAR already on the system, Landmark will reject the report. This reduced the number of dwellings for which all four assessments were available from Landmark. Two extracts of data were taken from Landmark, the first (taken in April) contained data for 24 dwellings with all four assessments. The second (taken in May) contained another 5 sets of four assessments. These 29 dwellings were used for analysis in Chapter 4.

1.14. Data and information gathered during a Green Deal assessment is 'lodged' by the assessor on the Energy Performance of Buildings (EPB) Register managed and maintained on behalf of DCLG. Authorised DECC staff have access to some parts of this database. Certain data associated with the assessments completed at the mystery shoppers' homes were retrieved by DECC and supplied to the project team for analysis.

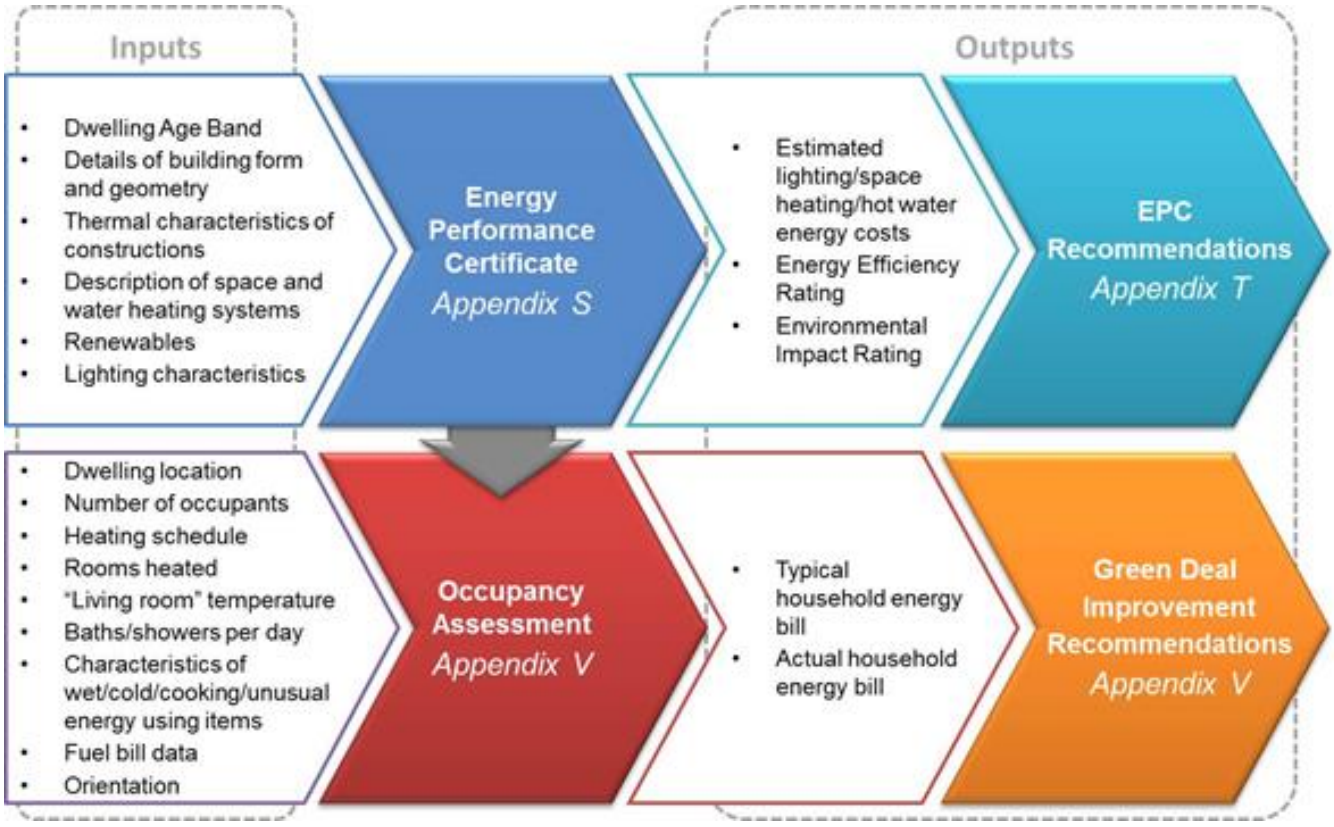
1.15. The information consisted of a number of data sets relating to the GDAR. Three sets of information were considered, namely:

- **The Energy Performance Certificate (EPC),** detailing a standardised energy assessment of the property (with associated EPC rating);
- **The Green Deal Occupancy Assessment**, which tailors the energy assessment to more specific occupant characteristics, with a view of making this more suitable for estimating real energy savings;
- **Recommendations** resulting from the above assessment, comprising a list of quantified savings from suitable retrofit measures.

1.16. The integration of theses stages within the overall GDAR is illustrated in Figure 1.2.

1.17. The assessment data were analysed by Heriot Watt University (HWU) with the aim of: understanding better how the Green Deal assessments were working in practice; reviewing the reliability and quality of the outputs produced; and, identifying aspects of the assessment process (and associated data capture) that contributed to variation in the information and advice provided to the mystery shoppers. The data submitted by the four Green Deal assessors were then compared to baseline information gathered by an independent Green Deal assessor retained by the project and to information reported by the mystery shoppers. Further information about the process of gathering baseline data is provided in Technical Annex B: Assessment analysis.

Figure 1.2: Components of a Green Deal Advice Report



Source: Heriot-Watt University; Note: Appendices relate to RdSAP 2009 version 9.91

1.18. Energy Performance of Buildings (EPB) Register data from four sets of Green Deal assessments were available for 29 properties[7]. Chapter 4 of this report focuses on analysis of the results for these homes.

1.19. The GDAR data from these properties were analysed by HWU to identify variables on which there was inconsistency. Particularly significant data were identified to guide the analysis. These included:

- A number of input and output parameters associated with the EPC calculation;
- Total energy use for both pre and post-retrofit scenarios, in relation to the EPC calculation;
- The construction period of the dwelling (for some properties);
- Basic construction information for different parts of the dwelling (e.g. where the properties associated with a newer extension may differ from those of the main building);
- A number of input and output parameters associated with the Occupancy Assessment;
- The list of recommended improvement measures as advised by the assessor on the basis of the OA;
- The improvements recommended through the OA resulting in "typical" and "estimated" savings, with indicative total cost;
- Outputs from mystery shopper questionnaires.

1.20. The assessment records were scanned for two types of variation:

- **Intra-dwelling variation** - i.e. does the input used and output generated for all four assessments of the same dwelling match, and if not why not?
- **Inter-dwelling variation** – i.e. do all dwellings exhibit similar trends and what factors contribute towards this?

1.21. A series of key inputs were identified to evaluate the effect of variation in these parameters on output metrics. These input factors are described in detail in Technical Annex B. Information collected by the mystery shopper questionnaires was also cross referenced against some of the aforementioned parameters to inform a judgement on whether the process adopted by the assessor had an impact on the quality or reliability of data collected. This is further described in Technical Annex B.

1.22. The original intention was to recruit mystery shoppers that were broadly representative of all the key criteria which could impact on GD assessments (whilst also being practicable, i.e. to select from within the GfK NOP shopper panel with the flexibility needed to complete within a tight timeframe). However, GfK NOP only received interest from owner-occupiers so it was not possible to get a mix of tenure types. The difficulties experienced by shoppers in booking assessments led to a number of them dropping out of the study. To secure the continuation of the study the sampling approach was abandoned.

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[7] The OA database only allows an 'OA' report to be lodged when it is linked to the exact EPC that was produced alongside the OA. The EPC database only exhibits the most recent EPC so only the EPC with the most recent date can be linked. As a result, if an Assessor did not lodge the OA and EPC immediately after the assessment date (which is not required by the GD code of practice) a subsequent GD assessor may lodge their 'later' EPC and OA afterwards and the earlier assessment can no longer be lodged. As such, although 48 properties had 4 assessments, the project team only had access to the data of 29 properties.

Interpretation of findings

1.23. All households in this study arranged assessments themselves. Evidence gathered in other research projects of the Green Deal / ECO evaluation suggests that such GD customers account, at present, for a small minority of Green Deal assessments. In a survey conducted under the Green Deal Customer Journey Research project , only 11% of respondents found the assessor and arranged the assessment themselves.[8]

1.24. This mystery shopping project was not intended to provide results that are statistically representative. The findings in this report provide insights into the customer journey for 'active' GD customers in the areas that these properties were located (see Figure 2.2) and at the time of the research. The figures provided should not be used to quantify likely variation across all Green Deal or EPC-related energy assessments. Where findings relate to the Green Deal Customer Journey Research (conducted as part of the overall Green Deal / ECO evaluation programme), which interviews a representative sample of households that have had a Green Deal assessment, this is noted. By way of example, this means that it would be correct to interpret the findings in the report as: "In nearly a quarter of mystery shopper assessments (23%) no energy bills were requested by the assessor." It would not be correct to state that, "23% of GD assessors do not request to see any energy bills".

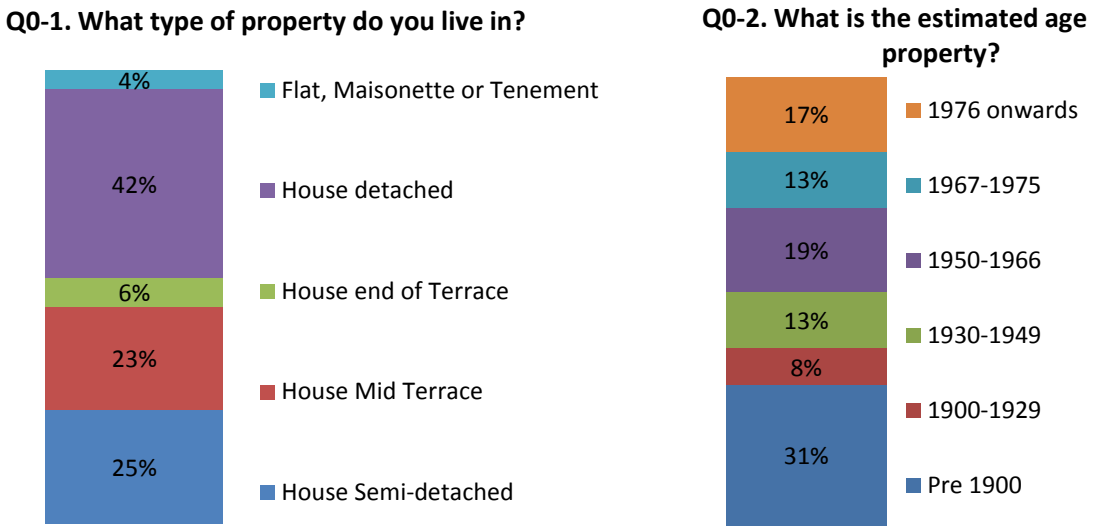
[8] GfK NOP Wave 2 Customer Journey survey. Available: https://www.gov.uk/government/publications/green-deal-customer-journey-survey-summary-report-quantitative-survey-wave-2. Note the Customer Journey sample includes households that had a GD assessment for ECO purposes as well as GD.

2. Overview of participating households

Characteristics of participating households

2.1. The characteristics of the participating households are set out below. All 48 participating households were owner occupiers. Many properties were detached (42%) or semi-detached (25%). Almost a third (31%) of properties were constructed before 1900 (Figure 2.1). Participating households were distributed across England and Wales (Figure 2.2).[9]

Figure 2.1: Property type and estimated age



Base: All participating mystery shopping properties (48)

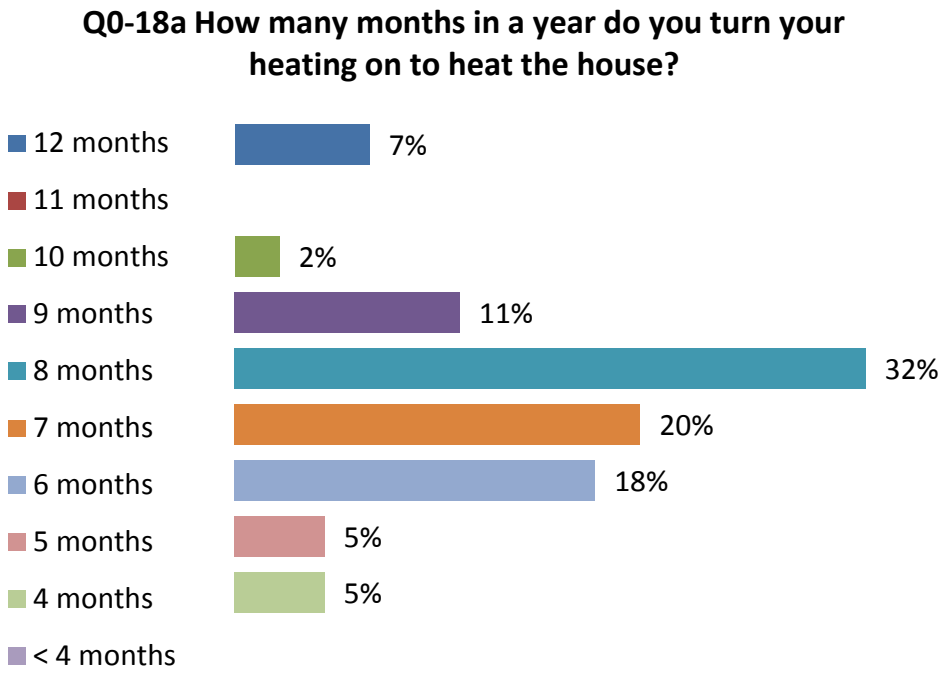
Figure 2.2: Location of Green Deal Assessment mystery shopper properties

Base: All participating mystery shopping properties (48)

[9] Households in Scotland were excluded from the study. Reasons for this are provided in Annex A.

2.2. Most participants[10] reported that their house was warm enough in the mornings (90%) and evenings (81%) with the heating on. Almost all participants (92%) reported having a boiler in their property. Those participants with a boiler[11] on average reported using the heating system for 7.5 months of the year (Figure 2.3).

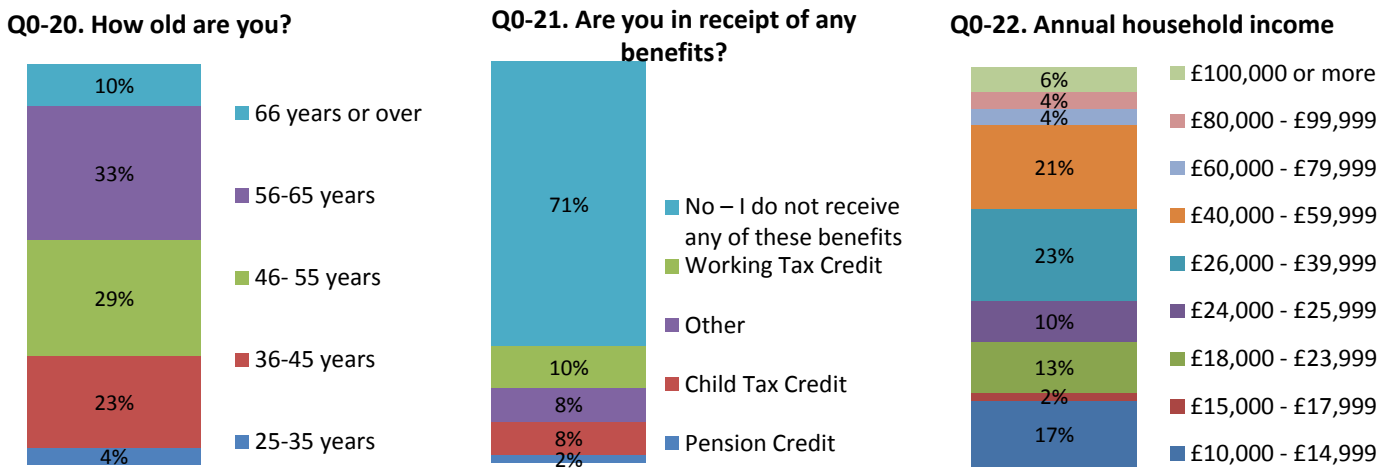
Figure 2.3: Use of heating system



Base: All participating mystery shopping properties that responded to this question (44)

2.3. Mystery shoppers spanned a range of ages and annual household income types. Most participants (71%) were not in receipt of any benefits (Figure 2.4).

Figure 2.4: Age of participant, receipt of benefits and annual household income



Base: All participants (48)

[10] Base: All participating mystery shopping households: 48

[11] Base: All participating households with a boiler: 44.

3. The customer journey experience

This chapter presents the analysis of responses to a questionnaire completed by mystery shoppers after each Green Deal assessment, and describes the customer experience of arranging a Green Deal assessment, the assessment itself, and the supply of a Green Deal Assessment Report

Note on reporting

3.1. This chapter is based on the 182 questionnaires that were completed for assessments done up to 1 April 2014. Names of Green Deal assessors (companies and individual) have been removed.

Key messages

- Participants experienced great difficulties in finding a Green Deal assessor that served their area and then in organising an assessment. The Energy Saving Advice Service (ESAS) list provided to participants was not sufficiently accurate and localised to meet householders' needs.
- Once participants had found an assessor that was able to help, the experience of the participants when booking appointments was generally positive. The majority of assessments were not free and there were very few examples of charging being conditional upon future works.
- Very few assessments took place at the weekend and one in five assessors were late for the appointment. About two-thirds (64%) of participants stated that the length of the assessment was 'about right'.
- Participants felt that the inspection process was explained clearly by the assessors. In almost all assessments, the assessor visited each room in the property (including the loft where applicable). Assessors also used questions to gather information about the property.
- In most assessments, the assessor asked the participant questions about the use of energy in the property. This compares to the Green Deal Customer Journey Research Wave 2 findings where energy use was discussed in less than half of the assessments.[12] During most assessments participants were asked if they could show any electricity bills. This number was slightly lower for gas bills. In nearly a quarter of assessments no energy bills were requested by the assessor.
- Participants were presented with a range of improvement options and discussed with the assessor the benefits and, to a lesser extent, the potential limitations of the measures.

[12] GfK NOP Wave 2 Customer Journey survey. Available: https://www.gov.uk/government/publications/green-deal-customer-journey-survey-summary-report-quantitative-survey-wave-2. Note the Customer Journey sample includes households that had a GD assessment for ECO purposes as well as GD.

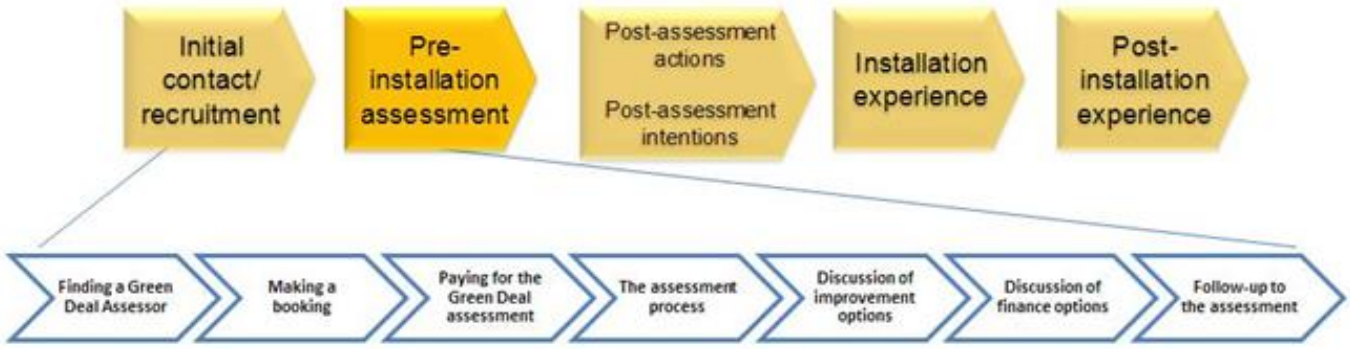
- There was little evidence from the research of inappropriate marketing of products and services during the assessment. However, in one quarter of assessments, the assessor did not explain about the choices available to participants in terms of who could supply the improvement measures.
- Financial options were discussed in almost two thirds of assessments but the benefits of taking out a Green Deal financial package were only explained in some assessments. Key elements of Green Deal finance were not discussed in most cases.
- The completed questionnaire results indicate that in many cases documents were not received by participants within five working days. However, this five day timescale is not mandatory and many participants reported that assessors indicated that documents would be sent within three to four weeks.
- When compared to the findings from the Green Deal Customer Journey Wave 2 research, the results suggest that 'active consumers' who attempt to find a GD supplier to undertake an assessment, rather than respond to initial contact made by a GD supplier, may have a more positive and comprehensive experience than householders that were either contacted by the assessor or had their assessment arranged for them.
- Overall, participant satisfaction with the Green Deal assessment was high.

Introduction

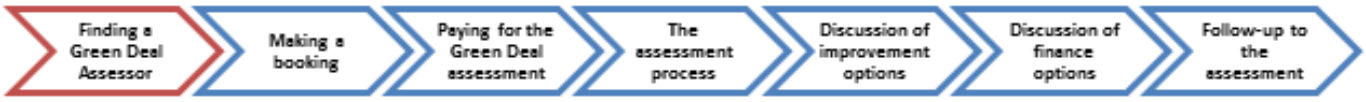
3.2. The assessment step of the Green Deal customer journey has seven components (Figure 3.1). These provide a framework for analysis of the experience of the participating mystery shopping households (the participants). The components are:

- Finding a Green Deal Assessor
- Making a booking
- Paying for the Green Deal assessment
- The assessment process
- Discussion of improvement options
- Discussion of finance options
- Follow-up to the assessment

Figure 3.1: The Green Deal Customer Journey and the seven steps of a GD assessment



Step 1: Finding a Green Deal Assessor



3.3. Participants experienced great difficulties in finding a Green Deal assessor that served their area and then in organising an assessment. The Energy Saving Advice Service (ESAS) list provided to participants was not sufficiently accurate and localised to meet householders' needs.

3.4. Participants obtained a list of Green Deal assessors that were registered as serving the postcode area of the customer's property by using the ESAS web page and telephoning ESAS. These data were drawn from the Green Deal Oversight and Regulation Body (GD ORB) database[13] of assessors. The lists provided to shoppers were long but were found to contain details of organisations that:

- Did not serve the customer's geographical area;
- Did not carry out assessments but instead provided business-to-business Green Deal related services[14]; or
- Were not currently active in the Green Deal market.

3.5. In the piloting phase of the research, ESAS advised a number of mystery shopper participants that their homes were already highly efficient and that they would not necessarily gain from having an assessment.

3.6. Participants were not required to record details of every attempted booking. However, GfK NOP report that, based on informal discussions with participants, a significant number of calls were required to make a booking. Anecdotal evidence from researcher discussions with mystery shopper suggests those shoppers that were able to secure four assessments had to call somewhere between 30 and 75 companies.

3.7. Some companies were found not to be local to the shoppers and that they would not serve the geographical area the shopper resided in (although no geographic patterns were discernible). One mystery shopper stated from their experience that:

> *"…we had companies from Maidstone, Newcastle-upon-Tyne and even Exeter listed". Mystery Shopper, Midland area.*

3.8. The experience from this mystery shopper exercise was that the list of Green Deal Assessors (GDAs) provided to shoppers by ESAS was not sufficiently accurate and localised to meet householders' needs. The system did not properly distinguish between organisations providing business-to-business and business-to-consumer services, or by geographical area. The lack of accuracy of the GDA list substantially increased search time and costs.

3.9. In addition, some shoppers reported a lack of interest or enthusiasm on the part of many assessors, both in conversations with shoppers and as indicated by the lack of response to shoppers, e.g. assessors not returning their calls. Some found assessors to be uninterested in providing a GD assessment or were discouraged by the assessor from obtaining one.

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[13] GD ORB database: http://gdorb.decc.gov.uk/

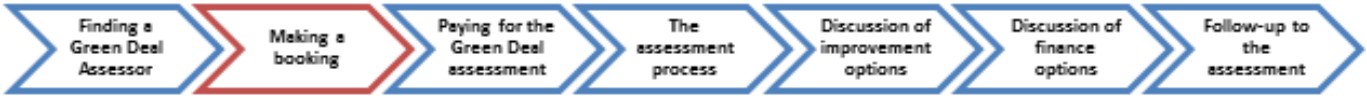
[14] e.g. Green Deal Providers

3.10. Other shoppers found it difficult to get an assessment within the required timescale of the study. Some GD assessors stated that they were not undertaking any more assessments until April 2014 due to new rates coming into force.[15]

3.11. Some GD assessors wanted householders to complete a screening questionnaire however shoppers were unwilling to complete these as no reimbursement had been previously agreed for any time spent completing them.

3.12. Finally, other GD assessors stated that they were still training their employees and were not yet ready to conduct assessments despite being registered on the ORB website or on the ESAS list of assessors. Further details and quotations from shoppers are available in Annex C.

Step 2: Making a booking



3.13. Once participants had found an assessor that was able to help, the experience of the participants when booking appointments was generally positive.

3.14. This section addresses only those phone calls that led to successful bookings. Once participants had found an assessor that was able to help, customer service standards in the assessment booking process were generally high. Seventy-five per cent of assessment bookings were rated as ‘quite good’ or ‘good’ in terms of the customer service provided (Figure 3.2).

3.15. Almost all phone calls that led to successful bookings were answered on the first attempt (92%) and received a greeting that was clear and easy to hear (97%).

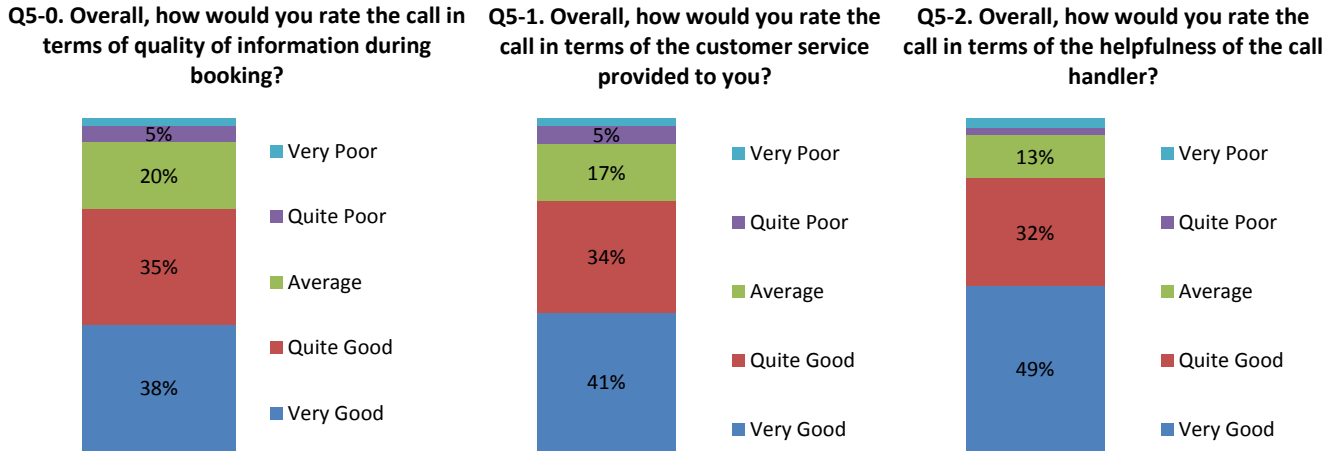
3.16. Many assessments (52%) were scheduled during that first call. The rest required either a second call to be made (15%) or the participant had to wait for a call back (32%). There were only two assessments (1%) where participants were told on the call to apply online.

3.17. For most assessments (88%) the participant was offered a choice of dates and times. For half of assessments (51%) the earliest available appointment was 0-5 working days but a quarter (25%) were more than ten working days.

3.18. In more than half (55%) of successful assessment booking telephone calls, the participant was given the name of the assessor (either partially or fully).

[15] It was unclear exactly what rates were being referred to by assessors; however it was possible that it stemmed from uncertainty following the Autumn Statement contributing to supply side reticence.

Figure 3.2: Overall standards of customer service



Base: All completed assessments (182)

3.19. Examples of comments from shoppers on customer service include:

"The information given was clear. I was asked if I understood the Green Deal and if I had any questions."

"The call seemed very professional and I was emailed some forms to complete. The information I was given was clear and helpful."

"The call handler was very friendly, chatty and efficient. If I had been a genuine customer I would have been keen to use the company."

"The service I received was polite and professional and I would have been happy to be a genuine customer."

"The call handler seemed eager to help and was very thorough with establishing my needs and satisfying them by arranging an assessment visit."

3.20. In terms of suggested improvements to the booking process, shoppers made similar remarks:

"Perhaps the call handler could have organised a date and time that would suit me there and then, rather than my having to wait until the following day when the Green Deal Advisor contacted me."

"I was told a specific time could not be given and the assessor would call me the evening before to arrange a time. I felt it would have been better to have been given a day and time there and then."

"A quicker return call to book the appointment would have been preferred: i.e. within an hour or so rather than 48 hours."

Step 3: Paying for the Green Deal assessment

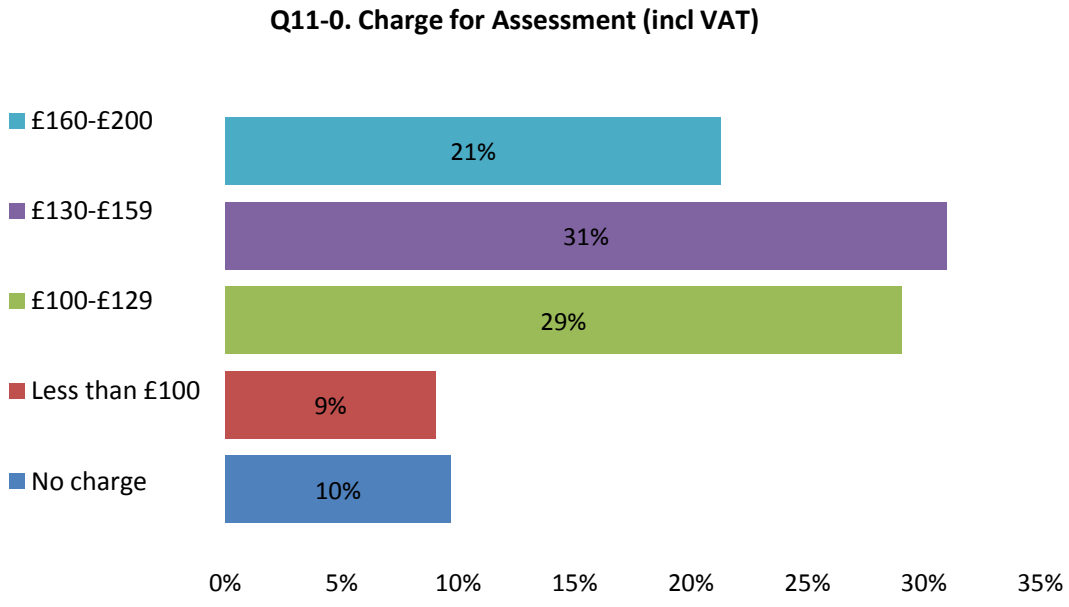
3.21. Charging for mystery shopping assessments appeared to be handled transparently by assessors. The majority of assessments were not free and there were very few examples of charging being conditional upon future works.

3.22. The charge for the assessment was stated by the call handler during almost all successful assessment booking calls (92%). Of these, 66% of assessments required payment upfront at the time of booking. No quantitative data were collected during the research as to how the remainder paid their fee. However, participants reported that alternative approaches for arranging payments included payment before the scheduled assessment date, payment at the time of visit, or invoicing of the participant after the assessment.

3.23. In cases where the participant was told the cost of the assessment during the call (n=166) very few of them (8%) were told that a charge would be refunded if they went ahead and installed one of the recommended energy efficiency measures. For one assessment the participant was told the fee would only be payable if they did not proceed with the recommended measures.

3.24. The mean price paid for a mystery shopping assessment was £139 including VAT. Charges ranged from £95 to £200 (Figure 3.3). Seventeen assessments (10%) were done at no charge to the participant.

Figure 3.3: Charge for the mystery shopping assessment



Base: All assessments that were charged and invoices received (163)

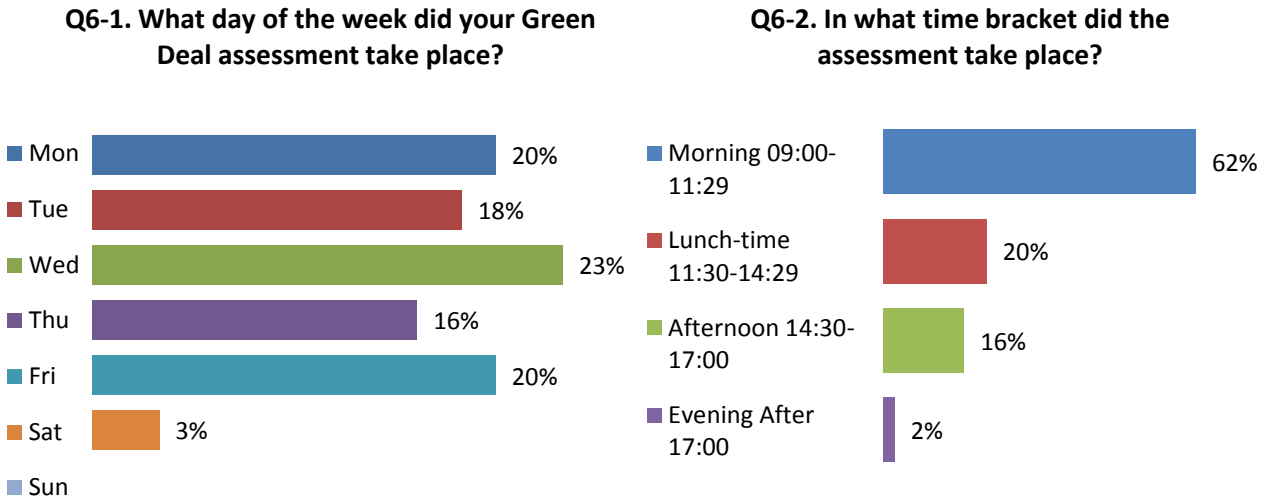
Step 4: The assessment process

When did the assessment take place?

3.25. As Figure 3.4 shows, very few assessments took place at the weekend. Very few assessments took place at the weekend or evenings (Figure 3.4). It was unclear from the research whether this was due to the assessors' inability to offer this or participant preference.

3.26. In most cases (79%) the assessor arrived on time for the assessment but in one in five cases (21% or 39 assessments) they arrived late. Of those assessors that arrived late, in 16 cases (9% of all assessments) the assessor arrived within 15 minutes and in some cases had telephoned to explain this.

Figure 3.4: When did the assessment take place



Base: All completed assessments (182)

3.27. In nine cases (5% of all assessments) there was a delay of more than 15 minutes between the scheduled appointment time and the assessor's arrival, the participant needed to take action to find out where the assessor was. Examples of comments for such cases were:

> *"The Assessor was an hour and forty-five minutes late. I called the company after waiting for thirty minutes and was reassured that the Assessor was on his way. The company representative apologised and explained that an Assessor had left the company at the last minute and that a replacement Assessor had only just been found."*

> *"The appointment was booked for 10:00 am, but no-one turned up. I phoned the company at 10:30 and was told the Green Deal Adviser had visited the property but I was not at home. I said I was and no-one had called. They then said this particular Green Deal Assessor was not very good and they would send someone else within an hour. The Green Deal Assessor finally arrived at 13.00, three hours after the appointment."*

3.28. Only one no-show was reported. This case involved the participant having to telephone the company to rearrange.

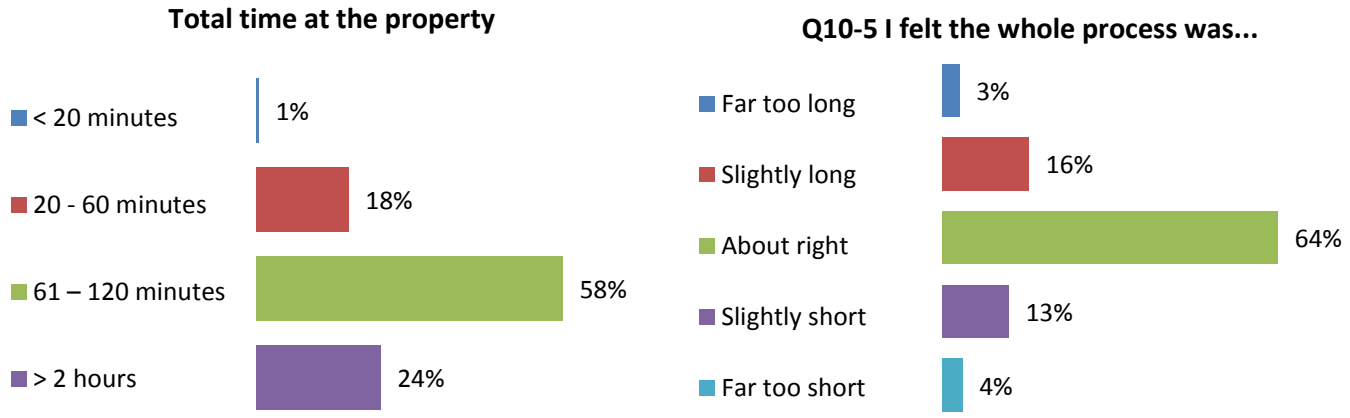
How long did the assessment last?

3.29. As shown in Figure 3.5, more than half (58%) of assessments involved visits that lasted between one and two hours. Assessments were longer that those seen in the Green Deal Customer Journey Research Wave 2 where around three quarters (73%[16]) of assessments were reported to have lasted less than 1 hour.

3.30. About two-thirds (64%) of participants stated that the length of the assessment was 'about right'. Of these participants[17], most (74%) had received a visit of between one and two hours (see Annex D).

3.31. The assessment process was reported as being 'far too long' in only 3% of cases. In all these cases the assessment was over two hours long. The assessment process was reported as being too short in 17% of cases. Two thirds of these cases (19 assessments) lasted one hour or less.

Figure 3.5: Time at the property



Base: All completed assessments (182)

3.32. As shown in Figure 3.6, in most assessments (82%), the assessor spent more time doing the inspection than discussing the participant's energy use and the Green Deal. On average, assessors spent two thirds of the visit (66%) doing the inspection and one third (33%) discussing the household's energy use and the Green Deal[18]. In less than 10% of cases did the discussion of energy use and the Green Deal last for more than an hour. In 42% of mystery shopper assessments the assessor spent over an hour inspecting the property.

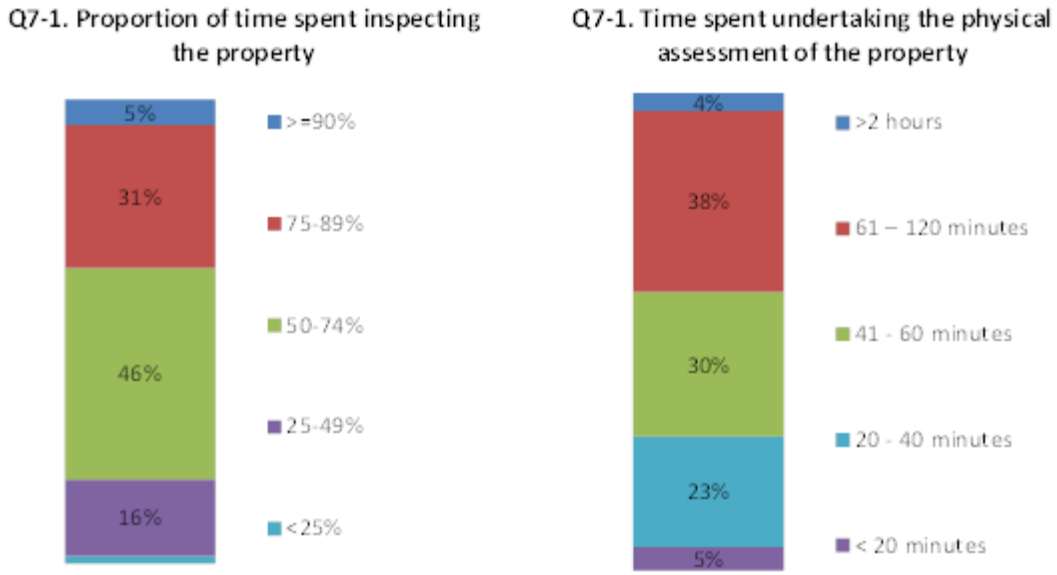
3.33. Just over half (56%) of the assessors explained how long they expected the visit to last.

[16] GfK NOP Wave 2 Customer Journey survey. Available: https://www.gov.uk/government/publications/green-deal-customer-journey-survey-summary-report-quantitative-survey-wave-2. Note the Customer Journey sample includes households that had a GD assessment for ECO purposes as well as GD. Base = 946.

[17] n=116

[18] This was established by calculating the average (mean) of the proportion of the spent at the property doing the inspection versus time spent discussing the household's energy use and the Green Deal.

Figure 3.6: Split of time during assessment



Base: All completed assessments (182) for each question. Note: May not sum to 100% due to rounding

During the assessment – introduction and explanation

3.34. Participants felt that the inspection process was explained clearly by the assessors.

3.35. Assessors showed their identification card, unprompted, on arrival at the property for two thirds (67%) of assessments. Twenty per cent showed the card after prompting.

3.36. In a few cases (11%) participants reported that the assessor did not show identification even after prompting. In very few cases (2%) the participant noted that they in fact did not prompt the assessor for their identification and it was not shown. As such, around a third of mystery shopping assessments seem not to have been conducted in line with the Green Deal Code of Conduct because the assessor failed to show identification unprompted on arrival.

3.37. During almost all assessments (93%), the assessor explained the inspection process. Typical comments noted by the participants were:

> *"The Assessor explained he would carry out a physical assessment for the Energy Performance Certificate, and then ask questions needed to complete an Occupancy Assessment, also using my gas and electricity bills and a questionnaire I had filled in earlier."*

> *"The Green Deal Assessor told me she would take some measurements, draw a plan of the house, ask some questions and then see what could be done."*

3.38. The Green Deal Customer Journey Wave 2 research[19] showed only 63% of assessments included an explanation of the assessment visit, suggesting that this group of 'active consumers' have received a more comprehensive service.

[19] GfK NOP Wave 2 Customer Journey survey. Available: https://www.gov.uk/government/publications/green-deal-customer-journey-survey-summary-report-quantitative-survey-wave-2. Note the Customer Journey sample includes households that had a GD assessment for ECO purposes as well as GD. Base = 946.

During the assessment - appliances and building fabric

3.39. In almost all assessments (93%), the assessor visited each room in the property (including the loft where applicable). Assessors also used questions to gather information about the property.

3.40. Two typical descriptions of the areas of the property inspected by the assessor are set out below:

> *"The assessor inspected both the front and rear of the house outside. He then inspected all rooms on both floors of the house including the garage and the loft. He also asked me for the key to my electricity meter so he could inspect that."*

> *"The Green Deal Assessor had the free run of the property, and seemed happy to walk around making her own assessment; periodically asking me for clarification when she required it. All floors were inspected along with the roof space and she took copious numbers of pictures which she mentioned might be needed if she received an audit on the inspection. She also made a full circuit of the exterior of the house, taking note of the roof lines, doors and windows."*

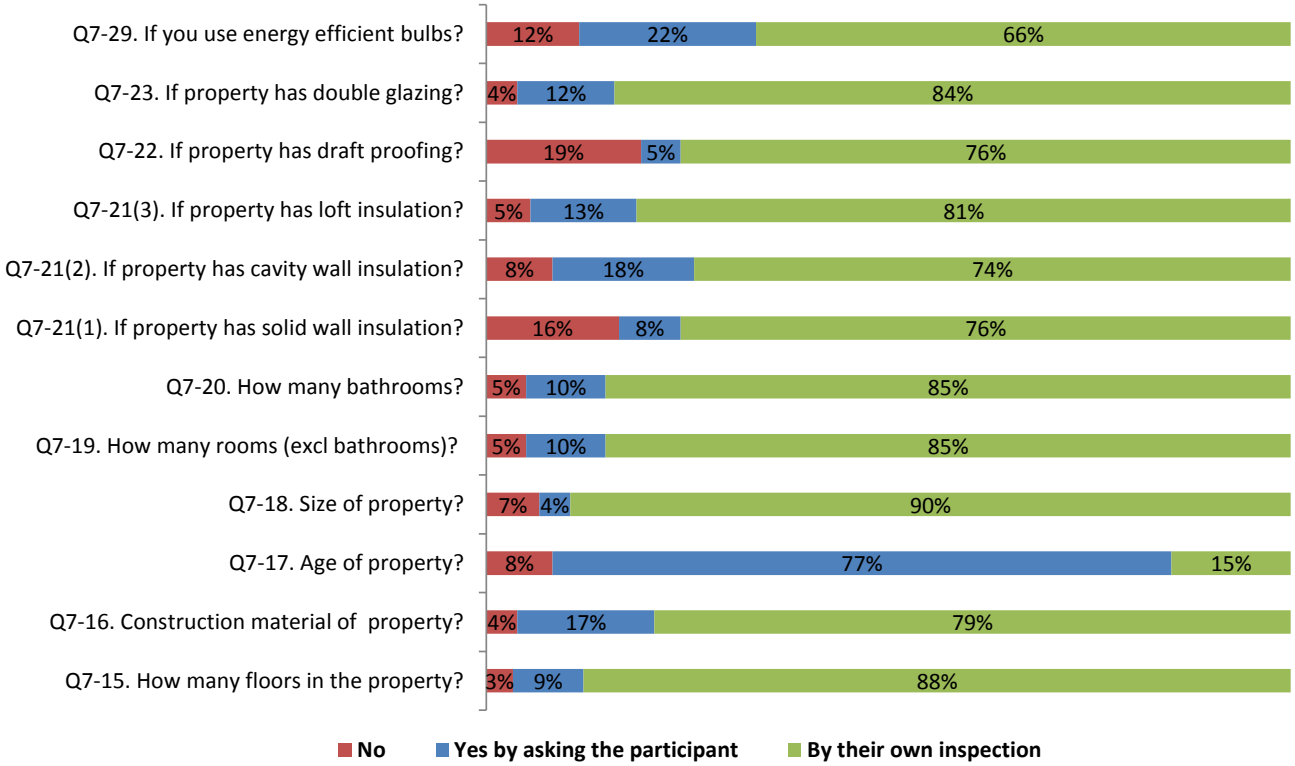
3.41. Participants reported that in most assessments, assessors inspected the property themselves to establish the key characteristics of the building (Figure 3.7). When determining the age of the property, most assessors asked the participant. However, it is not possible to determine whether this is the only source of information used by the assessor to establish the age of the property.[20]

3.42. In most assessments (81%) the assessor reportedly inspected the roof space to determine if loft insulation was present.[21]

[20] In Figures 3.7 to 3.9 the category "no" indicates that the participant was not asked and did not observe the assessor checking.

[21] Not all properties had a roof space however the research cannot differentiate.

Figure 3.7: Questions asked by the assessor regarding the property and building fabric

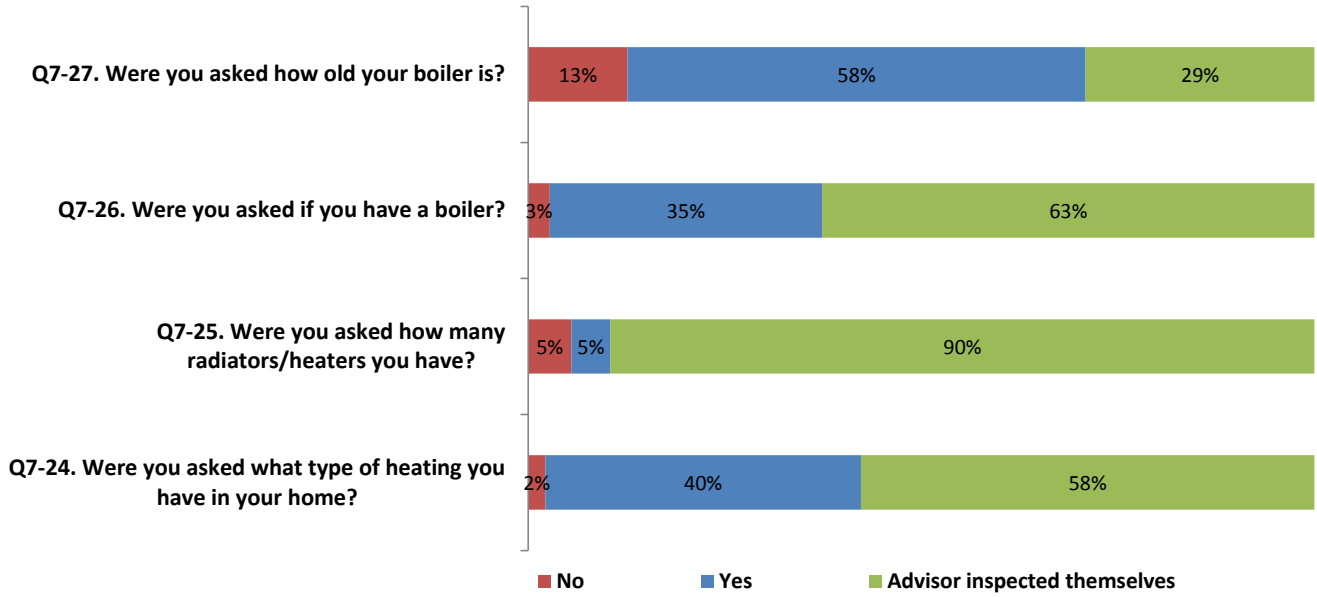


Base: All completed assessments (182) for each question. Note: Regardless of property type, participants were asked to report on whether the assessor asked certain questions regarding the property. Rows may not sum to 100% due to rounding.

3.43. When determining the type of heating system in the home in most assessments participants reported that assessors either inspected it themselves (59%) or asked the participants (40%) (Figure 3.8).

3.44. In almost all assessments (90%) the assessor inspected the property themselves to establish the number for radiators and only in very few cases was the participant asked.

Figure 3.8: Questions asked by the assessor regarding the heating system



Base: All completed assessments (182) for each question. Rows may not sum to 100% due to rounding.

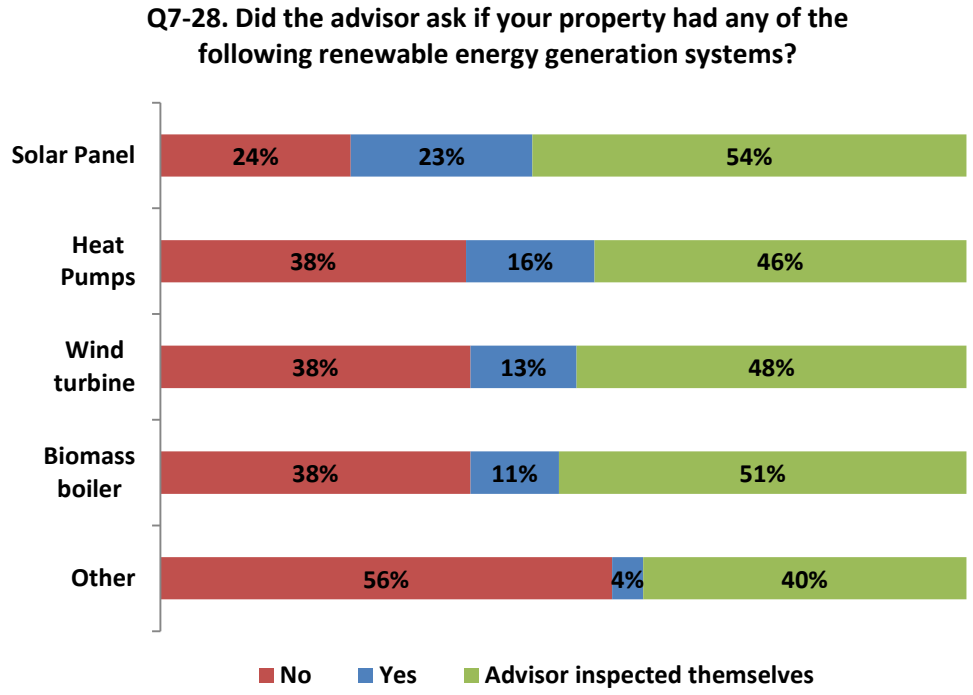
3.45. When determining whether the property had any type of renewable energy generation technology in most assessments, participants reported that assessors either inspected the building themselves or did not feel the need to ask the participants (Figure 3.9).

3.46. In a majority of assessments (68%) participants were asked if they lived in a conservation area. This could indicate that assessors may have been trying to determine the suitability of the property for any external works such as external wall insulation and external or roof-mounted renewable energy technologies.

3.47. About a fifth of mystery shopping assessments (22%) involved the assessor asking additional questions about the property. These questions covered:

- Whether they could inspect certificates / paperwork for work done such as cavity wall insulation, solar panels, building extensions, boilers
- The age of the windows
- The direction the property faced
- The type of floor
- Date moved in
- Dates of any building extensions
- Location of gas and electricity meters
- Temperature controls on hot water cylinder
- Temperature controls on under floor heating
- Whether the building was listed
- Presence of thermostatic radiator valves
- Location of draughts
- Use of wood burning stove
- Presence of a carbon monoxide monitor
- Recycling habits

Figure 3.9: Questions asked by the assessor regarding the existence of renewable energy systems



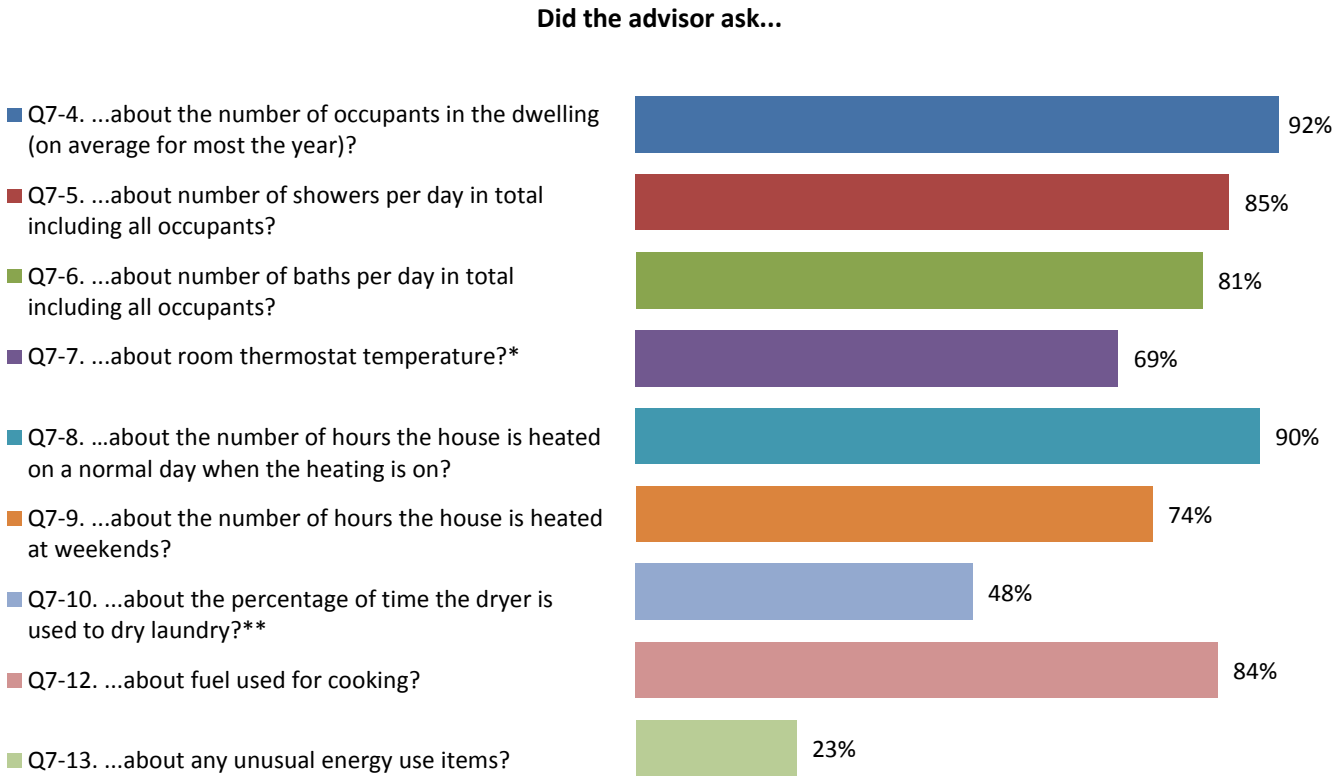
Base: All completed assessments (182) for each question. Rows may not sum to 100% due to rounding.

During the assessment - energy use

3.48. In most assessments, the assessor asked the participant questions about the use of energy in the property (Figure 3.10). This compares to the Green Deal Customer Journey Research Wave 2 project where energy use was discussed in less than half (41%) of the assessments. This suggests that an 'active' customer receives a more comprehensive service.

3.49. However, in only of 23% assessments did the assessor ask about the existence of any unusual energy use items such as portable heaters or dehumidifiers.

Figure 3.10: Questions asked by the assessor regarding energy usage within the property



Base: All completed assessments (182) for each question. Note: *In 22% of assessments the property did not have a room thermostat; **In 44% of assessments the property did not have a dryer

During the assessment - the occupants

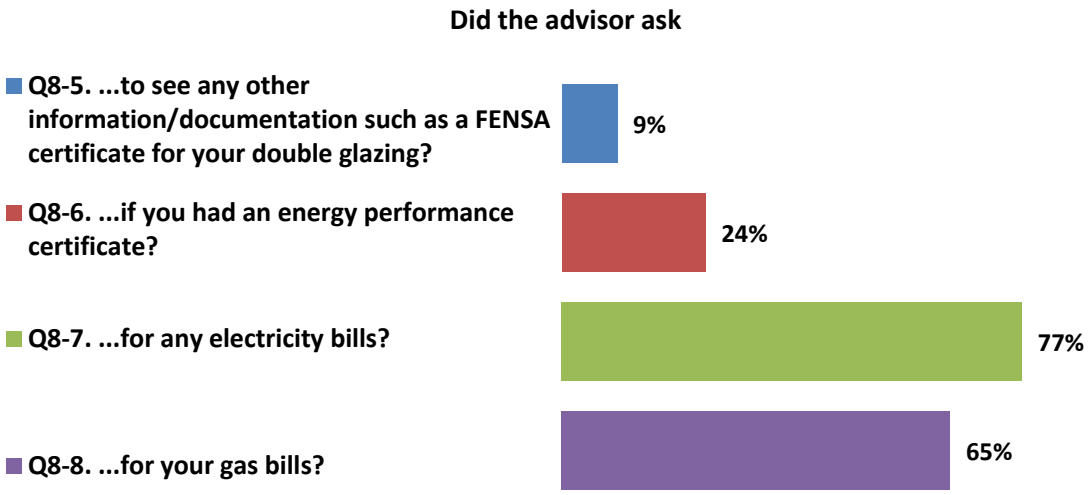
3.50. The assessor asked whether the property was owned or rented in about two thirds (64%) of cases. During almost all assessments (92%), the participant was asked about the number of occupants in the dwelling (on average for most the year). The assessor rarely asked the age of the participant (6% of assessments).

During the assessment – documentation

3.51. During most assessments (77%) participants were asked if they could show any electricity bills. This number was slightly lower for gas bills (65%) (Figure 3.11). It is significant that in nearly a quarter (23%) of assessments no energy bills were requested by the assessor[22].

[22] In 41 cases (23%), the participant was not asked for the electricity bills or the gas bills. In all cases where the participant was not asked about the electricity bill, the assessor also failed to ask for the gas bills.

Figure 3.11: Questions asked by the assessor regarding documentation



Base: All completed assessments (182) for each question

Step 5: Discussion of improvement options

3.52. Participants were presented with a range of improvement options and discussed with the assessor the benefits and, to a lesser extent, the potential limitations of the measures.

3.53. During most assessments the assessor described the different types of energy saving improvements that could be made (89%). This compares to almost two-thirds (60%) in the Green Deal Customer Journey Research (non-ECO only).

3.54. More than one measure was recommended in most assessments. Solar panels were the most frequently recommended measure (Figure 3.12), followed by loft insulation and new boilers. Other improvement recommendations discussed included hot water tank insulation, heating controls and thermostatic radiator valves, renewable heat technologies such as biomass boilers and heat pumps, heat recovery units and energy efficient lighting.

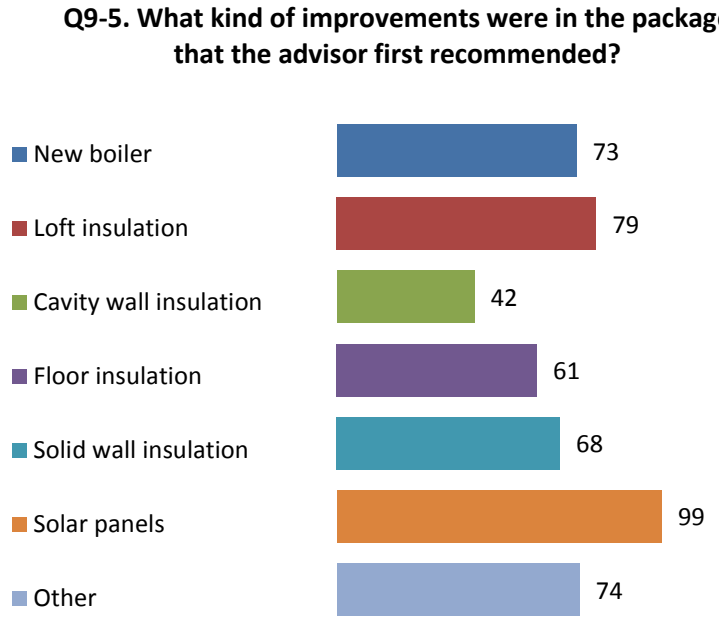
3.55. Examples of typical comments from an assessment where the assessor described the different types of energy saving improvements that could be made are:

> *"The Green Deal Assessor talked about loft and cavity wall insulation, he also talked about draught proofing using curtains. He also suggested that it might be worth changing off Economy 7[23]."*

> *"The Green Deal Assessor sat with me and discussed new energy saving improvements that were now available in the market. He said I would not know what was specifically recommended for my house until the report was produced."*

[23] Economy 7 is a type of electricity tariff commonly used in conjunction with night storage heaters.

Figure 3.12: What kind of improvements were in the package that the assessor first recommended?[24]



Base: All completed assessments (182) for each measure. n=162. As noted above, in 20 cases (11%), the assessor did not describe the different types of energy saving improvements that could be made.

3.56. During most assessments (74%) the assessor explained the benefits. Typical comments reported included:

"The Assessor explained the benefits in terms of improved comfort and reduced energy bills."

"The Green Deal Assessor explained to me what savings I could make on my gas bill by having a new boiler. He told me on average I could save £95 a year. He told me that by turning down the thermostat by one degree I could save £50 a year."

"All I was told was that I would save money on my bills."

"The Assessor gave me an indication of the costs of the improvements and the potential savings that could be made."

3.57. The assessor explained what the limitations of these improvements could be in just over half of assessments (54%). Typical comments included:

"The Assessor said that some improvements may not make a major improvement or be very inconvenient to do, such as extra loft insulation because we had a fully boarded loft."

"The Green Deal Assessor said that the amount saved by putting floor insulation was not large."

"I was told that the external insulation was quite an undertaking and the saving would take some time to recoup."

"The Assessor and I did not discuss any improvements in detail. I was told that this would all be explained in the Green Deal Assessment Report."

[24] The values in the chart are absolute numbers indicating the number of times an improvement measure was included in a package of recommendations.

3.58. In many assessments (63%), the assessor did not ask if the participant wanted to make any of these improvements. In a similar number of cases (65%), the assessor did not invite the participant to select or reject particular improvements and so tailor the 'package' of improvements to their preferences.

3.59. Where the assessor did invite the participant to select or reject particular improvements, examples of responses include:

> *"The Assessor asked if there were any measures I wanted to reject as impractical and I rejected the wall insulation and floor insulation."*
>
> *The Assessor excluded the most expensive options like solar, as our main consideration was the boiler and heating system, and heat saving, so it was tailored to a degree…."*

Supply of improvement options

3.60. There was little evidence from the research of inappropriate marketing of products and services during the assessment. However, in one quarter of assessments, the assessor did not explain about the choices available to participants in terms of who could supply the improvement measures.

3.61. In most assessments (75%) the assessor explained that the participant had a choice as to who supplied the improvement and how to do this.

> *"The Assessor told me to phone the Energy Saving Trust and ask for a list of companies in my area for the particular improvement that I decide to make."*
>
> *"The Assessor told me to go on Green Deal ORB website."*
>
> *"I was advised how to search for Green Deal accredited providers and to obtain several quotes before proceeding with the work."*
>
> *"It was suggested that, as with any work, it was best to get three quotations before having any work done."*
>
> *"I was told there were a wide range of companies who could supply the improvements and I was free to choose any I wished."*

3.62. As can be seen from typical comments above, the need for the supplier to be Green Deal certified was frequently mentioned. As one assessor pointed out, Green Deal certification was only a requirement if Green Deal finance or cashback was being sought:

> *"It was explained that anyone could do the improvements, although if I wanted it done through the Green Deal then it would need to be a Green Deal accredited contractor."*

3.63. In very few assessments (8%) did the assessor recommend or promote a particular company to provide and install the improvements.

3.64. In some assessments (29%) the assessor said that their own organisation could source and install these improvements.

> *"The Assessor said that [name of accredited company associated with the Assessor] could provide the improvements but that I would be under no obligation to use them, as the report was portable. I was told that it was entirely up to me who I approached to implement the improvements."*
>
> *"The Green Deal Assessor said that his company could provide a quotation for the work. He did not offer an alternative for selecting a supplier."*
>
> *"The Assessor said they could install or we could go to another provider."*

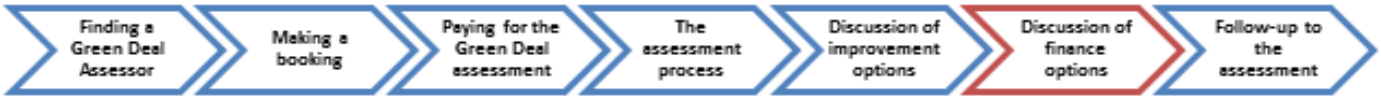
3.65. Special offers or promotions for committing to the improvements were only mentioned in 10% of assessments.

3.66. A quotation for the improvement works was only promised in very few assessments (8%) and in only 4 assessments (2%) was the participant asked to agree to accept the quotation for improvement works.

3.67. There was only one reported case of an assessor attempting to sell the participant any other products or services while in their home.

3.68. In almost all assessments (98%), participants reported feeling under no pressure at all to buy/accept improvements offered.

Step 6: Discussion of finance options



3.69. Green Deal assessments may involve the discussion of financial options, though this is not a requirement under the Green Deal Code of Practice for assessors[25]. National Occupational Standards for Green Deal Advisors[26] stipulate that advisors must be able to explain Green Deal finance, but again do not stipulate that this must be done as part of a Green Deal assessment. Research carried out with Green Deal suppliers as part of the overall Green Deal/ECO evaluation programme[27] found that a minority of assessors indicated that they provided help with finance following an assessment. In-depth qualitative interviews with a small sample of assessors found examples of individuals who believed that the provision of advice about finance would conflict with their role in providing an independent service to customers in identifying energy efficiency need. Some individuals had concerns about the complexity of providing financial advice (even in a general sense, as opposed to making specific recommendations).

3.70. Amongst the mystery shoppers in this study, in around a third (35%) of assessments, financing of the improvements was not discussed. Some of these participants commented that *"finance was not discussed but information was sent by email".*

3.71. When prompted with a list of payment methods, mystery shoppers reported that assessors most frequently mentioned that Green Deal loans/finance and/or householders' own money were possible methods of payment (Figure 3.13). In only several instances did assessors mention finance from their own company (3%) or from another company (3%).

3.72. In only a quarter of assessments (27%) did the assessor explain that if householders received certain benefits that they may be eligible for some financial help towards improvements.

3.73. Where a Green Deal loan was suggested, assessors explained how it works to participants (unprompted) in 60% of these cases.

3.74. In almost a third (30%) of assessments the assessor mentioned that there would be no up-front costs with a Green Deal loan. The results do not enable us to determine whether

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[25] DECC (June 2014) Green Deal Code of Practice (Version 4)

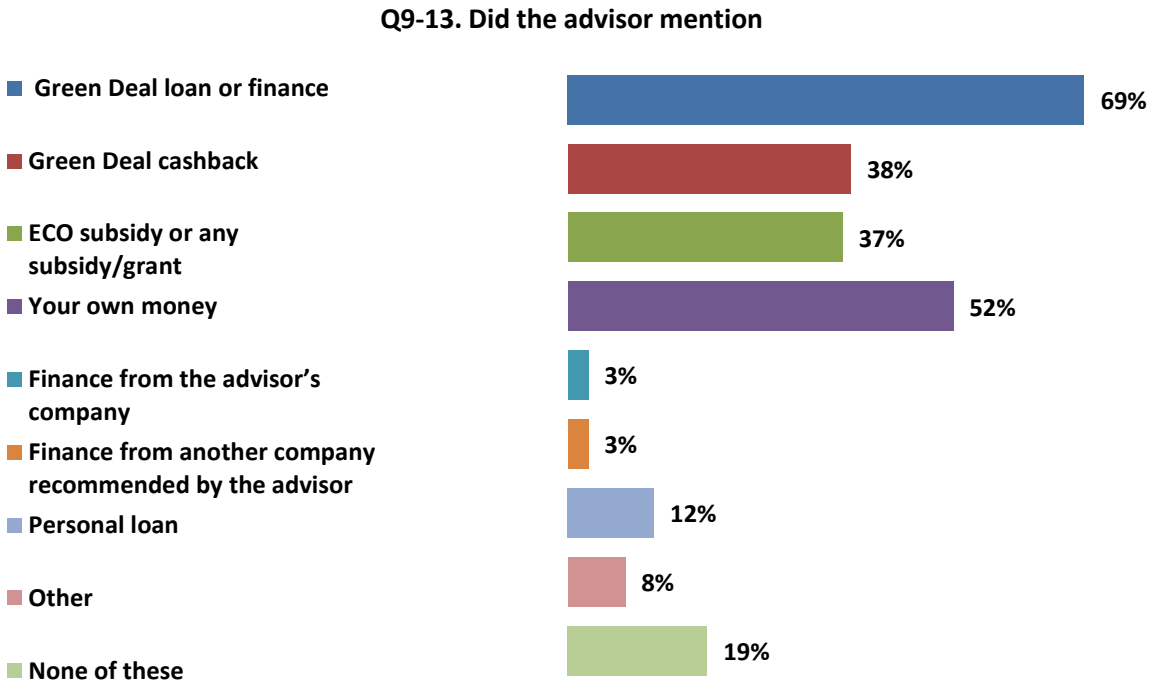
[26] http://nos.ukces.org.uk/PublishedNos/ASTGDA1.pdf

[27] ICF and BMG Research for DECC (2014) Research into the Green Deal and ECO Programme Supply Chain. Final report available: https://www.gov.uk/government/publications/research-into-the-green-deal-and-eco-programme-supply-chain

this is because in these cases Green Deal finance would cover the full installation costs and no top-up would be required or simply because the assessor did not mention this characteristic of Green Deal Finance.

3.75. In almost two thirds of assessments (62%) householders were told that Green Deal repayments would be paid for through electricity bills.

Figure 3.13: Methods of payment discussed

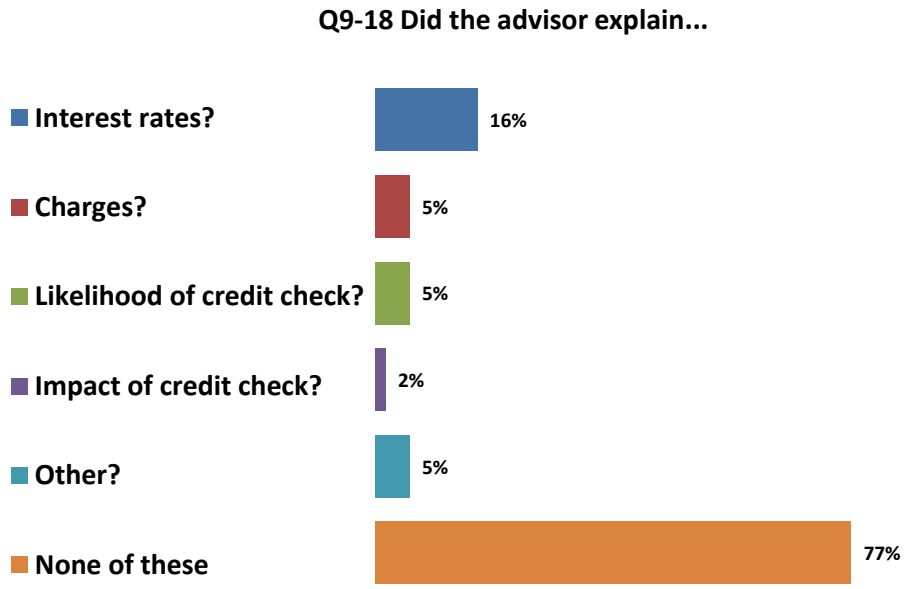


Base: All completed assessments (182) for each question

3.76. In most cases, the key elements of Green Deal finance were not explained to participants. Figure 3.14 shows that Green Deal interest rates were discussed more frequently than other aspects of Green Deal finance.

3.77. The benefits of taking out a Green Deal financial package were only explained in 35% of assessments. A typical comment from a participant was: "*The Green Deal finance package was not discussed other than being mentioned as an option*."

Figure 3.14: Explanation of key elements of the Green Deal



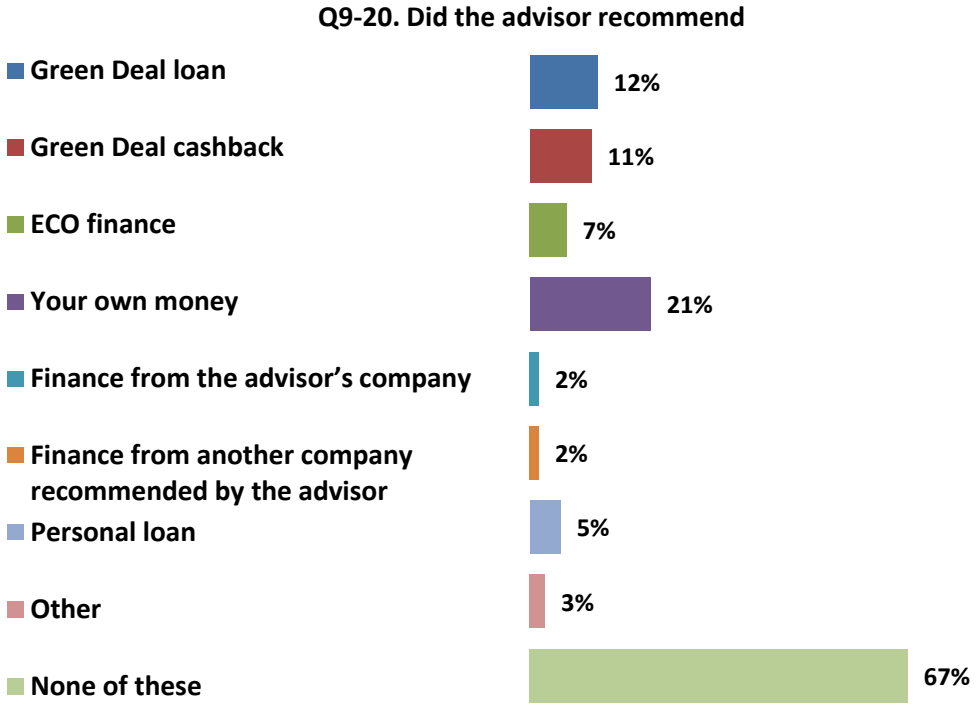
Base: All completed assessments (182) for each question

3.78. Figure 3.15 shows that in almost no assessments did the assessor recommend using finance from their company or from another company (both mentioned in only 2% of assessments).

3.79. The three most frequently recommended payment methods were Green Deal loans (12%), Green Deal cashback scheme (11%) or householders own resources (21%).

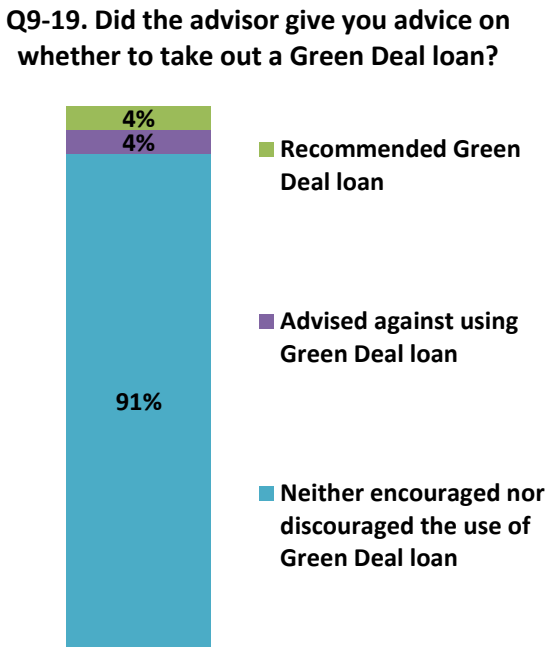
3.80. In more than 90% of assessments, assessors neither encouraged nor discouraged taking a Green Deal loans (Figure 3.16). This suggests that assessors demonstrated impartiality and did not try to 'push' a Green Deal loan over other financing options.

Figure 3.15: Recommended kinds of finance



Base: All completed assessments (182) for each question

Figure 3.16: Did the assessor provide advice on whether to take out a loan?



Base: All completed assessments (182) for each question

Overall satisfaction

3.81. Participant satisfaction with the Green Deal assessment in general was high. In most assessments (73%), participants were either extremely or fairly satisfied with the overall experience (see Figure 3.17). Some typical comments from participants include:

"The Green Deal Assessor came over as knowledgeable, competent and professional."

"A good inspection and explanation. If in the market for it I might have gone ahead."

"The Green Deal Assessor was friendly, helpful and very thorough. He seemed to be knowledgeable and explained things to me clearly in a way that I could understand."

3.82. Of those assessments where participants reported that they were fairly or extremely dissatisfied, examples of comments were:

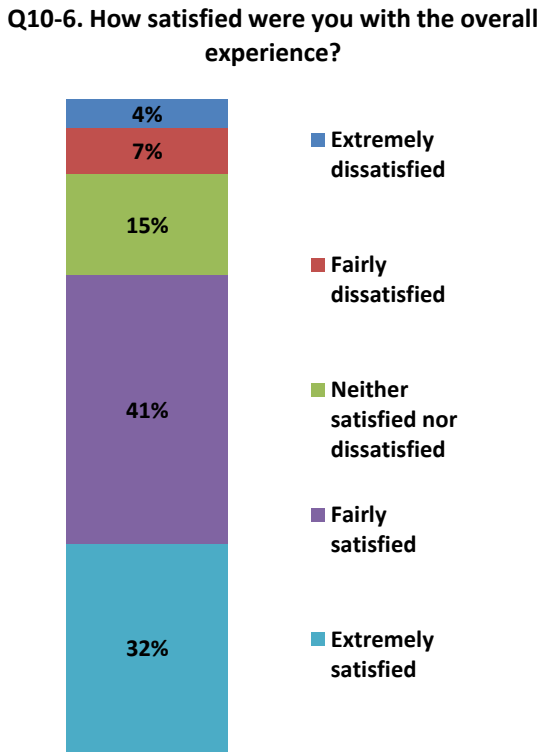
"Whilst the assessment seemed thorough I felt the Green Deal Assessor was reading from a script, and took no account of the fact that some of his recommendations were impractical."

"The Green Deal Advisor did not explain the process. He rushed through the assessment. He started drilling holes in my outside wall without telling me he was going to do that or why. It was only when I went outside to ask what he was doing that he explained it was to test the cavity. He did not establish my needs and only explained the different options when I asked him why I was not getting a report. He said I would not receive any reports but could access the EPC on line. The only recommendation he made was the loft insulation, despite my boiler being 15 years old and I did not have cavity wall insulation or energy saving bulbs. He seemed to be ticking boxes rather than listening and assessing. All that said he was friendly when I spoke to him and I got the definite impression that his workload (8 assessments in one day plus travelling the length of Kent) meant he was rushed for time."

"The Green Deal Advisor was at my property for too long. He seemed unsure of a few things and he needed to ring a colleague for advice. He did not explain to me how the Green Deal worked."

"The assessor made no effort to ask any questions."

Figure 3.17: Level of satisfaction with overall experience based on this assessment



Base: All completed assessments (182) for each question

3.83. In almost all (96%) assessments, participants found that the language used by the assessor was clear and understandable.

3.84. In most cases, participants felt that assessors took the time to establish their needs (87%) and obtain all the necessary information to establish those needs (83%).

Step 7: Follow-up to the assessment – re-contact and receipt of Green Deal Advice Report

3.85. The completed questionnaire results indicated that in many cases documents were not received by participants within five working days. However, this five day timescale was not mandatory and many participants reported that assessors indicated that documents would be sent within three to four weeks.

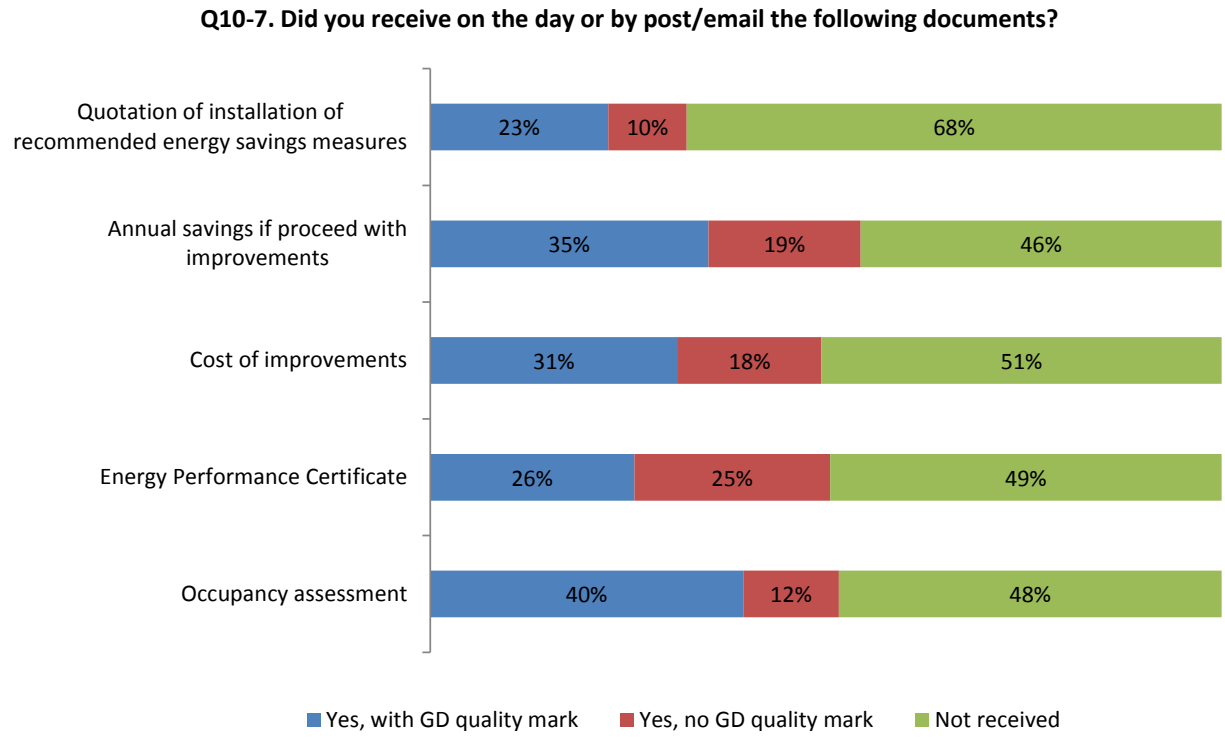
3.86. The questionnaires submitted by participants indicated that in 95% of assessments the assessor stated they would provide a GDAR. In 85% of assessments, the assessor said that they would produce an EPC.

3.87. Figure 3.18 shows that each of the key documents was only received within five working days in half of all cases . Many of the participants were told that documentation would take longer than five working days to send through:

> *"I phoned [ ] to enquire about it and was told that I would receive a copy in the post within 30 days."*
>
> *"I was told up to 21 days."*

3.88. Figure 3.18 also shows whether documents did or did not include the GD Quality Mark. The GD Quality Mark is a symbol that GD suppliers must include as part of identifying documents and marketing. On average, of all documents received within five working days, 65% included the Quality Mark.

Figure 3.18: Documents received by post or email within five working days



Base: All completed assessments (182) for each question; Note: The labels on the vertical axis of the chart relate to the specific language in the shopper questionnaire

4. Analysis of variability across GDARs

This chapter compares the findings from the four Green Deal assessments undertaken for each of 29 dwellings with assessments of the same properties undertaken by an independent Green Deal assessor retained by the project.[28] Using the methodology described in Chapter 1, it discusses the level of variation observed in relation to key input and output parameters, and considers the implications with respect to the overall quality and reliability of the Green Deal assessment process. The results are only valid for this small sample and should not be extrapolated to the wider population of GDARs that have been produced under the Green Deal to date.

Key messages

- Significant input variation was found in EPCs provided by different Green Deal assessors for the same dwelling, particularly for total floor area and the energy efficiency rating of fabric (wall, floor, roof and window) and technologies (e.g. boilers).
- There was wide variation in the outputs from the EPC process, particularly with respect to EPC rating and calculated space heating consumption. The input variation contributed to the output variation.
- This EPC-based variation was carried across to the Occupancy Assessment where it was augmented by further input variation, particularly with respect to definition of internal temperature and heating schedule.
- There was variation in the measures recommended for the same property under different assessments. A combination of the above variations was likely to be a contributing factor to the disparate nature of recommended measures.
- In many cases, assessors did not appear to have a clear and consistent rationale for providing recommendations. This was also likely to be a contributing factor to the variation in measures being recommended. Some recommendations, statistically, appeared to be specified in a relatively random way rather than being a natural consequence of a particular dwelling type being subject to a clear assessment process. This appeared to be the case for floor insulation, draught-

[28] In total there were 46 properties where four assessments were conducted, but for only 29 properties could four assessments be obtained from the Landmark database and therefore analysed in this chapter.

proofing and door insulation in particular. The use of, for example, loft insulation as a recommendation appeared to be more systematic and less randomly assigned.

- While the analysis could not explain all the causes of the all the variations recorded, there is sufficient evidence for a number of root causes to be identified. The variation in EPC, OA and recommendation results could be a composite outcome of all these factors. In no particular order, the research identified: cases of human error, resulting in guidance for the householder that was illogical or poorly supported; issues that question whether the software and calculation methodology can be reliably applied to all housing and occupant types; and, issues with the robustness of methodological procedures and calculations within.

Introduction

4.1. This chapter analyses 29 dwellings from the Green Deal mystery shopper project. Each of the 29 dwellings had four mystery shopped Green Deal assessments (each involving an EPC, occupancy assessment and recommendations). In addition, a fifth Green Deal assessment was carried out by the Project team's 'retained GD assessors' who knew they were participating in the research. This fifth assessment was used to provide baseline data to judge the accuracy of the first four. Finally, a third data source was involved in the analysis; each time a green deal assessment was carried out, the householder completed a questionnaire.

4.2. The consistency of the assessments was investigated in three areas:

- Baseline EPC,
- Occupancy Assessment,
- Final recommendations.

4.3. Where the term 'range' is used, this is the difference between the minimum and maximum values across the four assessments for a given dwelling. 'Mean range' refers to the average value of this range across all 29 dwellings.

4.4. Whisker plots have been used to illustrate the variation across the four assessments for each dwelling. These indicate: the maximum and minimum values reported for the specified variable; the median value across all four assessments; and the value reported by the project's independent assessment (labelled as 'CADS value' or 'CADS assessment' on the charts in this chapter), as per Figure 4.1 below.

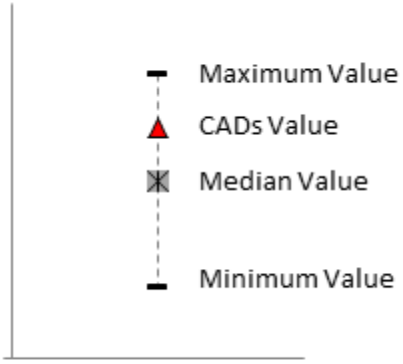
4.5. This chapter provides an:

- Analysis of inputs to and outputs from the Energy Performance certificate (EPC)
- Analysis of inputs to and outputs from the Occupancy Assessment (OA)
- Evaluation of CADS Green Deal assessment reports
- Analysis of the assessment process (based on key information from the survey) – use of bill information, duration of assessment
- Assessment of other issues, including anomalous comments and findings from the OA.

4.6. Annex E provides a detailed record of variability across the outputs and recommended measures for each dwelling. This contains a breakdown of all the areas where variability was identified in the GDARs returned for each dwelling by the four assessors. It goes on to

explore the response of the CADS assessor and finally includes a comparison of all the measures recommended.

Figure 4.1: Legend for whisker plots



Energy Performance Certificate (EPC)

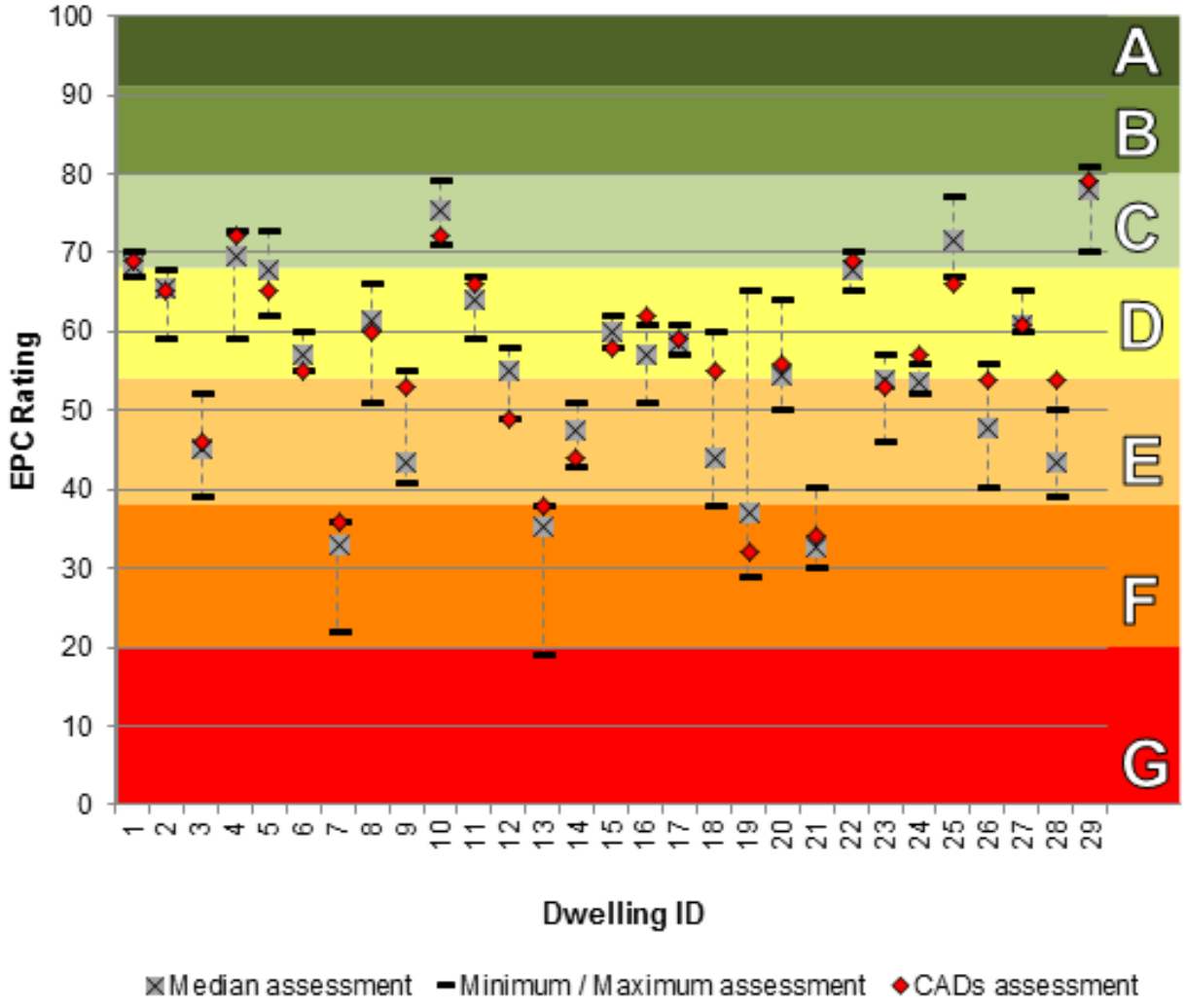
Calculation of the EPC Rating

4.7. The approach taken to calculate the baseline EPC can have repercussions for both the OA and recommendations in the final GDAR. The inputs determined for the baseline EPC will be carried through to the OA, therefore any differences between assessments will not only impact the estimated savings calculated for each recommended measure, but will affect the list of measures presented to the occupant. However, if focussing on only the EPC rating, the comparison between the four assessments should be more straightforward as the ratings rely on standardised physical data (and software), such that it should be possible to link any assessor disagreements to these key inputs (if such inputs have been made clear). It might be hypothesised, therefore, that there should be greater consistency in the baseline EPC ratings than in other outputs from a Green Deal assessment, where subjective judgement of an assessor may become more of a factor.

4.8. Figure 4.2 shows, for each dwelling, the variation in values across the five assessments (the four Green Deal assessments and assessments conducted by the project's retained assessors). While five assessments per dwelling may not be sufficient to extrapolate the effect of assessor variation within all Green Deal assessments undertaken in the UK, the recorded variations are quite clear: the EPC ratings determined by the five assessments spanned at least two EPC bands for almost two thirds of the 29 dwellings considered; for two of the dwellings the EPC ratings spanned across three EPC bands, and demonstrated in excess of a 20 point difference in the SAP rating. For the properties and assessments in question, the standardised process (and application of the Reduced Data SAP (RdSAP) method) did not provide a standardised outcome.[29]

[29] Throughout this report, the RdSAP methodology was used but the rating from the software is still referred to as "SAP" rating.

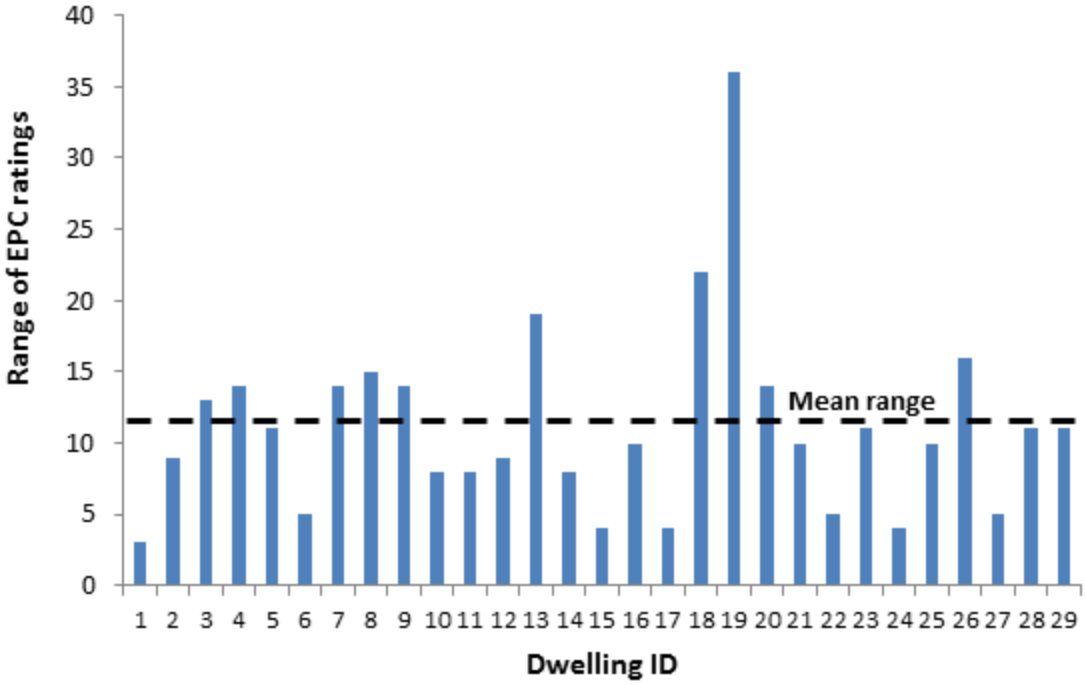
Figure 4.2: Values of baseline EPC ratings for the 29 dwellings with four assessments



4.9. The variation is further illustrated in Figure 4.3 which shows the range (difference between maximum and minimum) in EPC ratings for every dwelling. The mean range, representing the average difference in minimum and maximum EPC rating across all 29 dwellings, is 11.1.

4.10. The mystery shopper survey data was reviewed for patterns in these differences. The reported age, construction and property type have been used as possible indicators for why assessors may disagree on the thermal properties of these dwellings, perhaps highlighting dwelling types that are more difficult for (or viewed inconsistently by) assessors.

Figure 4.3: Range of EPC rating for each dwelling

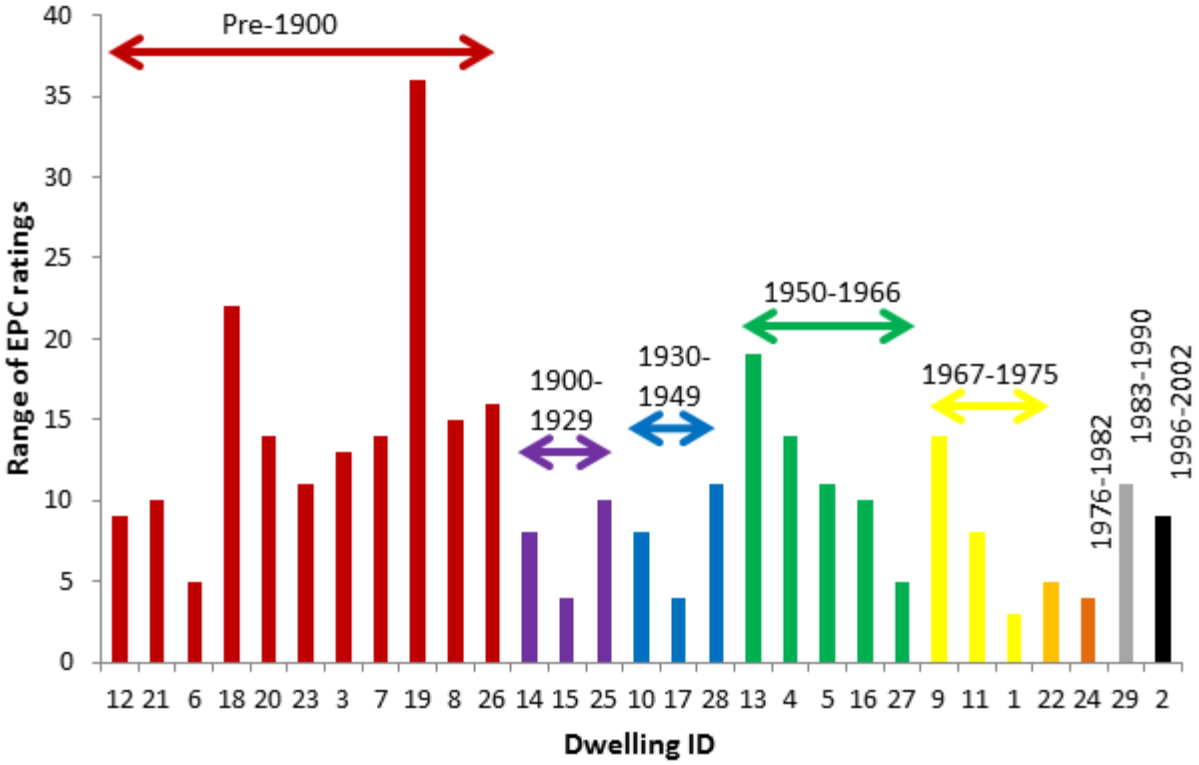


4.11. Figure 4.4 re-orders Figure 4.3 into property age categories, using the age band of the property as reported by the occupant (the age of the property as determined by the assessor was not directly provided in the EPB Register). With a different number of dwellings within each age group direct comparison is difficult though some dwelling types appear to show more inconsistencies than others, e.g. pre-1900 dwellings have consistently higher ranges in estimated EPC ratings. If we also factor in property type there may be other causes for the inconsistencies. For example, dwelling no.19 (returning the highest range) is described as a flat/maisonette/tenement. Such dwellings are more prone to being coded differently as a result of assessors needing to make decisions about whether, for instance, an internal wall is adjoining to a heated space from another property. Dwelling no.4 is also listed as the same property type and does not seem to suffer from such inconsistent assessments, but this is a more modern brick-built property as opposed to the stone construction of no.19. Parameters not provided from the EPB Register, but possibly being a cause of inconsistency, are highlighted in Technical Annex B.

4.12. The scale and scope of the dataset used here is insufficient to accurately quantify precisely the impact that input parameters are having on inconsistency. However, it is commonly noted that solid-walled, older properties are not well specified in SAP-based models due in part to difficulties in defining the heat transfer properties of the building fabric[30]. It is possible that the users of those models also have difficulties with these dwellings. Some statements from the occupants about the approach of assessors for these properties (see errors/misjudgements in “Other Issues” at end of chapter) support this theory.

[30] See Rye C. and Scott C, The SPAB Research Report 1 – U value Report, Nov 2012. Available at: http://www.spab.org.uk/downloads/SPABU-valueReport.Nov2012.v2.pdf

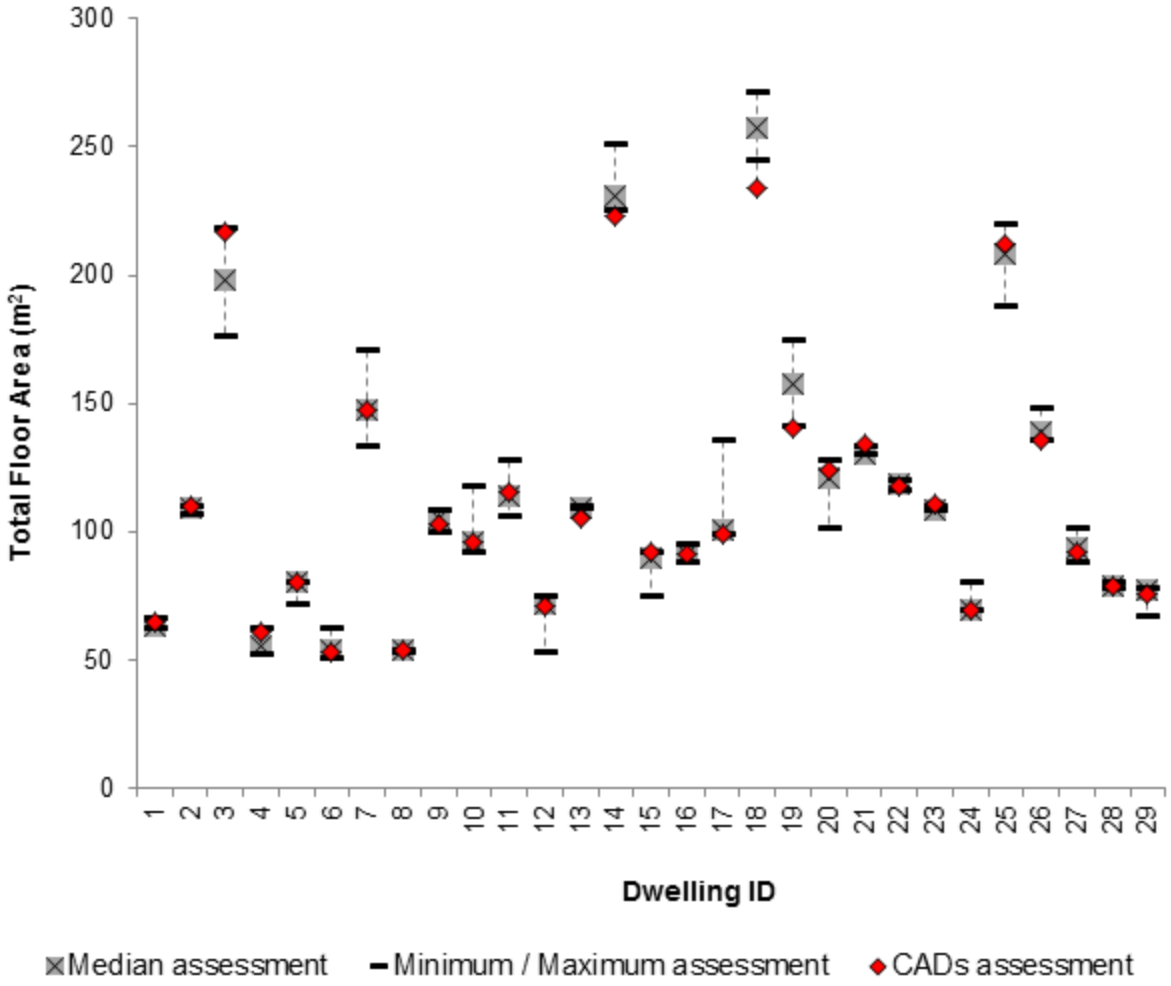
Figure 4.4: Range of EPC rating for every dwelling ordered by occupant reported age of dwelling



Inputs to the EPC calculation - Recorded total floor area

4.13. Not all physical information on the dwelling (used by RdSAP) is provided from the EPB Register made available to the project team, but total floor area (TFA) is one key parameter that is recorded by each assessor. An assessor can record this floor area as either "external" or "internal" – the former includes wall thickness but is converted to internal before being used by the RdSAP calculation. Figure 4.5 shows the variation in the reported floor areas for the 29 dwellings.

Figure 4.5: Values of total floor area for the 29 dwellings with four assessments



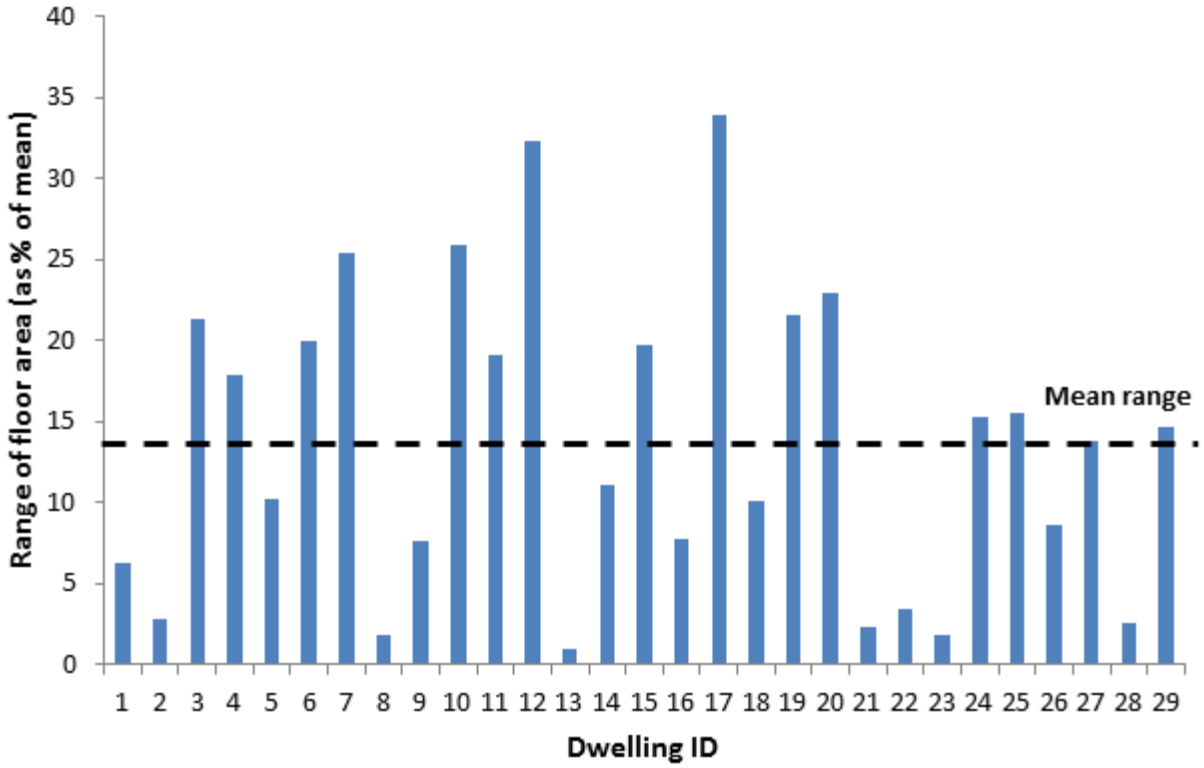
4.14. Considerable variation (as discussed below) was found in the TFA measured by different assessors for the same property. It is possible for assessors to arrive at different TFA as a consequence of small, understandable discrepancies (measurement of smaller areas within a dwelling, obstacles/furniture inhibiting access, etc.) coupled with rounding errors.

4.15. The dwellings that were found to have a high TFA variation were not necessarily those with a high variability in EPC rating and vice versa (e.g. dwelling no.13 has almost complete agreement on TFA across all four assessments but a 19 point range in EPC rating). This suggests that mistakes/disagreements in TFA are probably not the main cause of assessment consistencies (although they are likely to play a role in some dwellings).

4.16. Figure 4.6 shows the range of disagreement as a percentage of the average floor area returned over four assessments of a given dwelling – this allows for a relative metric to be used, so that variations in larger dwellings are not exaggerated. In this case, the construction type and age should not be a factor for any disagreement (and no correlation has been found in this regard). Across all dwellings, the average range in minimum and maximum TFA was 13.7% of floor area, but this is weighted towards a smaller value by the relatively consistent performance of some properties (e.g. seven homes had assessments that were within a 5m^2 range). The project's retained GD assessors (as described in paragraph 4.1) suggested a number of plausible reasons for circumstances where there was significant disparity in assessor's calculation of floor area. These included not accounting for a room-in-roof, not including heated conservatories or porches and the

inclusion of non-heated basements. However, the most widely suggested cause was simple individual error.

Figure 4.6: Range of total floor area as a percentage of the average floor area returned for every dwelling



Assessor agreement in EPC parameters

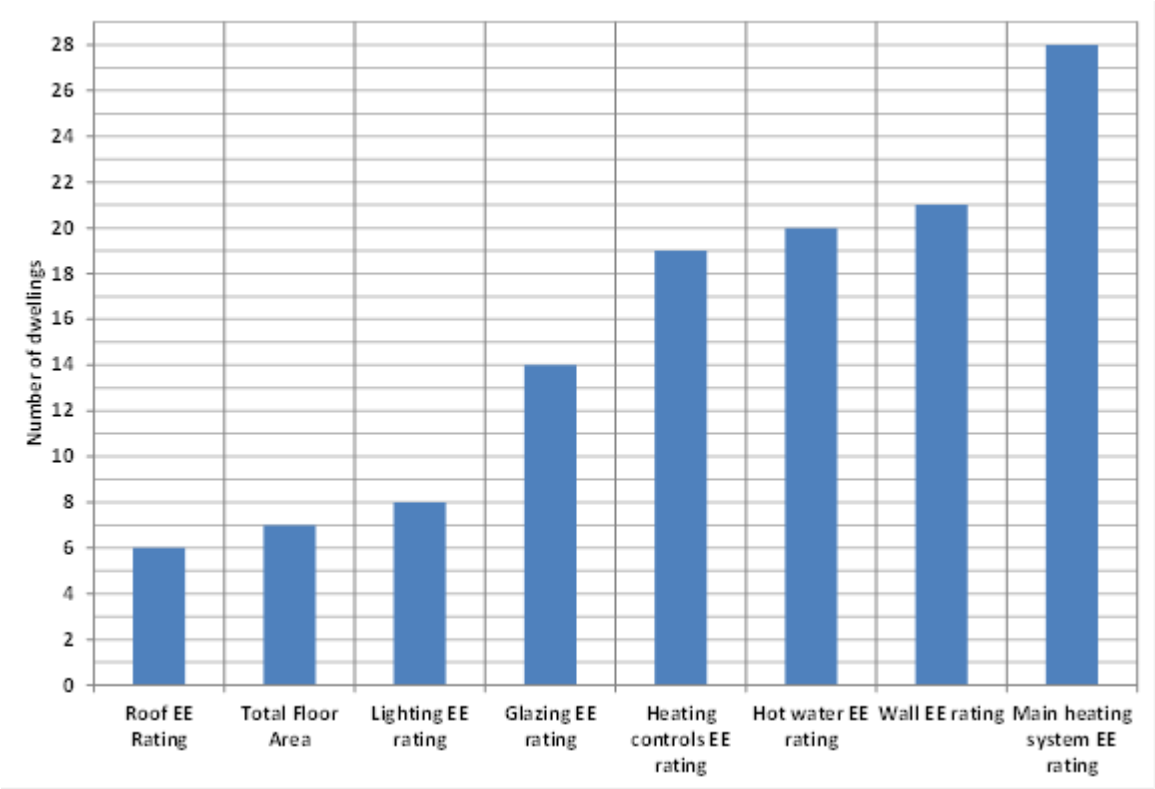
4.17. Variability in a basket of parameters used in the EPC calculation process was examined. Typically, the energy ratings for building fabric elements are an output from the EPC Register database and are derived from other, more detailed, input information. For example, the energy performance of the wall is defined by the type of construction and age of dwelling – this results in 31 distinct U-values (for England). The data provided to the project team were outputs of this process, in effect represented by the five point Energy Efficiency rating system for building fabric and some technologies, where 1 is poor and 5 is very good. For this reason, it was not possible to pinpoint the cause of any variability found in energy efficiency ratings.

4.18. The least degree of consistency was found with roof energy efficiency rating. Only six dwellings were given the same rating by all four Green Deal assessors (Figure 4.7). The fifth assessment undertaken by the project's retained assessor suggested that variation was attributable either to an assessor not accessing the loft space (where it was possible to do so) and therefore recorded a default poor rating or to variation in estimation. The latter could be a function of boarding being present in loft spaces or as a consequence of the age of insulation causing it to be *'settled and squashed in certain places'* in the words of one of the project's retained assessors.

4.19. It was not possible to determine from the data available why such a variation in many of these parameters occurred, particularly where the guidance provided in the software for some parameters (lighting for instance) should not allow for substantial disagreement. For example, in Figure 4.7 these parameters relate to physical properties of the dwelling, which

should correspond to a specific energy efficiency rating – if all assessors viewed the property in the same way then they should all agree on what these respective ratings should be. The reports from the project's retained assessors did not provide any additional insights other than to state their findings for the particular energy efficiency rating where variability had been found.

Figure 4.7: Number of dwellings where all four assessors agreed on parameters used in the EPC calculation process



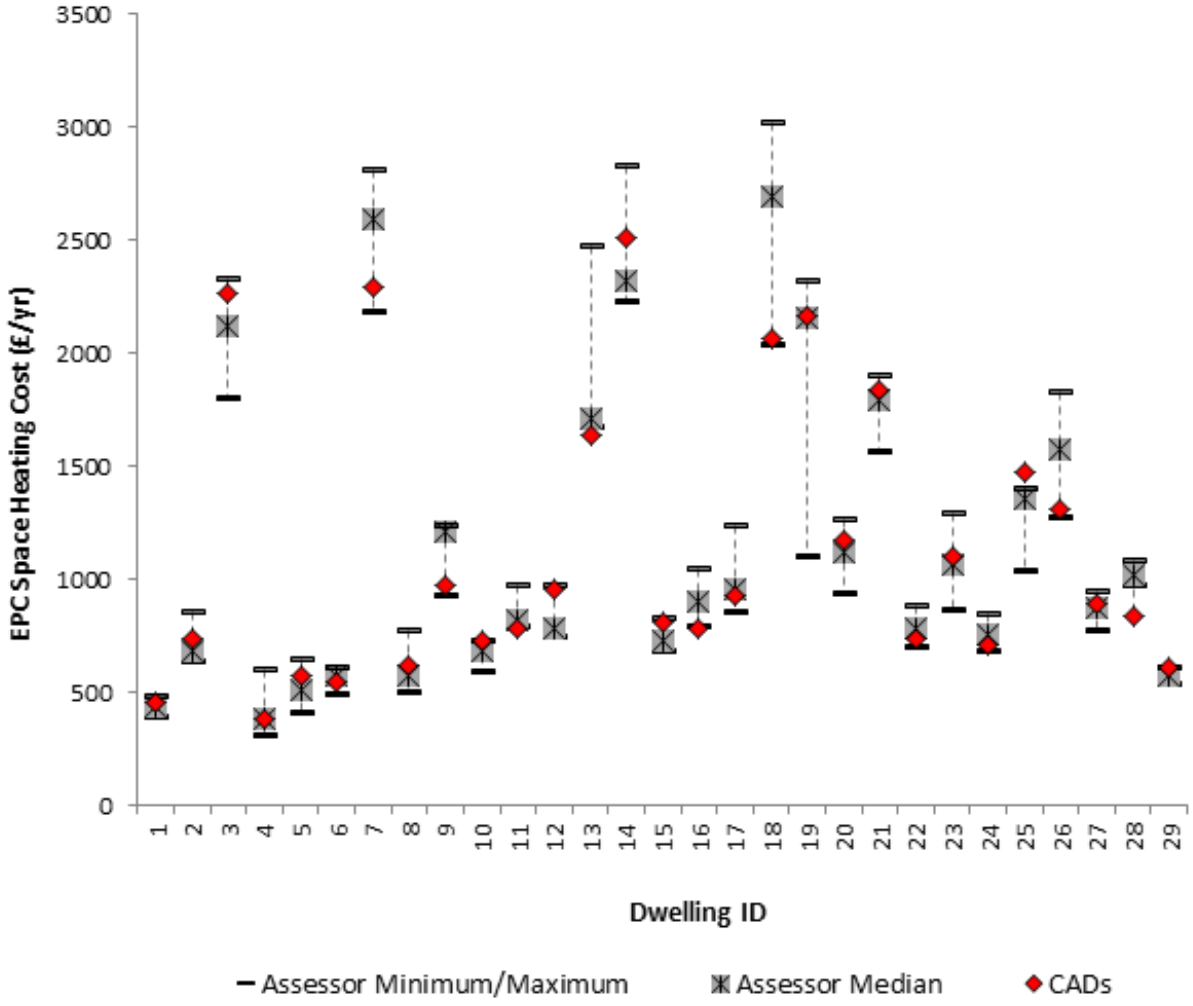
Calculated Space and Water Heating requirements for the EPC calculation

4.20. Whilst information relating to space and water heating requirements was provided in both the EPC and OA calculation, only variability in the values returned in the EPC was investigated. Unlike the OA calculation, the EPC calculation principally relies on a number of standardised assumptions and therefore provides less scope for variation among assessments. Any variability among assessments at the EPC level will, however, be carried through to the OA. Further to this, the project did not have access to many of the parameters collected by the assessors for the OA calculation and it was therefore not possible to define the extent to which OA parameters influenced the space and water heating outputs.

4.21. Figure 4.8 shows the variation in calculated space heating costs for the EPC across the four assessments. Significant variation between assessments is observed across the board. For example, there was a difference of more than £150 in estimated annual space heating costs for 23 of the 29 dwellings. The levels of variability increase with mean energy cost (with a linear correlation co-efficient of 0.8).

4.22. The surveys conducted by the project's retained assessors indicate that consensus among multiple assessments do not always indicate more accurate findings: for dwellings no.7, no.9 and no.18 the retained assessor's results are closer to one of the outlier values.

Figure 4.8: Calculated space heating costs from EPC for the 29 dwellings with four assessments

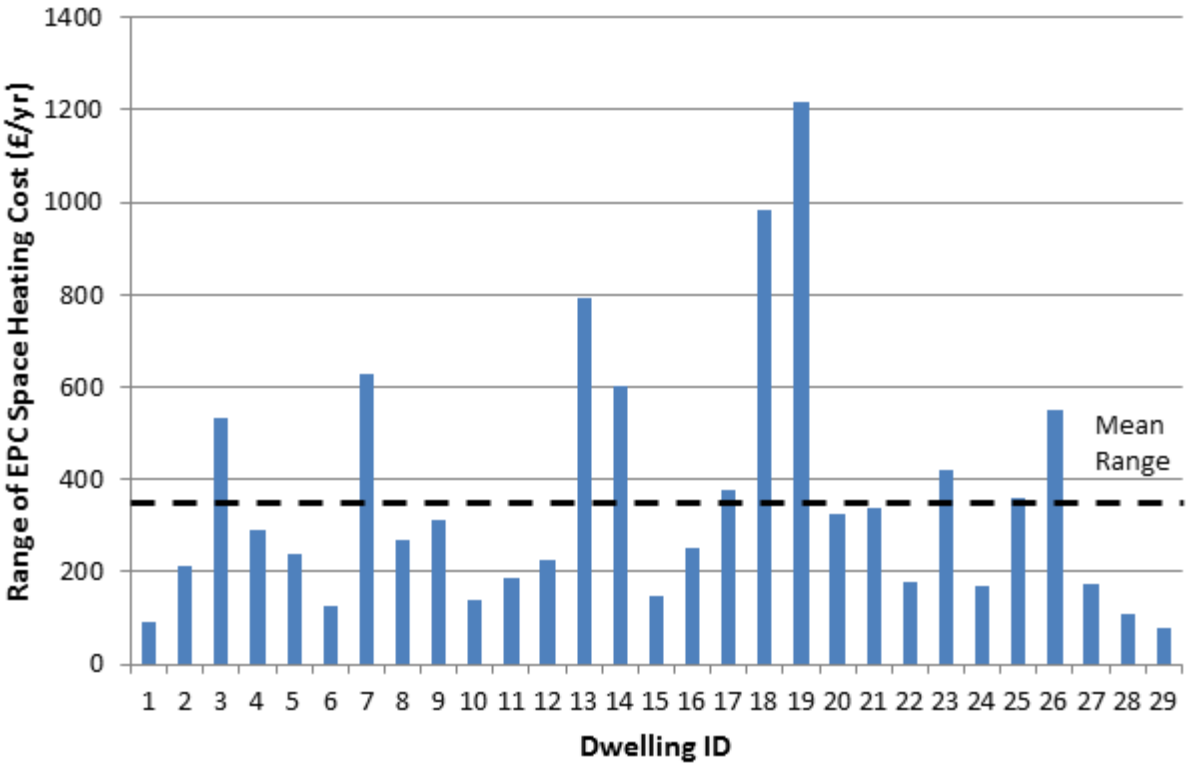


4.23. Figure 4.9 reports the range in reported space heating costs. For these 29 homes space heating accounts for the greatest proportion of the annual energy costs calculated by the EPC. It is therefore unsurprising that a correlation can be found between variability in EPC rating and variability in EPC space heating cost (linear correlation coefficient of 0.83). This is not a given rule as the EPC rating is independent of floor area (i.e. the annual energy cost is evaluated on a per square metre basis). This means that an assessor reporting a higher floor area will to some extent determine a lower annual space heating cost per unit area, and consequently positively influence the EPC rating.

4.24. The mean range across all 29 dwellings is substantial at £355, particularly if this is compared to the UK's average annual gas bill per household (in 2011), of £493 (provided in the latest (2014) UK housing energy data[31]). Ten dwellings exceed this (Figure 4.9). The mean value is raised by a number of dwellings demonstrating very different space heating costs: for dwellings no.13 and no.18 there is a circa £800 and £1,000 difference in costs among assessments respectively. The difference across assessments in dwelling no.19 was in excess of £1,200.

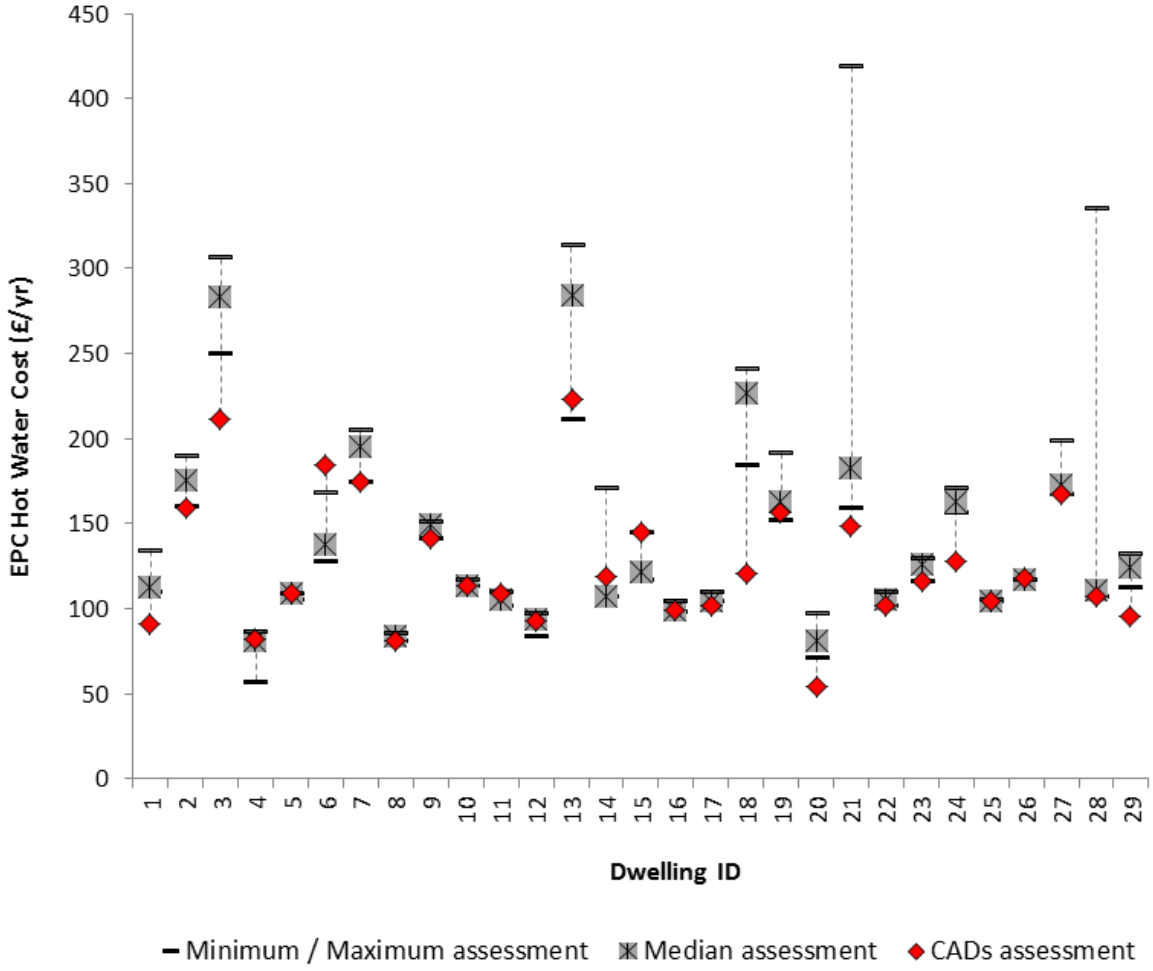
[31] DECC, UK Housing Energy Factfile, 2014.

Figure 4.9: Range of calculated space heating costs (EPC) for every dwelling



4.25. There was also variation in the estimated annual hot water costs (Figure 4.10). The axis scale of is very different from that of Figure 4.8 for space heating, as hot water represents a much smaller proportion of the total annual energy cost.

Figure 4.10: Calculated domestic hot water costs for the 29 dwellings with four assessments

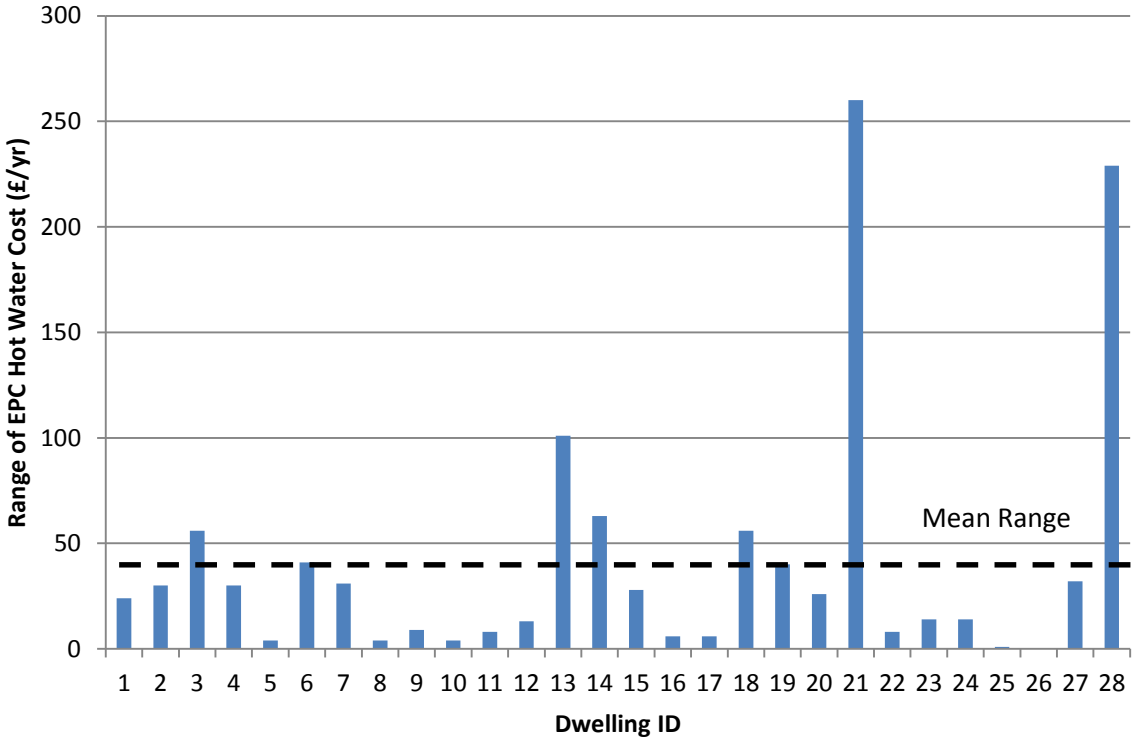


4.26. The hot water energy requirements were largely determined by the number of occupants (which for the EPC calculation is a function of TFA), and the specification of the hot water system (e.g. heat generator type, efficiency, and characteristics of any hot water storage system present). However, the influence of TFA seems to be weak. For instance, of the dwellings that returned the greatest range in TFA[32] from the GDARs only one (no.3) exceeded the mean range for hot water costs (Figure 4.11). In addition to this, there is a considerable range in hot water costs for dwellings no.21 and no.28, both of which demonstrate good agreement between assessments for TFA. There is only a weak correlation between range in TFA and range in hot water costs (-0.23).

4.27. This suggests that the greater variability in hot water consumption is provided by differences in specification of the hot water system, its controls and any associated storage (if present).

[32] no.3, no.7, no.17, no.19 and no.25 (see Figure 4.5).

Figure 4.11: Range of calculated domestic hot water costs (EPC) for every dwelling



Occupancy Assessment (OA)

The results of an EPC relate to an average household and standardised conditions. The OA provides a route to tailoring an energy assessment to a specific household. Information such as thermostat setting, type of appliances and (if available) energy bills can be used to tailor energy use predictions. The consistency in data relating to the OA is investigated below.

Thermostat heating set-point in occupancy assessment

4.28. A key feature of the OA is the ability of the assessor to choose a non-default thermostat setting. If assessors have assumed a default heating set point (i.e. no thermostat) then this is returned as 21°C.

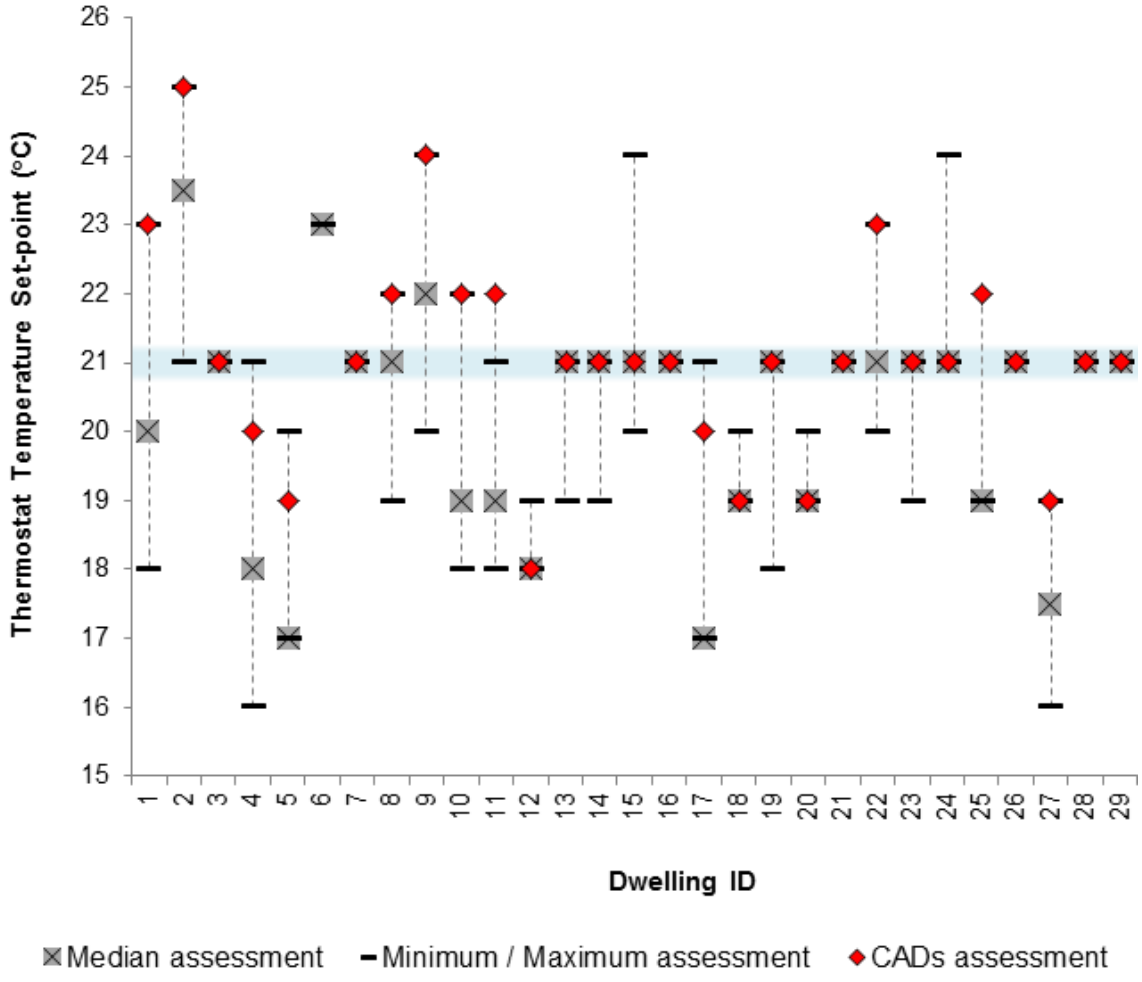
4.29. The data shows considerable disagreement among assessors on the temperature to which occupants are heating their homes (Figure 4.12). These variations may have been caused by assessors visiting at different times and occupants altering the thermostat set point between assessments. However, the full range of set point temperatures (Figure 4.13) indicates that in 13 dwellings assessors disagreed about the set point temperature by 3°C or more. The average range across all dwellings was 2.1°C (for the four assessments) and 2.2°C (including the fifth assessment by the project's retained assessor). For all the dwellings considered here and for the majority of dwellings in the UK that are likely to receive a GD assessment, space heating will represent the majority of energy consumption. These variations in set point temperature are therefore likely to be a critically important contributor to variation in the OA outputs.

4.30. Inconsistencies were also found in the way set point temperatures were defined (Figure Figure 4.14 and Annex F). By comparing the assessors' heating control descriptor (e.g. presence of thermostats, thermostatic radiator valves (TRVs)) in the EPC input with the set point temperature recorded in the OA it was possible to discern five different possible approaches for defining the living room set point temperature. Not enough data was

provided from the EPC Register to define precisely which of these approaches was followed in each case. These five approaches are:

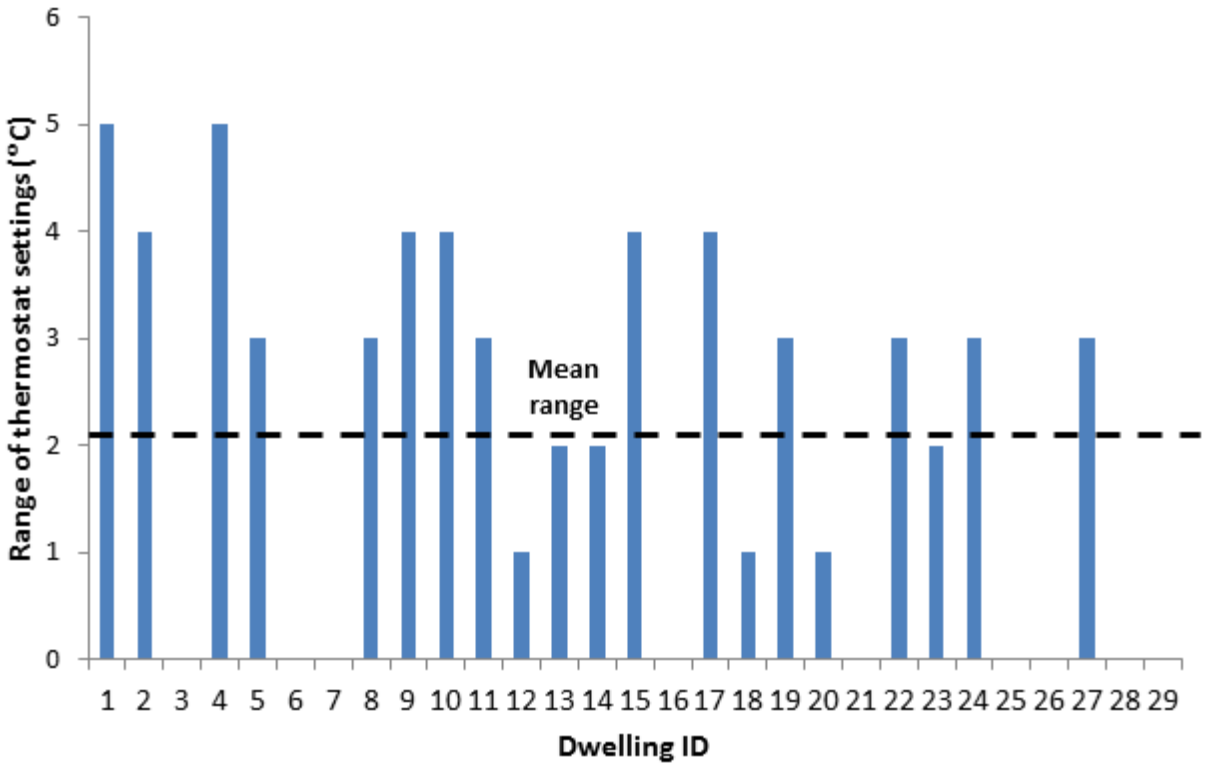
1. No thermostat was specified by the assessor – calculation protocol requires that assessors use the default set point temperature of 21°C;
2. No thermostat was specified by the assessor – however, in some instances the assessor has chosen to use a non-default set point temperature for the dwelling. This was found to be the case in dwelling no. 8 where assessor A1 indicated that the dwelling had no thermostat but specified a living room temperature of 22°C, i.e. 1°C above the default temperature. As part of the OA, assessors should not specify a non-default living room temperature if they have previously stated in the EPC that a thermostat does not exist. Figure shows practice that contradicts this guidance, with five assessments choosing this option. Four dwellings specified a lower temperature (dwellings ID no. 13, no.14, no.19 and no.23) and one a higher temperature (dwelling no.8).
3. A thermostat was defined as part of the heating control description in the EPC but the assessor chose to specify the default set point temperature or the default set point temperature is the same as the dwelling defined set point temperature.
4. A thermostat was defined as part of the heating control description and was located in the living room. In this instance the set point temperature from the thermostat was used.
5. A thermostat was defined as part of the heating control description and was not located in the living room. In this instance the assessor has specified the living room temperature as the set point temperature from the thermostat plus 3°C.

Figure 4.12: Values of thermostat set-point for the 29 dwellings with four assessments.



Analysis of the assessor's specification of the heating controls suggests some disagreement on whether a thermostat was present. The assessors were in agreement in 26 of the 29 dwellings on the presence of a room thermostat (nine dwellings did not have a thermostat and 17 did). Of the three dwellings where variability was found, three assessors out of four were in agreement. The project's retained assessor confirmed the majority view in each of these cases.

Figure 4.13: Range of chosen thermostat set-points for the 29 dwellings with four assessments

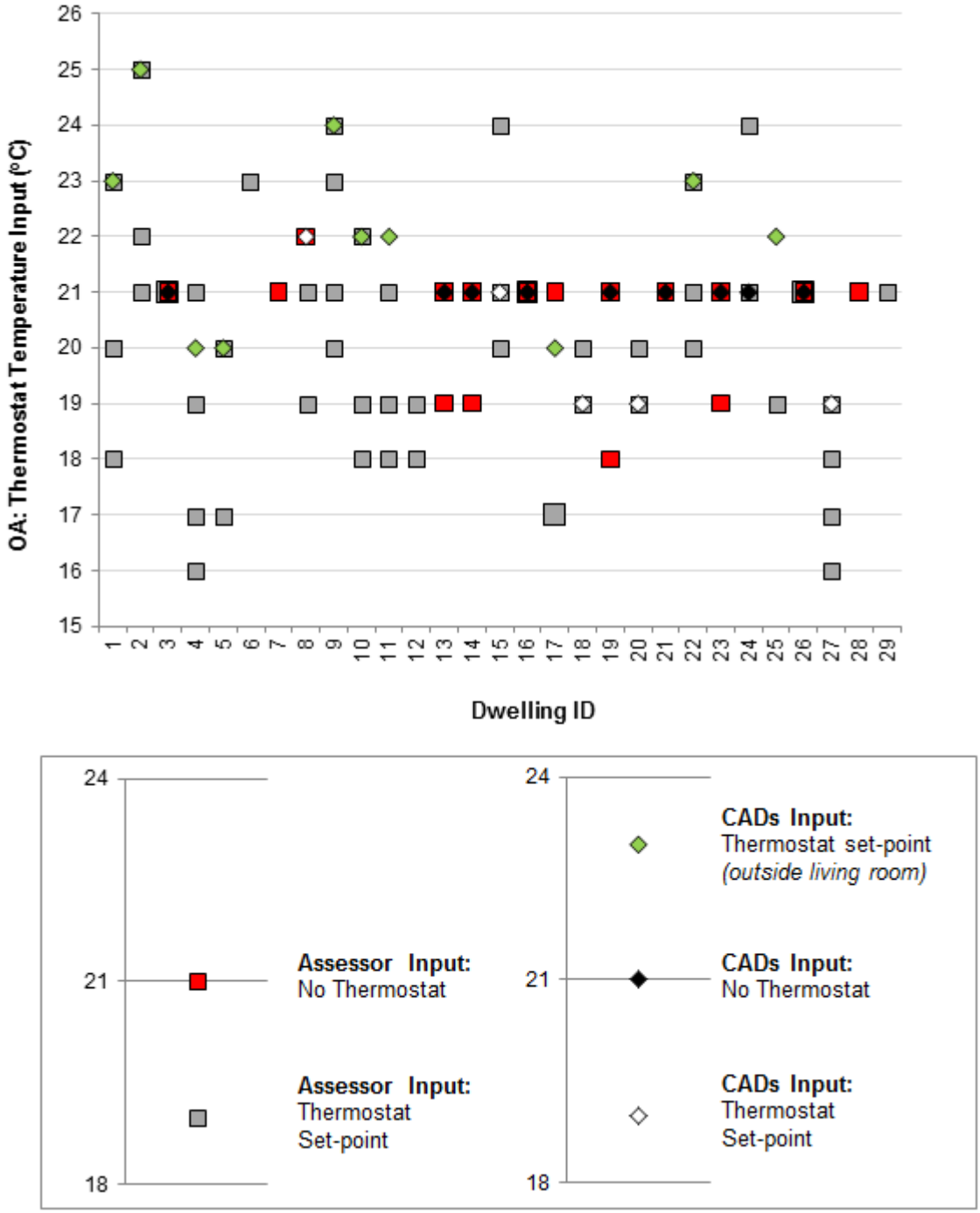


4.31. In addition to the possible discrepancies in how an assessor interprets the methodology for defining the living room set point temperature, considerable inconsistency was also found in the way in which the fifth option was applied. It was clear from the OA inputs and the project's independent assessment that not all assessors were applying a 3°C increase in specified temperature set point in instances where the thermostat was located outside the living room[33].

4.32. Figure 4.14 shows that where the control survey has identified that this should be the case (green diamond markers) many of the assessors specify lower temperature set points. It is assumed that this corresponds with the value taken directly from the thermostat, i.e. the 3°C increase is not applied. If this is correct then this oversight is a key contributor to the large range in thermostat temperature set point demonstrated in Figure 4.14.

[33] The RdSAP calculation methodology uses a default 21°C temperature for the "living room", which is 3°C higher than the 18°C applied to everywhere else in the dwelling.

Figure 4.14: Approach to specifying thermostat temperature set-points across all assessments



4.33. There is scope for inconsistency in which room is designated the “living room”. For the Green Deal assessment it is identified elsewhere[34] as *"the room used most or best*

[34] Appendix V: Calculation of energy use and costs using actual occupancy parameters, RdSAP 2009 v9.91: Occupancy Assessment version Oct 2012, ppV-26 to V-35

heated...thus is not necessarily the room that would be designated as the living room in a normal SAP assessment".

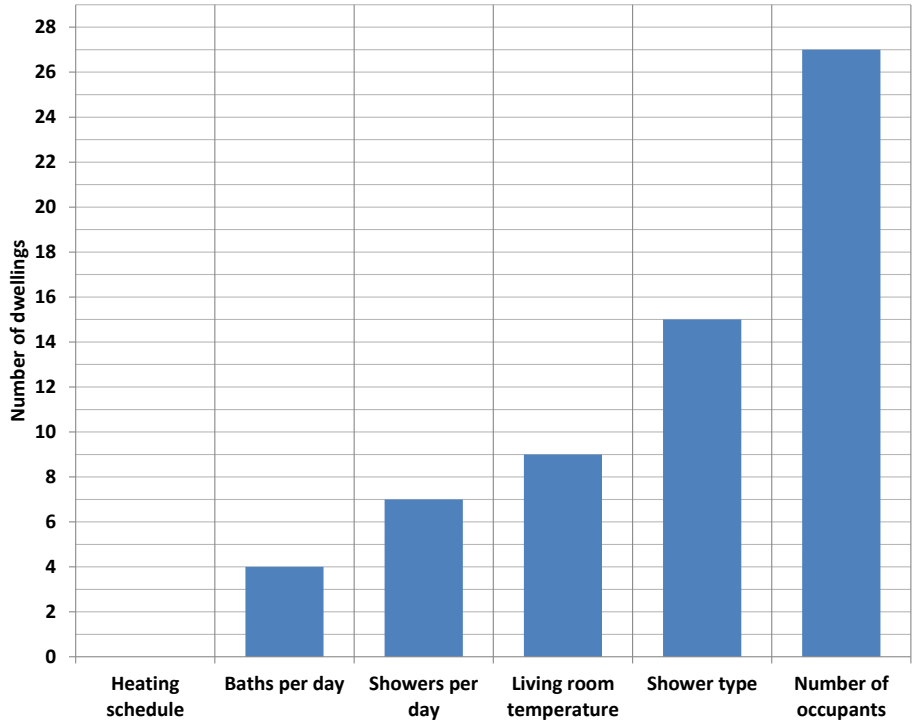
4.34. To test whether there were disparities in the way in which computational procedures and methodologies were defined by different software providers, the effect of software on the living room set point temperature was further explored by disaggregating the assessors' inputs (Annex F) by reference to the assessors' software type. Inconsistencies among assessments were still found.

4.35. The combination of these factors results in substantially different outputs from the OA and the estimated savings of any recommended measures. The lower specification of the thermostat temperature set point contributes to reduced energy requirements for the "estimated" calculations, and consequently lower "estimated" bill savings. This, in turn, impacts on the measures recommended.

Assessor agreement on Occupancy Assessment parameters

4.36. In large part the OA relies on information collected by the assessor from the occupant. Figure 4.15 shows the extent to which assessors recorded the same information in each dwelling.

Figure 4.15: Number of dwellings where all four assessors agreed on parameters used in the OA calculation process



4.37. The heating schedule of the dwelling is described by the average number of heating hours per day[35]. This is an amalgam of weekday and weekend heating schedules which are

[35] The EPB Register data relating to heating schedule reports percentage of hours the heating system operates per week. This will be an output derived from the assessor input parameters. The assessor is asked to identify the times the heating system switches on and off, for both a 'normal' and 'alternative' day. This presumes not only that all heating system operate as if they had a programmer, but that it will be constant throughout the year. The assessor may need to apply some degree of interpretation where the system does not operate to such a defined

either retrieved from the programmer (where one exists as part of the main heating controls) or from discussions with the occupant. The default value used by RdSAP assumes nine hours heating per day during week days and 16 hours heating per day during the weekend.

4.38. None of the 29 dwellings showed agreement across all four assessors on the heating schedule. In some instances the range was substantial; for instance the four assessors recorded a heating schedule of 6, 5, 3 and 1.5 hours per day in dwelling no. 23 (the project's retained assessor recorded 6). Differences in the heating schedule defined for a dwelling is likely to have a significant impact on the space heating consumption calculated as part of the OA and used subsequently for computing the efficacy of recommended measures.

4.39. Participating householders were instructed to provide consistent information about their property throughout the project to all Green Deal assessors. On more than one occasion the project's retained assessor, when commenting on the level of disagreement in heating schedule among assessors, stated that the householder had confirmed that they had provided all four assessors with the same heating schedule information.

4.40. There was significant variation in the number of baths and showers per day recorded, input factors that have an impact on the hot water consumption output generated by the OA calculation. There was evidence of input error. For instance one assessor recorded more than 10 showers per day for a dwelling with 3 occupants whereas the other assessors indicated it to be between 1 and 2[36]. The presence of input errors in both the EPC and OA calculation process might be expected given the number of parameters being evaluated. However, the fact that the output water heating energy consumption value was not challenged by the assessor may point to lack of awareness. This may indicate areas where the training process and calculation methodology could be improved; for example, by having error bands on outputs that trigger a warning that the input data may be erroneous.

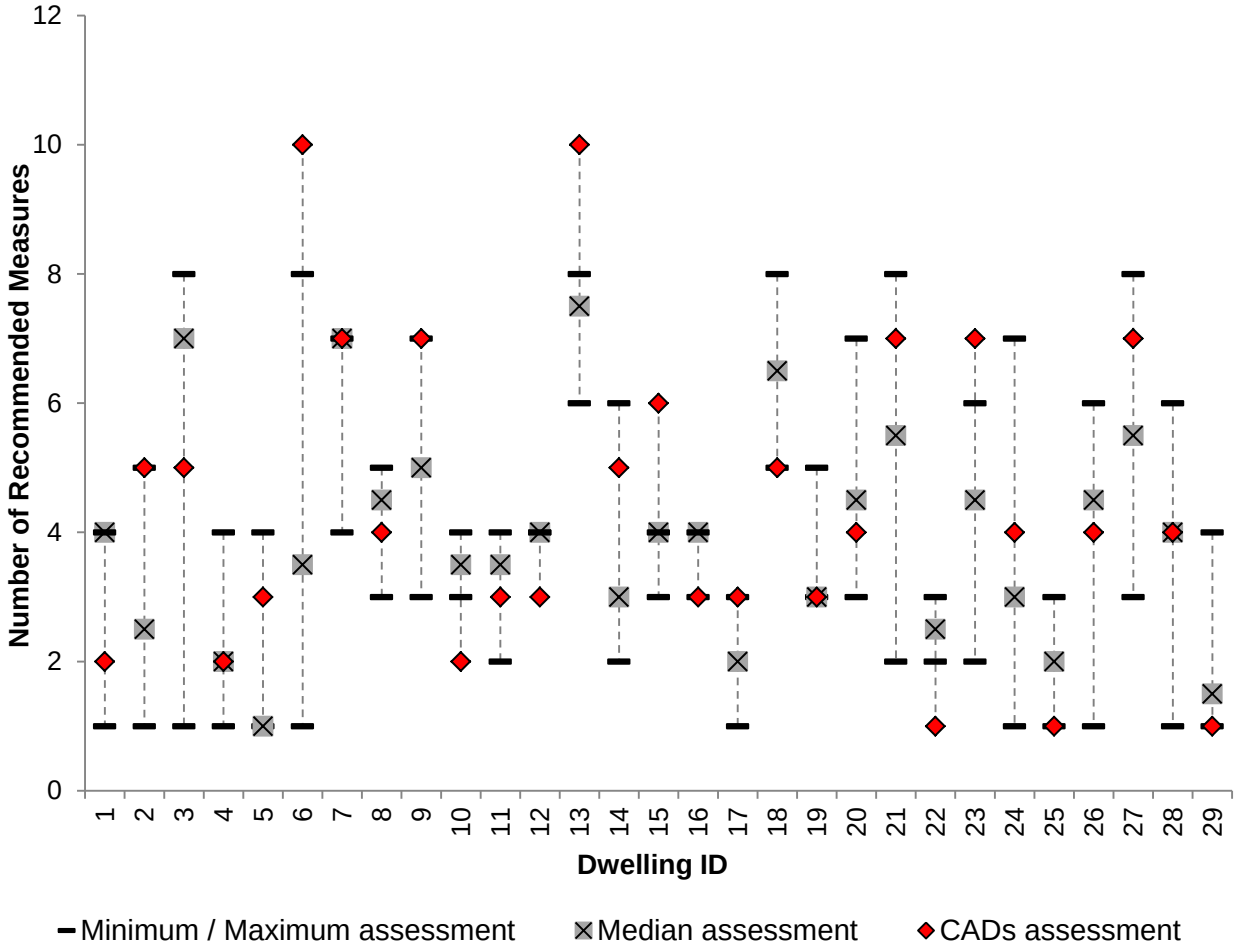
Number of recommendations presented

4.41. Assessors are able to choose from a broad range of recommendations for the final GDAR and these can be different recommendations from the standard EPC. The following analysis only investigates the recommendations made by the GDAR, which have therefore accounted for the results of any occupancy assessment. To capture the degree to which an assessor felt action was possible for a given dwelling, the number of recommendations presented in each set of reports was recorded. Figure 4.16 shows these values.

schedule – e.g. it's only switched on if the occupant is home and feels cold. This is therefore likely to result in some degree of variation based on the assessor's experience and understanding of the calculation methodology.

[36] One impact of recording such a high shower usage was that the OA output water heating energy consumption for this assessor in this dwelling was around 15,000kWh per annum.

Figure 4.16: The number of recommendations proposed for the 29 dwellings with four assessments[37]



4.42. The aforementioned Appendix V of RdSAP (footnote 36) provides information about the conditions under which a measure should be recommended, the range of improvement options, and information about any additional factors that should be taken into consideration. Following the survey of both the dwelling and occupants, the assessor should be able to determine which of these measures are viable, and those that are no longer applicable. Whilst all the available measures may present an opportunity to realise energy bill savings, they may not all be compatible with each other (e.g. the assessor can choose to recommend a new, more efficient gas boiler or installation of a heat pump, but not both), therefore the assessor will need to use his/her judgement to select the most appropriate combination of measures following a discussion with the homeowner. This means it is possible for different assessors to determine different recommendation measures, but doesn't mean that one approach is any less relevant than the other (providing that the assessment is informed by accurate input information).

4.43. No dwelling had zero measures recommended. A single measure was recommended in eleven of the 116 assessments but the mean number of recommendations per assessment was four. In some cases the variations in the number of measures recommended may have come from the assessors conducting the physical or occupancy assessment in different ways, or fundamental disagreements in the physical data collected. In other cases,

[37] These are the only dwellings (29) that were assessed four times. The figure also includes the CADS assessment (i.e. the "fifth" assessment used by the project team)

assessors may have quite deliberately omitted a measure due to a conversation with the occupant. Each occupant-assessor interaction will be unique, resulting in a different interpretation of measures that should be included in the recommendation list; this will have made it difficult for householders to maintain consistency in terms of their interaction with assessors and their responses to the surveys. For example, with regards to individual interactions resulting in different measures being recommended, one participant noted that: *"The Assessor explained any benefits that were listed, but she said that some of them were impractical. The Assessor and I discussed the possible savings. The only one that was left was loft insulation."*

4.44. As a result of this interaction, the assessor only recommended one measure (loft insulation). For the same dwelling, two other assessors recommended three and four recommendations respectively (although, in a further contradiction, neither included loft insulation). A fourth assessor recommended eight measures. The occupant stated that: *"The Advisor advised that I left any selection until after the EPC was produced and then decide what I wanted to investigate."*

4.45. Such discrepancies in numbers (occurring for similar reasons as described above) are also evident in many other dwellings. The differences in the type of measures possible might come from a different view of that property, based on a wide number of parameters (and could stem from the EPC part of the assessment). However, the different approaches taken once those theoretical measures have been identified might stem from the definition of the word "recommendation". From the occupant survey, it seems that some assessors do interpret any final measure as being expert-approved – it is both theoretically possible and advisable based on the house, its occupant, and the views expressed by the occupant during the site visit. Other assessors seem quite keen to include as wide a choice as possible in the report, leaving the occupant to make a decision at a later date. The problem with this latter approach is that, as well as potentially confusing the occupant with information about refurbishments that they do not want, some savings in the report are applied cumulatively. For example, savings from a new boiler will take into account an earlier insulation improvement that has also been proposed (a better insulated building will experience smaller savings from a new boiler than the same dwelling where insulation had not been applied). Conversely, the former approach (of choosing as few measures as possible) might restrict the ability of the occupant to obtain funding in the future, where such funding is restricted to measures listed on the GDAR.

4.46. No correlation was found between assessment duration and measures specified. In some cases, a longer, more detailed assessment might rule out certain measures such that the final list of recommendations is both smaller and more tailored to that household. This is discussed further in the later section on "Total duration of assessment".

4.47. A further issue, more difficult to quantify, is the observed differences between the recommendations in the GDAR (as stated in the EPB Register) and the recommendations recorded by the customers. Whilst it is possible that a customer may report, through poor recall or by misunderstanding, a slightly inaccurate representation of provided information, it does appear that, in many cases, s/he has been informed of a slightly different selection of measures during the visit than is listed in the final report. This may be due to a re-think by the assessor back in their office, perhaps after having checked the information more thoroughly. Equally it may be due to error or the assessor having forgotten that the occupant stated that they did not want a certain measure. There are examples in the participant questionnaires, however, of quite simple recommendations (e.g. loft insulation) being mentioned during the assessment but then being missed out from the final report. From the point of view of the customer, having a different set of recommendations provided

in the report as compared to the discussion in person may reduce confidence in the quality of the assessment or, at least, cause confusion.

Control assessor reports and feedback

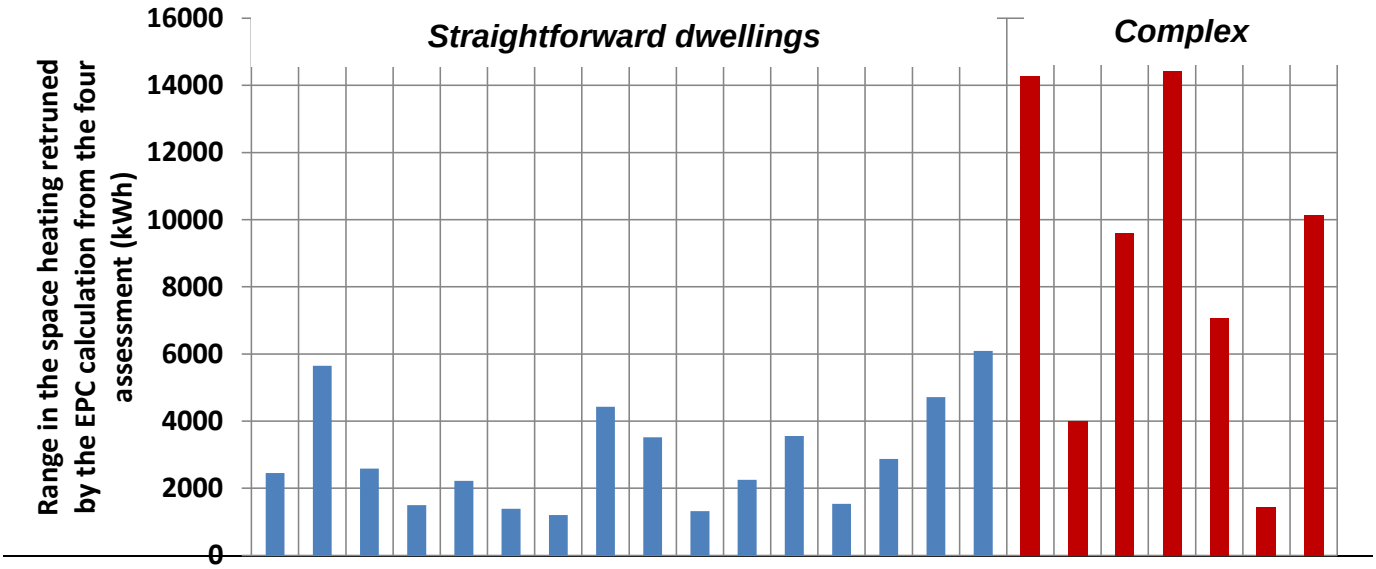
Complexity of dwelling

4.48. In 23 of the 29 dwellings, the project's retained assessor assessed the complexity of calculation presented by the dwelling. The assessor used terms such as *"straightforward"*, *"low complexity"* and *"fairly simple"* to denote less challenging dwellings and terms such as *"doesn't fit well with RdSAP methodology"*, *"tricky"*, *"quite a complex shape"* and *"particularly complicated"* to indicate a higher degree of challenge.

4.49. Dwellings were categorised by reference to this complexity description to see whether 'complexity' might be a contributing to the variability found in the assessor reports. The variability indicator used in this instance was the range in space heating requirement returned from the EPC calculations for each dwelling (Figure 4.17). There is a clear relationship between extent of variability returned by the assessors and the level of complexity defined by project's retained assessors. The mean range for space heating for the 'straightforward' dwellings was 2765kWh across the four assessors and 8705kWh for the 'complex' dwellings. The variation was statistically different using single factor analysis of variability[38].

4.50. Whilst accepting that this is a non-definitive, subjective assessment of complexity and that the dataset is small, this result could be interpreted as suggesting that there are issues to address in the applicability of the calculation methodology and RdSAP software. It could suggest that significant inconsistencies in output might be expected from repeated surveys of the same dwelling, and such inconsistencies would be more apparent for dwellings that do not have simple geometries with well-defined fabric constructions and heating systems. This implies that as dwellings become more complex, the liability for inconsistency is more likely to lie with the methodology rather than the assessor. This would certainly be worthy of additional assessment outside this research project.

Figure 4.17: Range in space heating returned by the EPC calculation for the four assessments disaggregated by the CADS assessment of dwelling complexity



[38] Single factor analysis of variability at 95% confidence limits; F-factor of 18.3 and p-ratio of 0.0004

Retained Assessors and recommended measures

4.51. The mean number of measures recommended by the project's retained assessors (4.4 per assessment) was slightly higher than that recommended by the initial four 'mystery shopped' assessors (3.9 per assessment). The retained assessors were more definitive about the nature of their recommendations than the mystery shopped assessors. There was only one comment (see below) that implied that the retained assessor suggested measures that they felt could not subsequently be adopted by the householder (where "actual OA" is presumed to refer to a revised OA that the retained assessor may have provided had this been a standard assessment for a real client):

> *"In the OA I have left in things that I thought might be feasible including loft insulation top up and PV but very few measures are worthwhile and would probably be removed in the actual OA."*

4.52. Annex E shows every recommendation made by each of the assessors (including the retained assessors) in each dwelling. An example of this representation is provided for dwelling no.1 in Figure . The recommended measure is in the first column and each assessor is in the subsequent columns. Clearly, if all assessors had recommended the same measures then all cells in the figure would be filled (i.e. the more white in the figure the greater the variation between assessors in the measures recommended for a dwelling).

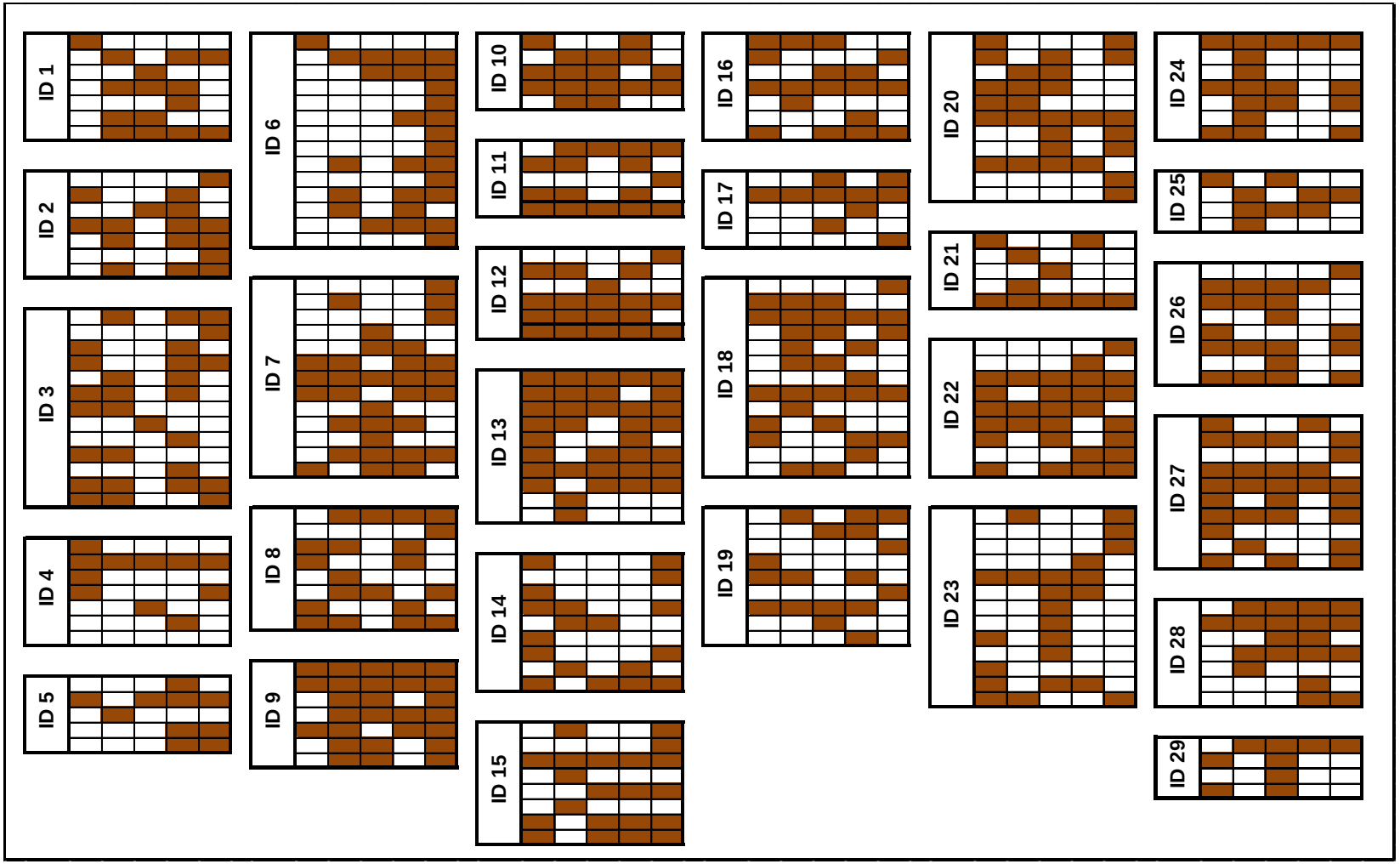
Figure 4.18: Pictorial representation of the measures recommended by each assessor for dwelling ID no.1.

Improvements	A1	A2	A3	A4	independent assessment
Loft insulation					
Floor insulation					
Ground source heat pump					
Solar water heating					
Hot water cylinder insulation					
Door insulation					
Solar PV					

4.53. This method of representation for all 29 dwellings is shown in Figure 4.19. In this representation the column containing the names of the measures has been omitted as the aim is only to provide an overview of the variation in recommendations of the five assessors in each dwelling. No dwelling has an absence of white cells: the GDAR process was not able to arrive at a common solution among five assessors applied to 29 dwellings. There was a greater degree of consistency for some dwellings than others (e.g. no.9 and no.13).

4.54. On the evidence gathered from this comparatively small number of homes, the Green Deal assessment process does not appear to be providing a single set of optimised recommendations for each dwelling.

Figure 4.19: Pictorial representation of the measures recommended by each assessor for dwelling ID



4.55. A binomial test was applied to the dataset of recommended measures to indicate, for a specific confidence interval, the percentage chance of a measure being recommended at random. A binomial test indicates whether deviations, in this case whether an assessor chooses a specific measure, are statistically significant across a given sample. In total 30 different measures were recommended with the total number of measures in the 29 dwellings equalling 507. The recommendations for loft insulation and floor insulation were considered in depth (they were recommended on 51 and 61 occasions respectively).

Loft insulation

4.56. Given the frequency with which it was recommended, the chance of four or more assessors recommending loft insulation in a single dwelling as a consequence of a random process was found to be less than 10%, i.e. deemed to be unlikely. Loft insulation was actually recommended for a single dwelling by four or more assessors in seven cases. The chance of this happening randomly was less than 1%.

Floor insulation

4.57. Given the frequency with which it was recommended, the chance of four or more assessors recommending floor insulation in a single dwelling as a consequence of a random process was found to be less than 10%, i.e. deemed to be unlikely. Floor insulation was recommended by four or more assessors four times. The chance that this number of occurrences could have taken place as a consequence of random events was 28%.

4.58. This kind of analysis could be viewed as proving the robustness (or otherwise) of the process by which the assessor arrives at a recommended measure. For loft insulation, the assessor has to make an observation as to the thickness of insulation present. As a consequence of this observation, the assessor then follows a set of guidelines that arrive at a definitive decision point as to whether loft insulation should be recommended for this dwelling or not. Whilst we have seen that the process contains flaws (where the observation itself can induce errors) the binomial test indicates that a process is being followed and that an informed judgement is being made.

4.59. With floor insulation the process by which the measure gets recommended is more opaque. No observation of existing floor energy efficiency is made. No observation that could be used to ascertain whether floor insulation is suitable for the dwelling has been recorded in either the EPC or the OA. The extent to which the assessor is therefore following a robust methodology that contains consistently used pathways is much less clear. In this context the rest of the binomial test is not a surprise.

4.60. When the binomial test was extended to the most popular ten measures recommended by the assessors, the only other measures that were found to have a relatively high chance of random processes being followed were draught-proofing and the application of insulated doors. Similar to the example of floor insulation, no energy efficiency rating associated with these parameters was found in the dataset provided to the project team. It may therefore be plausible to assume that the methodologies applied to arrive at these measures being recommended are similarly lacking in methodological rigour.

Use of energy bill information

4.61. To account for SAP-based models often showing poor agreement with real energy bills[39,40,41,] the assessors are expected to use energy bill data provided by the occupant when available (and if the data are in an appropriate form). Modelled savings can then be recalibrated based on these empirical data.

4.62. This contribution to the calculation of "estimated" energy savings can be quite important. Although the use of energy bill information will vary by dwelling (depending on availability), the four assessors should have used the available information in the same way for each property. This did not always happen. Figure 4.20 shows the number of assessors, per dwelling, who asked for energy bills. In contrast to other information gathered during the occupancy assessment (e.g. thermostat temperature, where an assessor might make a note of a value with the occupant registering this in the survey), there should be no confusion about whether the assessor and customer had, at least, a conversation about available energy bill data. The assessor, after this point, could still decide not to use the information due to issues of quality, but Figure 4.20 shows that many assessors did not ask for the information in the first place. Of the 116 assessments, 21 of them (18%) did not involve an enquiry into energy bills (this is consistent with the results of the questionnaire for all 48 homes in the mystery shopper dataset, where 23% of assessors did not ask for electricity bill information). When assessors did ask for information, they enquired about both electricity and heating fuel with two exceptions who only asked for electricity bills (Figure 4.20 does not distinguish between electricity or gas bills).

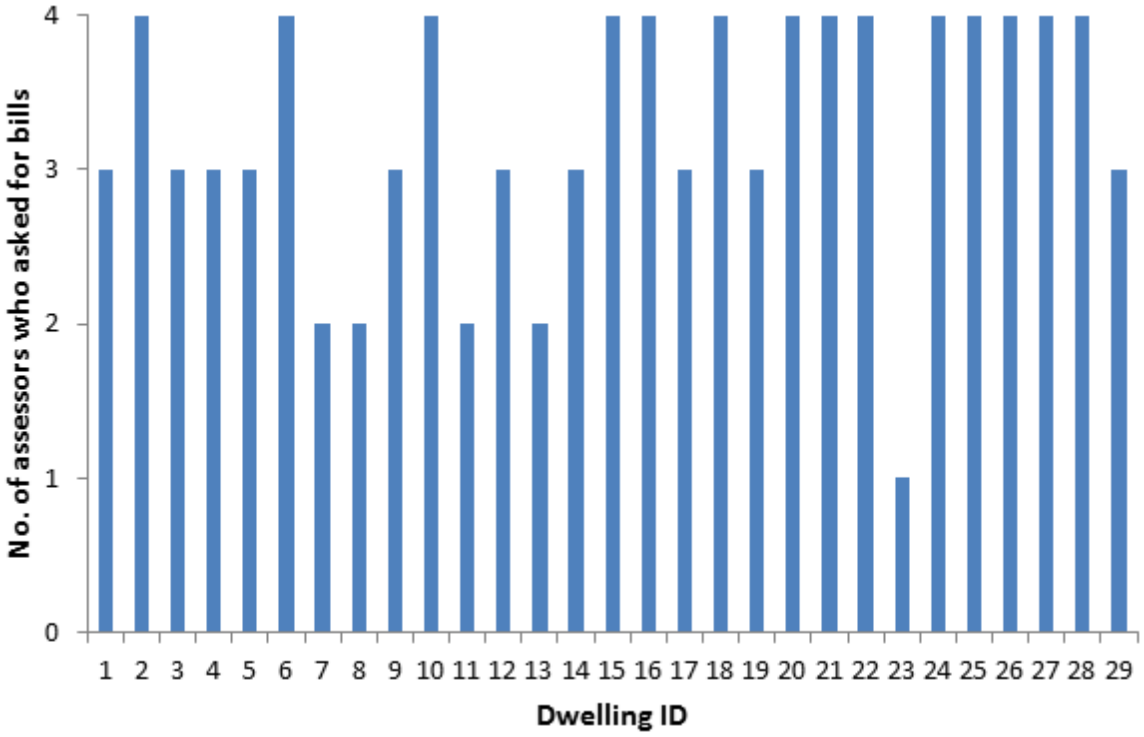
4.63. The fact that some assessors did not ask for energy bill information is likely to be a cause of inconsistencies in final energy saving calculations. The EPB Register provides information for both "typical" and "estimated" energy savings from the proposed recommendations, with the latter incorporating any bill recalibration. While the estimated savings cannot be compared directly for each set of four assessments (as discussed in the previous section "Number of recommendations presented", the selection of measures already vary for a number of reasons), the use or non-use of an existing energy bill will produce quite different energy savings when using the Green Deal RdSAP methodology.

[39] Affinity Sutton, Future Fit – Final report, 2013 http://www.affinitysutton.com/media/364652/futurefit-quick-links-PDF-1.pdf

[40] P de Wilde, The gap between predicted and measured energy performance of buildings: A framework for investigation, Automation in Construction 41, 2014, pp 40-49

[41] S Kelly et al, Building performance evaluation and certification in the UK: Is SAP fit for purpose?, Renewable and Sustainable Energy Reviews 16, 2012, pp 6861-6878

Figure 4.20: The number of assessors who asked for energy bill data for the 29 dwellings with four assessments excluding fifth independent assessment



Total duration of assessment

4.64. The mystery shopper questionnaires showed considerable variation in the time taken to carry out the full assessment, from entering to leaving the home (Figure 4.21). The average assessment time across all 116 assessments was 100 minutes.

4.65. Figure 4.22 further illustrates the variations observed for the four assessments per dwelling. The average range in assessment duration across all 29 dwellings was 57 minutes. Figure 4.23 shows that there is, as might be expected, a correlation between assessment duration and TFA (i.e. larger properties take longer to assess). This figure also shows an energy bill effect: for assessments where bills were requested, the duration of the visit was significantly shorter for smaller properties. For larger dwellings, this part of the assessment becomes less important to assessment duration (though caution is needed here given the small number of dwellings in the sample that were more than 200m^2). This pattern is intuitive: for smaller dwellings, obtaining physical information (dimensions etc.) and some occupancy information (e.g. kitchen appliances) should be a relatively quick process, such that any discussion with the occupant about energy bills becomes a large part of the total assessment time.

4.66. More generally, it is noticeable from the survey that customers had quite varied experiences with assessors in terms of discussions about energy bills (e.g. in dwelling no.6, one assessor refused to accept the form of energy information on offer, while the other assessors appeared to use it).

4.67. The intermittent use (at the discretion of the assessor) of inconsistently formatted (real data, quarterly, annual etc.) household energy data will contribute to different calculations of “estimated” energy bill savings, affecting the validity, viability and appeal of the recommendation measures as part of the Green Deal process.

Figure 4.21: The total assessment duration for the 29 dwellings with four assessments

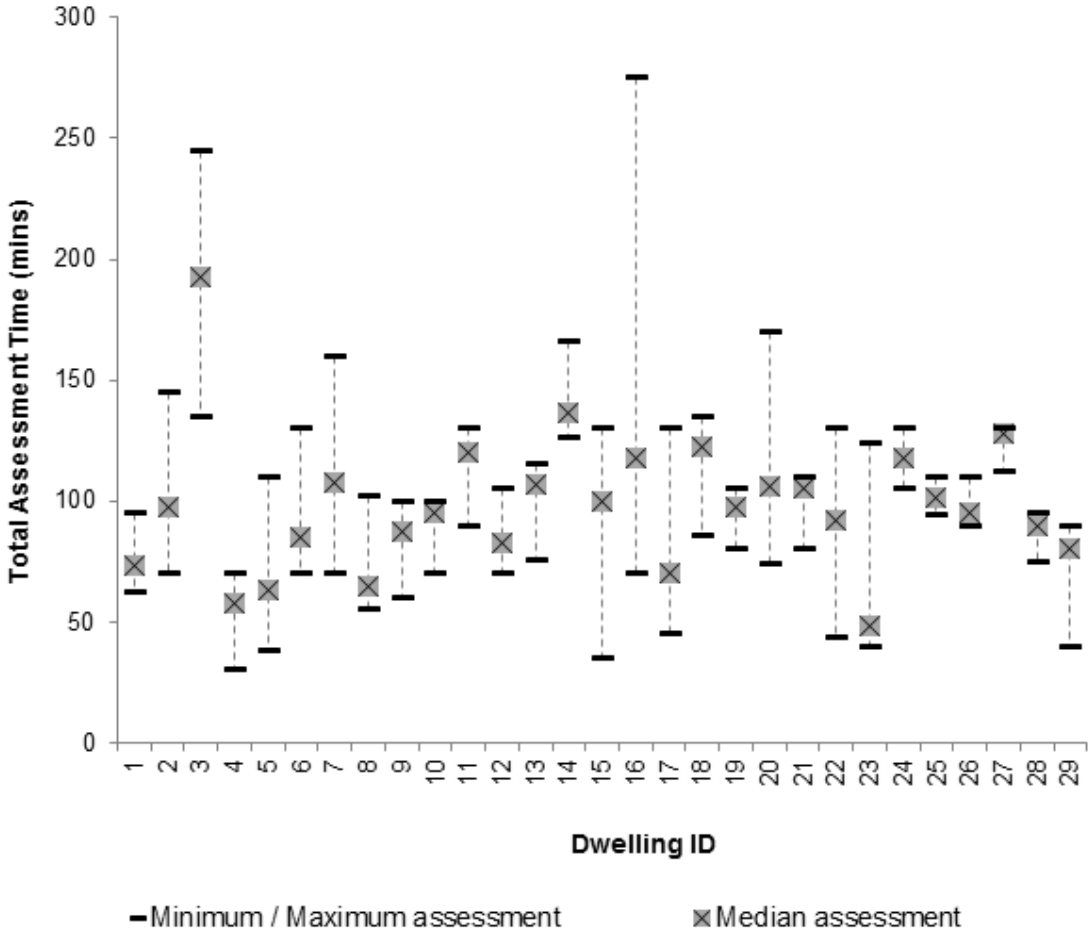


Figure 4.22: Range of assessment duration for every dwelling

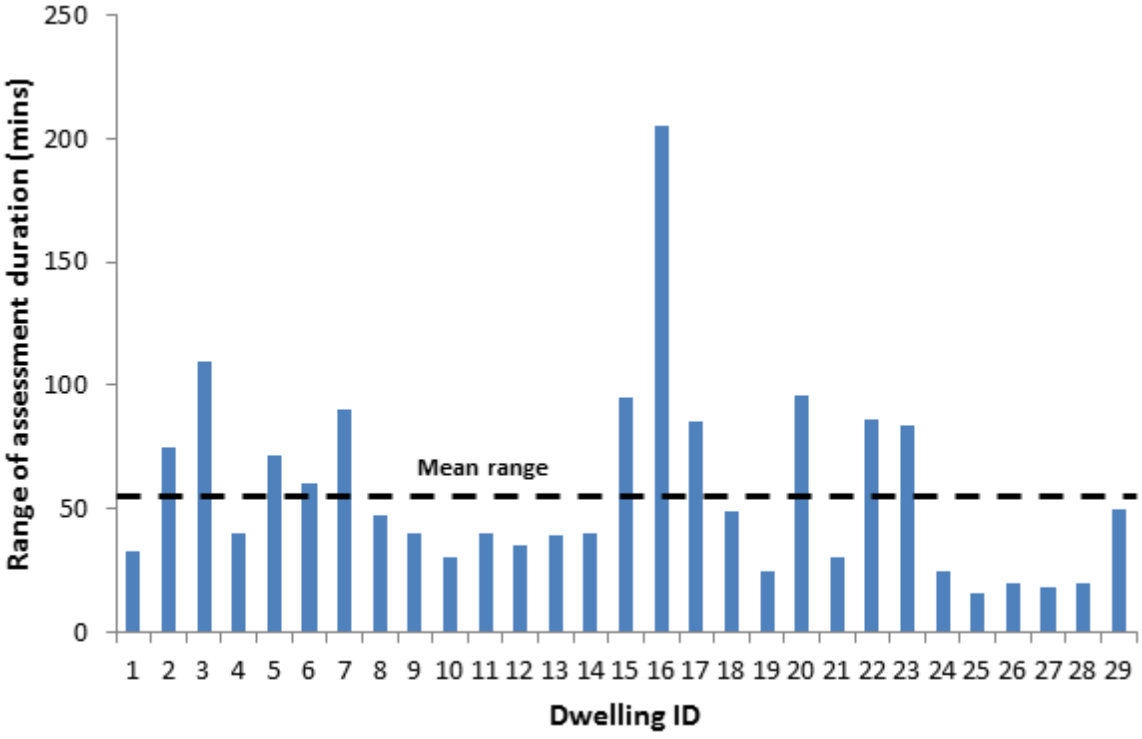
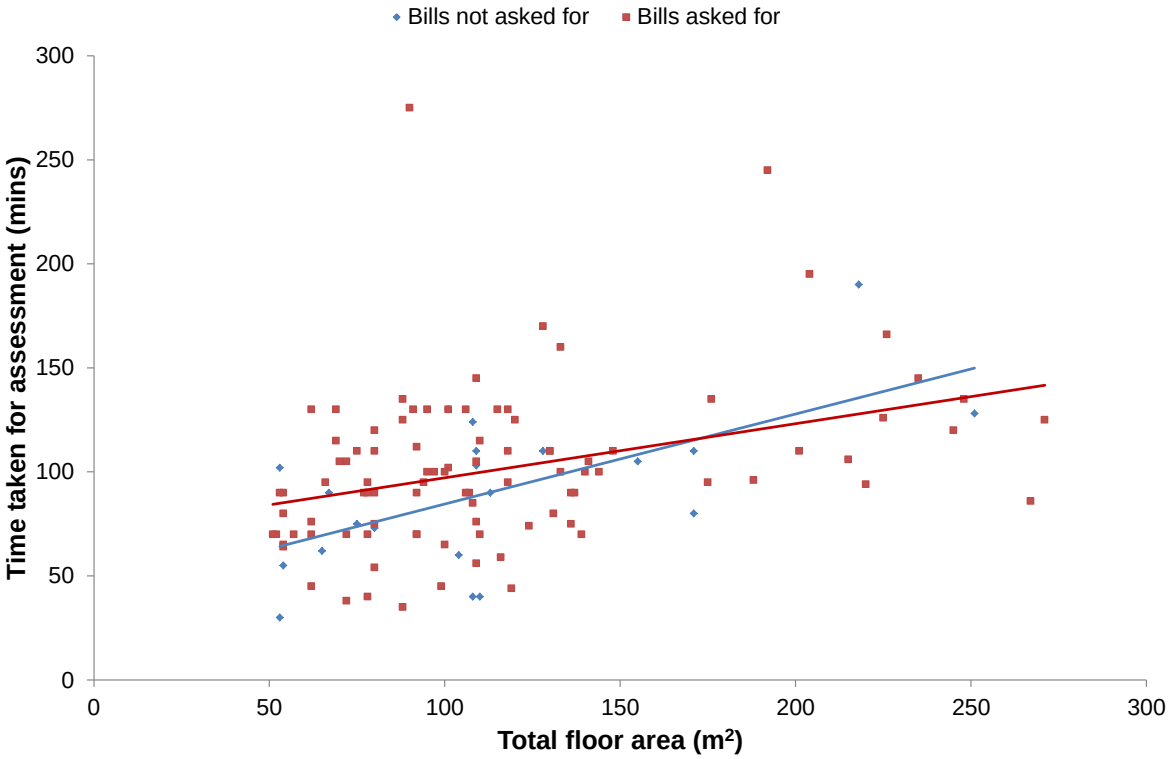


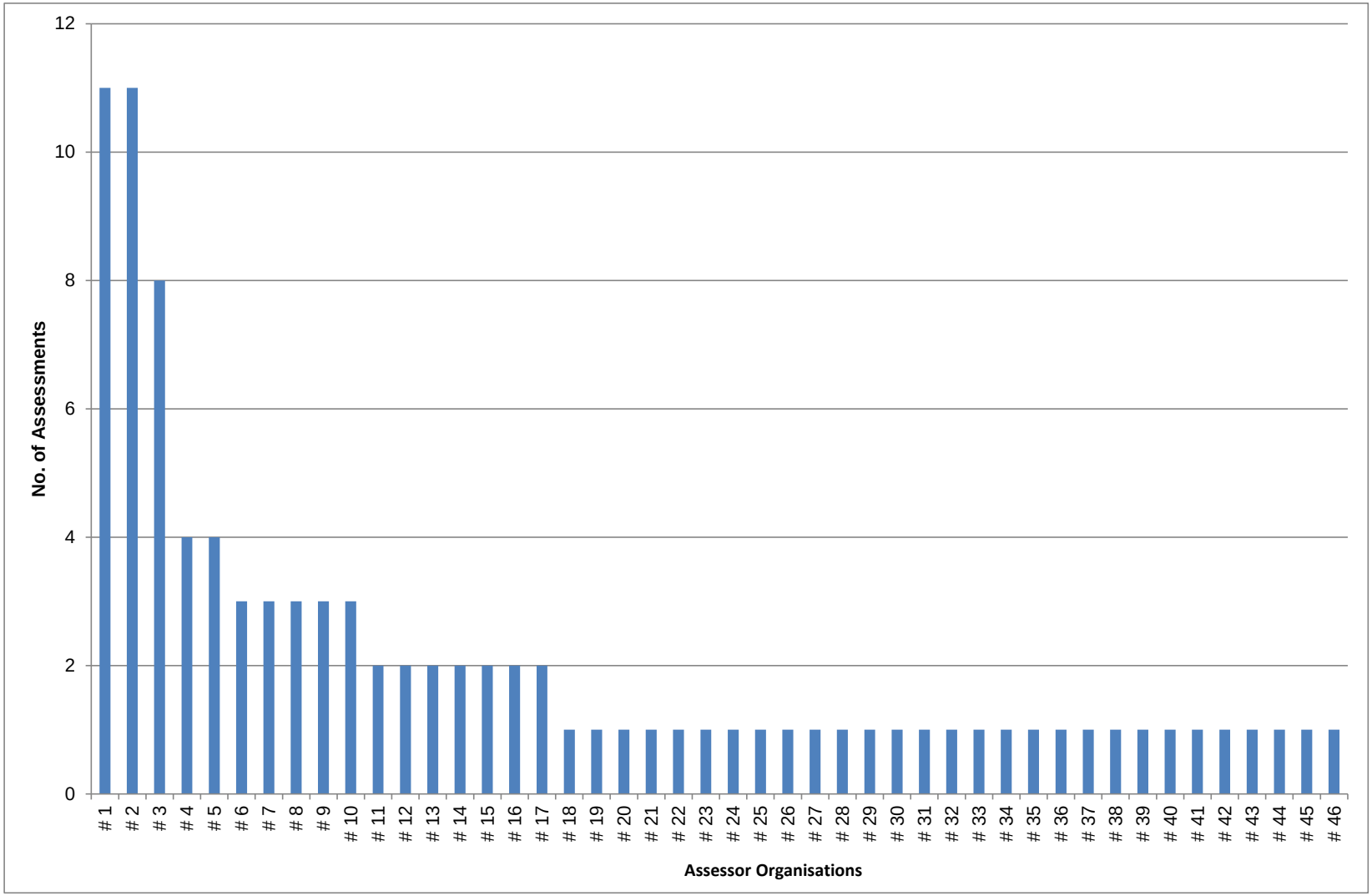
Figure 4.23: Effect of TFA and bill enquiries on duration of mystery shopper assessments



Organisation behind assessments

4.68. The assessors came from a variety of companies, from sole traders to larger organisations with a national outreach. With the exception of three organisations, the spread was quite even. Three companies collectively provided over a quarter (26%) of the 116 assessments (Figure 4.24). It has not been possible to determine from this sample whether organisational practices influence the quality and nature of the assessments.

Figure 4.24: Number of assessments undertaken by each organisation across all 29 dwellings (total 116 assessments)



Other Issues

4.69. The analysis has highlighted several issues regarding the quality and quantity of data available through the current system for retrieving information from the EPB Register, particularly when using such a database to investigate the consistency of domestic energy assessments. The “energy efficiency ratings” (1 to 5) used in EPCs to describe building elements, lighting and other aspects of the building do not provide specific information about, for example, the wall type or insulation levels currently present in the dwellings. This study had to rely on reference assessments to confirm property type, construction and age, and more disaggregated data for parts of the building (which still did not include, for example, U-values and could not be applied to a heat loss assessment of the whole dwelling).

4.70. The reporting of “real” and “modelled” energy information is particularly unclear. While information about whether an assessor asked for energy data was available from the mystery shoppers’ questionnaires, it is not clear how this information was used and what specific value of electricity/gas usage has been applied. Such information would have been useful to further explain some of the modelled values for “estimated” savings. This has also slightly constrained the report’s ability to determine the importance of energy bills to the assessments and to understand ‘standard practice’ (insofar as this exists).

4.71. When using the mystery shopper occupant surveys, there may be a “knowledge creep” between the first and fourth assessment. While the occupant might not be aware of some of the technologies (or the assessment itself) during the first visit, by the time of the fourth, that customer will be better informed about what the assessor is recommending. For some dwellings, this is noticeable in the occupant responses (e.g. an earlier assessment might have dissuaded them from installing a solar technology so they ask these not to be included in later assessments). This might have a small effect on the final list of recommendations, if the assessor incorporates customer’s thoughts into that list.

4.72. When investigating parameters such as use of energy bills and assessment duration, the obvious next step is to identify the effect this might have on assessment quality. The project’s independent assessments provide a useful reference point for this but, even with this reference, assessment quality would appear to be within a sliding scale, rather than based on absolute definitions of “right” and “wrong”. However, in some cases, clear errors have been found, errors that invite judgements about the ability of that assessor (or, at least, the use of that assessment) to provide reliable advice. Some examples of likely errors/misjudgements are:

- Dwelling no.4: A2 took just 30mins to carry out the entire assessment, did not ask for any energy bill information;
- Dwelling no.6: A3 refused to use the energy bill data provided;
- Dwelling no.6: A4 stated they could not provide results of recommendations during the visit, so tailoring that list to the occupant was not possible;
- Dwelling no.7: A3 asked if the property had loft insulation or cavity wall insulation, even though the house was a stone-wall property with no loft. The assessor also recommended double glazing even though, according to the occupant, this was already present (though it was not included in the final report);
- Dwelling no.7: A1 asked the occupant to sign up to the recommended measures there and then, insisting that this was normal. The occupant refused to do this and was unhappy at being coerced in this way;
- Dwelling no.9: A4 refused to use online energy data (occupant did not have hard copy);

- Dwelling no.9: A3 refused to use energy data stating they were only “estimates” – the research was unable to confirm whether this information were truly estimates;
- Dwelling no.9: A2, during visit, stated that CWI was not suitable as the damp proof course was too low. However, they still included CWI in the final report;
- Dwelling no.17: A1 and A4 discussed CWI but occupant states that the dwelling is solid-walled (and, ultimately, no CWI is recommended in the final report);
- Dwelling no.17: A1 did not ask about how long the heating was used for in the occupancy assessment;
- Dwelling no.18: A2 had a discussion with the occupant about not being able to use double glazing or SWI in view of the type and location of the property, but then included both these in the final report anyway. Other assessors chose secondary glazing instead.
- Dwelling no.19: A1 recommended full SWI even though the dwelling already has this (s/he also did not appear to ask whether the dwelling already had this).
- Dwelling no.19: A2 did not ask about how long the heating was used for in the occupancy assessment;

4.73. Throughout all dwellings, there was consistent disagreement about roof orientation for assessors choosing solar technologies.

5. Conclusions

This final chapter brings together the results of the preceding chapters and sets out the conclusions of the ICF study team in respect of the evaluation questions. These evaluation questions, set out in Chapter 1 were selected from the overarching evaluation framework for the Green Deal and ECO Evaluation Program.

All conclusions should be placed in context of the small sample size. The research was not designed to be statistically representative of the entire UK housing stock, with sampled homes being those households available for the exercise and able to provide results. The small sample of owner-occupier homes (29 dwellings selected for comparison in Chapter 4 of this report) means that the quantified results are specific only to that sample. The findings in this report provide insights into the customer journey for 'active' GD customers in the areas that these properties were located in early 2014. The findings are not quantitatively extrapolated to the population of GDARs that have been conducted under Green Deal to date but are used as indicators for problems that might be hindering the consistency and impact of Green Deal assessments. The figures provided should not be used to quantify likely variation across all Green Deal or EPC-related energy assessments. However, the existence and widespread nature of recorded variation is likely to have implications for the design of future assessments, particularly as these inconsistencies were observed throughout the dataset and not just sporadically.

To what extent is the Green Deal assessor supply chain sufficiently developed and responsive to meet the levels of consumer demand? What are the implications of this?

5.1. Participants experienced great difficulties in finding a Green Deal assessor that served their area and then in organising an assessment. Numerous calls were required to secure a booking. In addition, some shoppers reported a lack of interest or enthusiasm on the part of many assessors for undertaking assessments within the time frame required. This could suggest that the Green Deal assessor supply chain was not, at the time of this research, fully developed and that gaps in geographical coverage and capacity constraints inhibited delivery in a timely manner. This research suggests that market efficiency is not helped by the GD ORB website provided to help link demand to supply. At the time of the research the tool was not accurate enough to fulfil its function effectively, either for customers (in finding a relevant assessor) or assessors (in connecting them to potential customers in the specific geographical area that they serve).

What are consumers' experiences of the customer journey? (What's working well and what are the obstacles at each stage?)

5.2. This research provides insights into the first two stages of the customer journey; the initial contact between the householder and the assessor and then the assessment process itself.

5.3. Previous research conducted for the Green Deal / ECO evaluation has found variation across households in the GD assessment process relating to:

- The time taken for the assessment;
- The solicitation of energy bills / energy use data from the consumer by the assessor;

- The discussion of GD Finance during the assessment; and
- The timely receipt of a GDAR by the consumer after the assessment.

5.4. This project has found evidence of some of the same kinds of variation in the assessment process across properties and for the same property. In addition it has identified variation for the same property in:

- The results of the assessment (e.g. EPC category);
- The approach taken to the determination of the recommendations to be provided to the consumer.

5.5. As noted above, the first step in the customer journey was problematic. Participants experienced difficulties in finding a GD assessor that served their area and was willing to perform an assessment. Limited evidence gathered during the pilot phase suggested that ESAS was effective in signalling to customers who already had highly efficient homes that the gains from an assessment could be limited, but the assessor data provided to those who did proceed were not reliable. Once participants had found an assessor that was able undertaken an assessment, the experience of the participants when booking appointments was generally positive. Details of the cost of an assessment were almost always discussed upfront over the telephone and there were very few examples of charging for the assessment being conditional upon future works.

5.6. Overall participant satisfaction with the Green Deal assessment itself was high. Most participants felt that the inspection process was explained clearly by the assessors. In almost all assessments, the assessor visited each room in the property (including the loft where applicable). Some punctuality issues were identified, with one in five assessors being late for the appointment.

5.7. The overall impression of participants was that an assessment of between one to two hours was acceptable.

5.8. When compared to the findings from the Green Deal Customer Journey Research, the results suggest that 'active average consumers' who attempt to find a GD supplier to undertake an assessment, rather than respond to initial contact made by a GD supplier, may have a more positive and comprehensive experience than householders that were either contacted by the assessor or had their assessment arranged for them.

5.9. The observed variability in assessment results and recommendations subsequently provided to customers, suggests that the mystery shoppers in this study could not necessarily rely on Green Deal assessments providing robust advice on the existing energy performance of their home or the best options for improving it. However, since in practice few undergo more than one assessment, variability in assessment results would not be apparent to the typical Green Deal customer.

5.10. Some of the issues identified appear to relate to the assessors' approach to the assessment (potentially reflecting factors such as skill levels and the training provided), others appear to be derived – at least in part - from the RdSAP methodology and the software that supports assessors in applying it.

How is the supporting infrastructure (IT) and Code of Practice supporting delivery of the Green Deal? Are they fit for purpose?

5.11. At the time of the research (February - April 2014), participants experienced difficulties in finding a Green Deal assessor that served their area. One key component of the supporting IT infrastructure, the GD ORB database of assessors (as signposted by www.gov.uk and as used to generate contact data for callers to the ESAS), was found not to be sufficiently accurate and localised to meet householders' needs. The GD ORB database did not

accurately distinguish between organisations providing business-to-business and business-to-consumer services, or by geographical area. The lack of accuracy of the Green Deal Assessor list substantially increased search time and costs[42]. The project results suggest that, at the time of the research, the tool was not fit for purpose for the mystery shoppers in this study. Determination of the reasons for the inaccuracies in the tool was beyond the scope of this project.

5.12. Participants were not subjected to cross-selling or behaviours that would breach the Code of Practice. A minor issue around the compliance with the Code was identified. Around a third of assessors completing assessments as part of this research project did not show their identification card, unprompted, on arrival at the property.

5.13. The analysis of variability of the results raises, but does not answer, some questions about the software packages used for assessments and, for example, the extent to which they support assessors in handling more complex situations and flag possible data entry errors.

5.14. Some issues were also identified with DECC's access to data held on the EPB Register. Existing agreements limited the ability of authorised third parties – such as DECC analysts and research contractors - to use the Register to investigate the consistency of domestic energy assessments. For example, the reporting of "real" and "modelled" energy information is particularly unclear and it was not possible to determine the approach used by assessors for defining the living room set point temperature as not enough data were provided.

How are the underlying methodological procedures and domestic energy assessment calculations supporting delivery of the Green Deal? Are they fit for purpose?

With all other factors remaining constant, do repeat assessments vary depending on who undertakes the assessment? If so, how and why?

5.15. Repeat assessments exhibit variation both in EPC results and OAs. Significant input variation was found with EPCs, particularly for total floor area and the energy efficiency rating of building fabric and technologies. This input variation was a contributing factor to the wide output variation from the EPC process, particularly with respect to EPC rating and calculated space heating consumption. This EPC-based variation was carried across to the OA where it was augmented by further input variation particularly with respect to definition of internal temperature and heating schedule.

5.16. A combination of the above variations was likely to be a contributing factor to the disparate nature of recommended measures made by different assessors to individual dwellings.

What assessment inputs (e.g. floor area, property age) vary most, and most frequently, and to what degree? What might be causing inputs to vary?

5.17. Substantial variation was found in a number of key parameters used in the calculation of the EPC rating. For example, the range in measurements of total floor area made by the four assessors was greater than 15% of the mean floor area for 13 of the 29 dwellings. Roof and lighting "energy efficiency rating" varied considerably; assessors only agreed on the rating in 6 and 8 of the 29 dwellings respectively.

5.18. Discrepancies in EPC assessments were carried over into the OA calculation process and augmented by additional variation relating to how householders used energy. Principal among these was the way in which assessors defined the internal temperature of the

[42] The same applies to the GD ORB website database of assessors online at the time of the research.

dwelling. A variety of methodologies were employed, raising questions about the assessor training process. The average range in the heating setpoint stated by the assessors was 2.1°C.

5.19. Occupants' experience of assessors interest in discussing energy bills varied. The intermittent use (at the discretion of the assessor) of inconsistently formatted (real data, quarterly, annual etc.) household energy data did contribute to different calculations of "estimated" energy bill savings, affecting the validity, viability and appeal of the recommended measures.

What is the scale of the variability of results?

5.20. The variation in the inputs to the EPC process contributed to the EPC rating varying by, on average, 11 points in each dwelling. The range of EPC ratings encompassed at least two EPC bands for almost two thirds of the dwellings considered.

To what extent are variations systematic or random? If they are systematic, what are the systematic sources of variation (by assessor type or property characteristics?)

5.21. While the causes of the all the variations could not be determined, evidence suggests a number of root causes. The variation in EPC, OA and recommendations could be a composite of all these factors. In no particular order, the results:

- Suggest that human error on the part of the assessor resulted in guidance to mystery shoppers that were illogical or poorly supported;
- Raise questions about the universal applicability of the software and methodology for all housing and occupant types, for both EPC and GDOA;
- Raise questions about the robustness of methodological procedures and calculation engines within both EPC and GDOA, but particularly the latter.

Do combined EPC and Occupancy Assessments give the relevant outputs to support various policies that rely on this data? Is there evidence that the assumptions made in the assessment process adversely affect EPC and OA calculations?

5.22. The Green Deal programme model is predicated on an assumption of a standardised assessment process and reliable, repeatable results that inform consumer choice. The results in this study were, for the properties concerned, not consistent with that assumption. Had the mystery shoppers participating in this study been genuine Green Deal customers the advice received, and potentially the investments made, on improving the energy efficiency of their homes would often have been quite different depending on which one of the four assessors they had engaged to provide their assessment.

5.23. Whilst variation might be observed in other forms of dwelling energy assessment (as has been indicated, for example, in the English Housing Survey data used in fuel poverty studies[43]), the nature of the software, range of assessor background and existence of the OA makes the variation in GD assessments more apparent and larger in magnitude within the assessed sample.

5.24. Loosening parts of the standardised methodology of the SAP assessment used for an EPC (to make it more flexible for applying to a dwelling/occupant-specific GDOA) puts a greater onus on the judgement of an assessor and his or her understanding of a number of issues. Some evidence (even within this very small sample) suggests that certain dwelling types, that might deviate slightly from a simple, easily-modelled, ideal, are more difficult to

[43] DECC, Annual Fuel Poverty Statistics Report, 2014

assess and therefore yield greater variations in terms of the guidance provided after an energy assessment. This appears to include those homes often categorised as “hard-to-treat”, but also homes with garages, porches and adjoining walls. The results raise some questions about whether the current methodology can provide reliable advice for a range of dwelling types, and whether those using that methodology have a common understanding of how it should be applied under a range of circumstances.

How does the Green Deal support consumer choice?

5.25. Participants were presented with a range of improvement options and discussed with the assessor the benefits and, to a lesser extent, the potential limitations of the measures.

5.26. The research found significant variation in the type and number of measures recommended by the assessors. On average four measures were recommended by each assessor for each dwelling but the number of recommendations varied. As with other parts of the OA, the individual judgement (and therefore expertise) of the assessor is a crucial part of the process in a way that is not as evident in a more standardised EPC assessment.

5.27. A combination of the variations described in the previous section was likely to be a contributing factor to the disparate nature of recommended measures made by different assessors to individual dwellings.

5.28. The customers’ reports of their conversations with the assessors suggest that the recommendations (beyond just the RdSAP calculation process) were not always based on a commonly-shared, consistent methodology. Some assessors recommend lots of measures to allow the occupier to consult more widely. Other assessors appear to take the approach that measures should only be recommended if they were applicable to a particular occupant after a consultation process. This suggests ambiguity in the Code of Practice on the role of the assessor and the level of choice to be provided to customers. The Code of Practice could therefore either: (i) ensure that assessors have stringent guidelines when recommending measures (e.g. whether or not to adjust to householder responses) or (ii) accept that the nature of the householder-assessor interaction and subjectivity of assessor might result in inconsistency of recommended measures under the current framework. If the latter is acceptable then this changes somewhat the original intention of a standardised energy assessment, but allows an adequately-trained assessor to apply their own knowledge/experience to a specific case.

5.29. Little evidence was found of inappropriate marketing of products and services. However, in one quarter of assessments, the assessor did not explain the choices available to customers in the supply of improvement measures. This may prevent consumers from fully understanding the options available to them.

5.30. Financial options were not discussed in more than a third of assessments completed in this project. The benefits of taking out a Green Deal financial package were explained in about a third (35%). This suggests that the assessment stage of the customer journey cannot be relied upon to provide the customer with information about Green Deal finance.

How do customers engage with and understand payment of the Green Deal through their bills and annual energy statement?

5.31. Key elements of Green Deal finance were not discussed in most cases. This suggests that participants were not being provided with the information that would enable them to understand how the Green Deal payment mechanism works.

Technical Annex A: Mystery Shopping

Approach

Recruitment of shoppers

As discussed in Chapter 2 of the main report the goal of the project was for a group of mystery shoppers to arrange for Green Deal assessments to be carried out on their homes by four different assessors who would not be aware that they were participating in a research project.

GfK NOP recruited and managed the mystery shoppers. The shoppers were selected from the GfK NOP shopping panel of around 15,000 active mystery shoppers who are geo-demographically representative of the UK population. A sampling approach was agreed for the selection of shoppers from the panel. The sample was intended to be broadly representative across the following variables: region, tenure, "urbanity", property type, property age and property size. Mystery shoppers who work, or who have close friends or family who work in the energy industry were excluded from participating. In addition, all mystery shoppers working on the project were required to be either the householder or their partner (in order to mirror the profile of those who would be authorised to request a Green Deal assessment). Households from Scotland were excluded for a number of reasons:

1) The small size of the prospective Scottish sample would not have allowed anything particular to be said about Scotland as distinct from the rest of the data but might have introduced greater variability into the sample that would be difficult to investigate;

2) The provider market in Scotland, at the time of research, was not at a stage whereby mystery shoppers could guarantee access to four different assessments on each property. The majority of Scottish assessment work is being undertaken by one company. If this was the case, cases would be lost from an already small sample;

3) The use of different data collection tools in Scotland was deemed to be problematic because greater variability would be introduced into the data;

4) The English Housing Survey, against which mystery shopping data might be compared in the future doesn't include Scotland.

The table below shows the number of mystery shoppers that were originally expected to be included in each category.

Variable	Sub-group	# mystery shoppers	Notes
Region	Scotland Wales England	0 6 44	England shoppers will be spread across: • London / SE • SW • Midlands • North
Tenure	Owner-occupier Tenant	38 12	Tenants will be spread across social rented and private rented sectors
Urbanity	Urban/suburban	40	

	Rural	10	
Property type	House Bungalow Flat/maisonette/tenement	40 2 8	Houses will be spread across detached, semi and terraced properties in proportion to national housing stock
Property age	Pre 1930 1930-1989 1990 or later	12 30 8	
Property size	Over 2000 sq ft Under 2000 sq ft	10 40	

Owing to difficulties in recruiting suitable shoppers (for instance, no tenants expressed an interest in participating in the research) and securing assessments the selection criteria were relaxed and mystery shoppers were recruited from the whole panel. The achieved sample is show in the table below. An additional screening step was introduced to exclude shoppers with homes recorded as having a high EPC rating. This information was collated from shoppers who expressed interested in participating and checked manually against data from the EPB Register.

Variable	Sub-group	# mystery shoppers	Notes
Region	Wales England	3 45	
Tenure	Owner-occupier	48	
Urbanity	Urban/suburban Rural	34 14	
Property type	House Bungalow Flat/maisonette/tenement	46 0 2	Houses, split by type: - Detached: 20 - Semi-detached: 12 - Mid-terrace: 11 - End of terrace: 3
Property age	Pre 1930 1930-1989 1990 or later	19 26 3	
Property size	Over 2000 sq ft Under 2000 sq ft	13 35	

Assessment providers to be tested by mystery shoppers

The initial plan was for the four visits arranged by the mystery shopper to be allocated as follows:

- One was to be with or arranged through the shopper's usual energy provider;
- One from the top 10 of other providers;
- Two from other accredited Green Deal Assessment providers.

However, during the pilot phase it was found that many shoppers encountered significant challenges when looking for Green Deal assessors and in trying to secure four assessments in the timescales required for the study. As a result, shoppers were advised to contact the Energy Saving Advice Service (ESAS) to obtain a list of Green Deal organisations in their area, rather

than look to obtain the above mix of assessors. Furthermore at the time of research only two energy providers were found to provide Green Deal assessments and so the first criterion was dropped.

Shopper briefing and training

The recruited shoppers received detailed briefing instructions to ensure they knew what was expect of them and why. Shoppers were instructed to provide consistent information about their property throughout the project to all Green Deal assessors. Shoppers were also instructed to not reveal they were involved in a mystery shopping exercise. These briefing instructions were updated during the fieldwork to reflect the experience of the piloting phase in early February.

The final instructions provided to mystery shoppers who signed up to the research exercise are provided on the following pages.

Shopper questionnaire

After each assessment, the mystery shopper completed a structured questionnaire detailing their experience. The questionnaire was developed by GfK NOP in conjunction with ICF International and was agreed with DECC.

The questionnaire is available at https://www.gov.uk/government/publications/green-deal-assessment-mystery-shopping-research.

The completed questionnaires were checked for completeness by GfK NOP who then aggregated results against each question.

Shopper instructions

Brief Summary of Assessment

- This mystery shop will require you to undergo 4-5 Green Deal Assessments at your property by 4 different companies plus a baseline survey by CADS. You must be prepared to complete all of these assessments when agreeing to take part in this survey. The aim is to test the variability and accuracy of Green Deal Assessments, and identify areas for improvement.
- You must book 4 appointments with different Green Deal assessors before embarking on your first assessment. The bookings must be made by your scheduled visit date. Please ensure all your bookings are booked in to take place no later than the 31st of March 2014. Please contact GfK if this is likely to be a problem.
- If you think you will not be able to secure 4 appointments please contact GfK and de-allocate the assessment. It is important each shopper has 4 assessments for comparative reasons and this is a client requirement.
- Please thoroughly read the important information at page 6 of these briefing notes
- Background:
  - The Green Deal gives advice on home energy saving measures and provides access to special 'loans' to improve your home and to cut energy bills.
  - The Green Deal Assessment process is fundamental to households accessing the Green Deal and taking forward actions to achieve energy savings. The assessment explains what energy saving improvements can be made to a home and determines how much Green Deal finance a customer can access, and how much subsidy they can receive from other sources (e.g. the ECO programme and/or Green Deal cash back).
  - The assessment process results in a Green Deal Advice Report.

Estimated Length of Assessment

- This mystery shop consists of 3 stages and four to five assessments. Each assessment will have a separate visit for data entry, in total you will complete 4-5 questionnaires for the different Green Deal assessments:
  - **Stage 1:** Occupancy usage information (the first section of the questionnaire). **This will take approximately 20 minutes** and will be completed once for your first assessment, in subsequent assessments the questionnaire will route you to stage 2.
  - **Stage 2:**

  – Call the Energy Savings Advice Service (ESAS) on 0300 123 1234. ESAS will take some brief details and send you a list of Green Deal advisors in your area. Please select 4 Green Deal advisors from this list at **random <u>not</u> in alphabetical order** that charge less than £200 (including VAT) to conduct a Green Deal assessment.

  – Book in Green Deal assessments with the 4 different organisations from the ESAS list, complete them and enter your results. **Approximately 1.5 hours each**.

  - **Stage 3: (selected properties only):** A visit by an <u>independent surveyor from CADS Housing Surveys</u> plus questionnaire data entry. **This will take approximately 2 hours**.
- In total, the whole exercise should take approximately 8 to 10 hours. The process is likely to take 4-6 weeks.
- **Do not accept this assignment if you are not prepared to complete all 5 assessments. This is compulsory. A bonus fee of £50 will be paid on completion of the set of 4-5 assessments.**

Fees

- There will be a bonus £50 at the end of the project if you have completed the full 4-5 assessments.
- Bear in mind that the Questionnaire for these assessments is quite lengthy and may take about an hour to complete
- Each Green Deal Assessment may require an up-front fee of £99 to £200 (including VAT); you must be prepared to pay this up front, obtain a receipt and upload it on to cybershop when you data enter.
- We will reimburse the up-front fees you need to pay for Each Green Deal Assessment when a receipt has been supplied.
- There is likely to be around a 2 to 4 week turnaround in getting this money back so please bear this in mind before accepting the assignment. If an organisation asks for more than £200 including VAT upfront for a Green Deal assessment please ring another organisation off your list provided by ESAS.

Date and Time Requirements

- In total, the whole exercise should take approximately 8 to 10 hours. The process is likely to take 4-6 weeks.
- **Do not accept this assignment if you are not prepared to complete all 5 assessments.**

Profile

- You **MUST** be the householder or the partner/spouse of the registered occupant of the property and not living in social housing
- You **MUST** live in England or Wales.

Restrictions

- You **MUST NOT** have any close friends or family that work for Department of Energy and Climate Change or a company associated with or part of the Green Deal Scheme in the last 5 years.
- You **MUST NOT** work, or have worked for Department of Energy and Climate Change or a company associated with or part of the Green Deal Scheme in the last 5 years.
- You **MUST NOT** live in Scotland
- You **MUST NOT** of had a Green Deal assessment carried out on your property in the last 12 months as the ESAS call handler or Green Deal organisation may be able to view this information and this may arouse suspicion
- You **MUST NOT** have a home which is less than 10 years old

Proof of Assessment Requirements

- The Green Deal Assessment should result in 2 documents:
- A 'Green Deal assessment report' and 'Occupancy Assessment' that you need to post to GfK
- You **MUST** **also** upload a copy of your receipt showing the fee paid to the Green Deal assessor (A credit card statement will also suffice)

Data Entry Requirements

- You will need to complete a questionnaire for each assessment you complete (4 or 5).
- **You must enter results up to Q5-6 on the day you make your call to the Green Deal organisation to book a Green Deal assessment.**
- **You must enter results up to Q10-6 on the day you are scheduled to have a Green Deal assessment carried out at your home.**
- Failure to this will result in the assessment being deallocated/cancelled as we will assume that you have not commenced your assessment.

  If the appointment is cancelled or the Advisor does not show up, you must let GfK know by emailing charles.blythe@gfk.com
- Save your report up to Q10.6 on CyberShop. Do not submit the rest of your feedback on CyberShop until your assessment is complete and you have waited 5 working days for any documentation that you may be sent.
- Failure to enter your results within the specified timescales will result in the assessment being deallocated and non-payment.
- You must upload proof of the fees paid to the Green Deal assessor or else you will not be reimbursed

Contact Information

- If you have any queries regarding this assessment please contact us at charles.blythe@gfk.com
- To help us answer your query as quickly as possible please include your name, advisor number and the Visit ID number of the assessment in your email.

Your Coversheet and Questionnaire

- You **MUST** print and complete the Coversheet and Questionnaire for every Assessment.
- You **MUST** retain the completed printed paperwork for at least 3 months (unless otherwise stated) after the assessment so that if needed you can be contacted and answer any query that may arise from your assessment.
- **Failure** to print your Coversheet and Questionnaire before you complete an assessment will mean the assessment is invalid and you will

Technical Annex B: Assessment analysis

Approach

For this part of the project, the aim was to understand better how the Green Deal assessments were working in practice, review the reliability and quality of the outputs produced, and identify key aspects of the assessment process that contributed to variation in the information and advice provided to the mystery shoppers. The data submitted by the four separate Green Deal assessors were compared to the baseline information determined by an independent Green Deal assessor and to information reported by the mystery shoppers. This technical annex provides detail on the methodology used to analyse the assessments.

Data sorting

DECC provided data from the EPB Register to the project team for analysis. Identifying all the assessment records associated with a specific home was straightforward because each dwelling had a unique, seven digit identification number which was common to all assessments undertaken on that home. The data from the EPC and OA databases were paired up using common identifiers. The data were cleaned to address problems caused by duplicate records being uploaded for a single assessment. In such instances, one of the duplicated records was removed from analysis with the most recently submitted version being retained (where this represented the updated one).

Dwellings clearly having four separate assessments were isolated for further analysis. EPB Register data from four sets of Green Deal assessments were only available for 29 properties. For the purposes of this report homes are identified as ID nos. 1 – 29. The GDAR data from these 29 properties were analysed to identify variables on which there was inconsistency. Some information was missing in the datasets provided to the study team, as extracted from the EPB Register. No dwelling had full information for all four assessments. Some of the datasets (including those detailing the construction period of the dwelling and the basic construction information for different parts of the dwelling) contained data in very few fields. These parameters were excluded from the analysis where insufficient data were available for comparison.

The dataset detailing information about predicted total energy use in the EPC, both pre and post-retrofit, was also excluded from the analysis; this was to avoid confusion between the post-OA energy use (which is used for the Green Deal analysis) and the pre-OA energy use (which is not directly used for the Green Deal). However, space heating and hot water energy consumption from the EPC is used in the later analysis (see 5.21). Furthermore, the process used to determine recommended measures for the EPC differs from that for the Green Deal assessment: the order in which the recommended measures are listed is slightly different in the two methodologies, affecting the cumulative calculation of savings. A number of measures cannot be specified for the former, but can be included in the latter (e.g. if the assessor cannot identify the thickness of insulation in the loft due to restricted access, “loft insulation” is not permitted as an improvement measure for the EPC, but is allowed within the context of the GDAR). Since the focus of this report is on the GDAR, and to avoid additional confusion in discussing the results, the decision was made to focus efforts on the recommendations

generated as a result of the OA, as opposed to the EPC. The comparison of the Green Deal assessment process therefore centred on:

- A number of input and output parameters associated with the EPC calculation;
- Total energy use for both pre and post-retrofit scenarios, in relation to the EPC calculation;
- The construction period of the dwelling (for some properties);
- Basic construction information for different parts of the dwelling (e.g. where the properties associated with a newer extension may differ from those of the main building).
- A number of input and output parameters associated with the Occupancy Assessment (OA);
- The list of recommended improvement measures as advised by the assessor on the basis of the OA;
- The improvements recommended through the OA resulting in “typical” and “estimated” savings, with indicative total cost;
- Outputs from mystery shopper questionnaires.

Independent Green Deal assessors

Independent ‘control’ surveys of selected dwellings were commissioned to provide information that could be used to validate the inputs/outputs from the GDARs, or to identify factors contributing to any inconsistencies between assessments. It was originally proposed that properties would be chosen on the basis of need for clarification (e.g. unclear assessor input) or particularly evident inconsistencies across the four assessors. However four sets of Green Deal assessments were only available for 29 properties. It was therefore agreed that independent assessments would take place on all these 29 dwellings.

CADS Housing Survey (CADS HS) was responsible for organising the independent surveyor visits. CADS HS recruited qualified Green Deal assessors from their pool of surveyors. Potential assessors were first screened for any conflict of interest versus the assessments carried out in the mystery shopping field phase. Surveyors were then briefed on the purpose of the project. Each surveyors was provided with a pro forma to be used during the property visit (an example of which is shown in the research tools section below). The pro forma was part-completed with data provided by HWU. These highlighted particular areas of variation for the assessor to focus on as identified in the analysis of the mystery shopped GDARs. The aim was for the assessor to establish the actual situation and/or seek to explain the interpretation or approach that led to the inconsistencies in the GDAR results. A pilot property assessment was conducted to refine the methodology and address any issues with the pro forma. The assessors produced a Green Deal assessment for each property (provided in the form of a set of data exported from the GDA software) and took photographs of the properties visited to provide evidence where required.

Measuring variation

The assessment records were scanned for two types of variation:

- **Intra-dwelling variation** - i.e. does the input used and output generated for all four assessments of the same dwelling match, and if not why?
- **Inter-dwelling variation** – i.e. do all dwellings exhibit similar trends and what factors contribute towards this?

A series of key inputs were identified to evaluate the effect of variation in these parameters on output metrics. These input factors are listed in the table below together with the component of

the Green Deal assessment that they are relevant to (where 'RM' represents 'Recommended Measures'). Whilst all these parameters have been investigated, the bold text indicates the input parameters discussed in greater detail in this report.

Input Parameter	Relevant to:	Limitations of data / Factors to consider
Total Floor Area	EPC, OA	The EPB Register did not indicate whether the total floor area value was derived from internal measurements, or adjusted external measurements (taking into account wall thickness). Data describing the heat loss perimeter were not available.
Building form	EPC, OA	Whilst information describing the form of the property (e.g. house/ bungalow/ flat/maisonette, and detached/semi-detached/mid-terrace/end-terrace) was available, there was no indication of the core parameters required to understand heat loss, e.g. configuration of walls with respect to whether they are adjacent to heated spaces or not.
Main heating type	EPC, OA,	Not all assessors reported a boiler index number (used, through the Sedbuk database, to identify manufacturer and model), therefore it was not possible to determine the performance parameters for systems (specifically hot water and space heating efficiency) manually specified.
Secondary heating type	EPC, OA	Description of a secondary heating system was excluded by some assessors.
Heating controls	EPC, OA, RM	Appendix V[44] provides guidelines such that an assessor can choose a suitable upgrade for a heating control system found in a dwelling. These heating control options are categorised in terms of, for example, type (or existence) of thermostat etc.
Properties of construction elements	EPC, OA, RM	Only the energy efficiency rating of construction elements, a simple 1 to 5 score of efficiency, was available via the EPC Register. Some data was available for individual "parts" of the dwelling, but not enough information was included for a full assessment of heat loss variations assumed by the different assessors. Therefore it was not possible to determine the construction material, thickness of any insulation or the location of its installation (e.g. within the cavity or internal / external to wall). This analysis was also severely inhibited by the lack of "construction age" data. The age of the dwelling is a key input parameter to the RdSAP calculation in relation to the determination of U-values for construction elements.
Number of occupants	OA	The figure for number of occupants was compared across the assessments conducted on each dwelling.
Thermostat temperature set-point	OA	The thermostat temperature set-point was reviewed. It was not possible to determine with full confidence where assessors had adjusted the temperature value for thermostats located outside the

[44] Appendix V: Calculation of energy use and costs using actual occupancy parameters, RdSAP 2009 version 9.91: Occupancy Assessment version Oct 2012 (with minor amendments December 2012)

		"living room" (identified by a 3°C difference relative to the minimum temperature value, and compared against the independent assessment result).
Heating schedule	OA	The percentage of weekly hours for which the heating system is active was compared via the EPC Register. This does not account for variation in the length and division of heating hours (and consequent effects on temperature drops between heating periods).
Software used	OA	This was particularly relevant to the thermostat temperature set-point. Guidance provided in the software handbook was reviewed.
Wet/Cold appliances and bathing facilities	OA	Values reported in the assessments were compared for each dwelling.
Orientation of roof for solar technologies	RM	This was only reviewed where solar technologies were specified (where not reported otherwise). No information was provided regarding the area of roof, or level of over-shading.
Energy bill data	OA	Whilst "typical" and "actual" energy data were reported for the occupancy assessment, it was not possible to confirm whether bill information had been used to calibrate the latter unless reference was made to the mystery shopper questionnaire – even then, this did not provide quantitative information. The assessor's use of energy bill information has been reviewed against duration of the assessment (see Figure 4.23.

In addition to the input parameters described, a number of outputs were also reviewed. These are listed in the table below. Again, the text highlighted in bold represents parameters discussed in greater detail in this report.

Output Parameter	Relevant to:	Limitations of data / Factors to consider
EPC Rating	EPC	Without access to the complete range of input parameters, it was not possible to directly quantify the effect of these on the variation of the resulting outputs, but their level of influence could be qualitatively assessed.
Space heating energy requirements	EPC, OA	These data were reported in different forms: as energy costs in the EPC data; as energy consumption in the OA data. The limited availability of data in the OA database made it impossible to attribute variation in the outputs to any of the input parameters, without access to key information such as the energy bill calibration inputs. A decision was made to assess the EPC outputs, as the EPC calculation should follow a more standardised process. Any variation occurring at this stage is carried through to the OA assessment.
Hot water energy requirements	EPC, OA	As with the space heating energy requirements, data were available in a number of forms. A decision was made to review the EPC outputs (see above).
Lighting energy requirements	EPC, OA	Only the current and potential lighting energy cost was available via the EPC Register, therefore these values were compared between assessments for each dwelling (on the assumption 'potential' featured

		maximum energy efficient light fittings).
Recommended Measures	RM	The ability to fully assess the validity of recommended measures was limited by the availability of the relevant input parameters (e.g. construction elements were only described by an energy efficiency rating and limited material/thickness information). However, comparison between assessments highlighted differences and these could be reviewed against findings from the project's own assessment. The appropriateness of some measures could be clearly identified by referencing section V14 of Appendix V (see footnote 36) which details the conditions under which a specific measure can be offered to an existing dwelling.

The GDARs produced by the project's retained assessors were, in effect, guided reports based on analysis of the four mystery shopped GDARs returned for each dwelling. They contain commentary useful in highlighting why certain differences between assessments occurred. This information was reviewed and overarching themes reported.

Linkage with Mystery Shopper Questionnaires

In addition to the input-output analysis mentioned above, information collected by the mystery shopper questionnaires was also cross referenced against some of the aforementioned parameters to inform a judgement on whether the process adopted by the assessor had an impact on the quality or reliability of data collected. Whilst all the parameters outlined in the table below were reviewed, those highlighted in bold are discussed in greater detail in the report. 'AP' indicates the 'assessment process'.

Input Parameter	Relevant to:	Limitations of data / Factors to consider
Basic property information	EPC, OA	The occupant provided information describing parameters such as the age of the property and the construction type. This was used to inform the analysis of the EPC and OA records. Occupants may not be sufficiently experienced (or informed) to provide accurate information (e.g. differentiating between solid and cavity brick construction).
Duration of the assessment	AP	Reference was made to the mystery shopper questionnaire to determine the total length (including the dwelling survey and occupancy assessment) of the assessment process.
Quality of EPC physical survey and OA	OA, RM, AP	The occupant was asked to confirm (yes or no) whether an assessor asked about an input parameter, or if they checked for themselves. Confirmation of the latter may have been difficult to determine (if, for example, purely observational).
Assessor Organisations	AP	The organisations carrying out the assessment were noted to see if this has an influence on any values used as an input or practices more generally.

Research tools

The pro forma below was developed to be used by surveyors during the property visit.

Auditor Name:		Software version used	
Reference			
RRN			
Postcode			
Report Type			
Inspection Date			
Lodgement Date			

Summary of observed differences
EPC assessment [Dwelling-based]: **Occupancy assessment:** **Recommended measures:** **Auditor to include observations relating to:**
Audit feedback
Auditor comments regarding complexity of surveyed address

Limitations

The study methodology had certain limitations, detailed below.

Lodgement issues with Landmark - The OA database only allows an 'OA' report to be lodged when it is linked to the exact EPC that was produced alongside the OA. The EPC database only exhibits the most recent EPC so only the EPC with the most recent date can be linked. As a result, if an Assessor did not lodge the OA and EPC immediately after the assessment date (which is not required by the GD code of practice) a subsequent GD assessor may lodge their 'later' EPC and OA afterwards and the earlier assessment can no longer be lodged. As such, although 48 properties had 4 assessments, the project team only had access to the data of 29 properties.

Some input parameters could not be determined because relevant data were missing from the Landmark export – The data set received from Landmark only provided information on parameters covered by the DECC's data access agreement. Some building/occupant parameters were either missing or only partly described. Some quantities, although not present, were partly described by proxy variables (e.g. assumed wall construction U-value was not specified but an energy efficiency rating was given). Some parameters could be inferred from other associated variables (e.g. the heating system could be derived from the Sedbuk database using the boiler index number), while other checks (such as viewing the property on Google Maps) were used to confirm other basic properties of the dwelling. The project's independent assessment provided the ultimate validation of the actual dwelling properties, though did not necessarily provide clarification of the values used by other assessors. The following list suggests input data that would have been useful within the Landmark database but was not available for the analysis:

For building parts (where "parts" is defined in the Landmark database)**:**

- Construction age band (where this is critical to determining a wide range of default assumptions, including U-values)
- Floor Area
- Average room height
- Exposed Perimeter
- Ground floor construction type (suspended or solid?)
- Stone/Solid brick walls only – dry lined or lath plaster?
- Details for any 'alternative walls'
- Roof description (e.g. pitched, flat, room-in-roof, thatched)
- Location of any roof insulation
- Clarification where different "roof scenarios" have been applied (e.g. where part of the dwelling has no roof insulation)
- If glazing area is much more or much less than typical – location (i.e. building part), window or roof window?, area (including frame), orientation

For whole dwelling inputs:

- Glazing type (single, secondary, triple and dated)
- Number of external doors (count of insulated and non-insulated)

- Where no product index number is provided for the main space heating system, clarification of flue type, ignition type and existence of fan-assisted flue
- Lighting – number of fixed lighting outlets, and number that are energy efficient fixed lighting outlets

Other useful information (though not relevant for all dwellings)**:**

- Details of any conservatory (area, height, heating set-up etc)
- For flats or maisonettes, is access corridor heated?
- Details of any renewables or energy conservation measures installed

Unclear causal effects – The project team had a detailed knowledge of the calculation algorithms within SAP methodologies but discrepancies in outputs from assessments on the same dwelling could not always be isolated to a single parameter. The dwellings were not re-modelled to provide this kind of detailed sensitivity analysis. However, with a knowledge of the key inputs likely to cause noticeable differences in outputs (SAP rating, energy savings etc.) and the project's independent survey, the main causes of the discrepancies could be inferred where all necessary input parameters were confirmed. If causal links appeared across the whole sample of dwellings (e.g. the relative effect of an input parameter on assessor outputs) this was used as further validation of a hypothesis.

Limited number of dwellings with four assessments in Landmark – The 29 dwellings assessed is a small sample. Even with a larger sample, the reasons for assessment variations may be quite specific to a single dwelling. However, the analysis undertaken signals where common mistakes, misjudgements or more systematic errors are occurring. These may be due to stochastic errors (which may or may not be seen in other assessments), or recurring themes. Examples of this could be certain house types having similar variations in assessment (due to assessors, or software, finding that house type more difficult to standardise and define) or certain parameters being poorly understood by the assessors (e.g. disagreement in thermostat temperature in the occupancy assessment might suggest that assessors do not know which value to use).

Annex C: Informal note on experience with booking GD assessments

This informal note on experience with booking GD assessments was issued to DECC on 14 March 2014, during the research phase of the project.

Introduction

This informal note is an unscheduled deliverable providing early reflections on the experience of the mystery shoppers during the field work phase of the mystery shopping project being carried out under the Green Deal & ECO evaluation that is being conducted by ICF with the support of GfK NOP and other subcontractors.

In this project, the goal was for a group of mystery shoppers to arrange for Green Deal assessments to be carried out on their homes by four different assessors who would not be aware that this is a research exercise. After each visit the mystery shopper has to complete a structured questionnaire detailing their experience (e.g. clarity of information provided, information sought by the assessor, whether assessors offered/explained Green Deal finance). The field work phase formally started in 12th February. The field work phase was due to finish on 14th March 2014 but has been extended until the end of March owing to the many issues that have arisen.

The mystery shopping project provides insights into the experience of the early GD Customer Journey for an **active** '**average consumer'** - one who attempted to find a GD supplier to undertake an assessment, rather than respond to initial contact made by a GD supplier, e.g. through leaflets, cold calls, etc. .

Findings

The table below reports findings from the first phase of the mystery shopping project, in which shoppers were asked to make bookings with four assessors. The sample is not large but the findings were widespread and consistent enough to suggest that there is substance to the issues raised. Shoppers were drawn from across the country and intended to represent a mix of different household types. After the pilot phase, shoppers with efficient homes were screened out as part of the recruitment process.

Stage of the journey	Finding
Finding a GDA	In the piloting phase, which took place in early February, shoppers that attempted to find GDAs without reference to the ESAS list struggled. Most energy companies were either non-responsive or directed the shopper to ESAS. They had little success with online searches. In the piloting phase shoppers that contacted ESAS for advice on the Green Deal were advised not to proceed to an assessment if ESAS had access to an EPC for their property which suggests that the property is already efficient. This screening mechanism appears to be working well in the interests of the consumer. Customers that are not screened out by this procedure are provided by ESAS with a list of Green Deal Assessors (GDAs) who serve their area.
	The list is supposed to show GDAs that serve the postcode area of the customer's property. It

Stage of the journey	Finding
	appears to be drawn from the GDORB database. The list is long but contains details of organisations that: - do not serve the customer's geographical area; - do not carry out assessments but instead provided B2B Green Deal related services - are not currently active in the Green Deal market. Those shoppers that were able to secure 4 assessments had to call between 30 and 75 companies. Most of those companies have proved not be local to the shoppers. *"The process and information from the ESAS helpline is woeful - we had companies from Maidstone, Newcastle-upon-Tyne and even Exeter listed"* Mystery Shopper, Midland area. The experience from this mystery shopper exercise is that the list of GDAs provided to shoppers by ESAS is not fit for purpose. A visit to the GDORB website corroborates the project findings that the database delivers results that do not properly distinguish between organisations providing B2B and B2C services, or by geographical area.
	The lack of accuracy of the GDA list dramatically increases search time and costs. A 'real world' consumer might only want to speak to one or two potential GDAs (e.g. to compare on price) but the redundancy in the GDA list provided by ESAS makes finding an active, local GDA very difficult and more time consuming than would otherwise be the case.
	The shopper exercise suggests a lack of depth in the assessor market in some parts of the country. Of the 60 mystery shoppers originally recruited only 30 (as 19th March) have been able to book 4 assessments having exhausted the ESAS list of GDAs. This was after three to four weeks of attempting to book these assessments. Five shoppers managed to book two or three assessments but were unable to secure all four.
	About 80 shoppers have pulled out of the project to date in total because of the combination of problems described above (e.g. frustrated due to amount of time spent trying to book assessments, told by ESAS their property was already sufficiently efficient, unable to secure four assessments in timescales required etc.)
Making a booking	Shoppers have reported a lack of interest/enthusiasm on the part of many assessors, both in conversation and as indicated by the lack of response to phone calls (GDAs not returning calls). This is not entirely a matter of the geographical issues referred to above. Some organisations have told shoppers that they are not able to do assessments until April 2014 "due to cuts in government funding". This may be a result of uncertainty following the Autumn Statement which may be contributing to the supply side reticence. This could indicate linkages between Green Deal assessments and ECO financing, but the comments suggest a broader reluctance to engage.
Cost of assessment	Most assessors are charging for assessments (of 78 receipts that have been processed to date, only 3% of assessments have been free). The average price on data collected to date is £140, within a range of £0 to £192. The GDA usually requires payment upfront. There are no data on the assessment price in the ESAS list so the consumer cannot target the least cost provider.
The assessment experience	Shoppers are completing questionnaires that will be analysed and reported

Mystery Shopper Quotes

“I seem to be having a bit of a problem getting anyone to agree to the survey. I rang the ESAS and got a list of suppliers, "In my area". I have got about two thirds of the way down it but I either cannot get connected or the companies are based miles away and do not actually cover my area. Interestingly, when I 'phoned [ ] on the list) I was basically told that I should really have a good think about it before I committed to a survey!! A few companies have also told me that they are not doing anything this month as they are waiting to see what happens in April when the new rates come into force.

I will keep you informed, but so far I have only encountered one company who is prepared to offer me a survey and I have had to apply via their on line request service and I have not had a reply yet.”

“The advice line provided a list of about 30 numbers. Of these, 5 numbers rang until the line went dead with no answer or option to leave a message. Of the other, 1 person took my details and said they would email with next steps, one took my details but said there was no assessor available to make an appointment and that someone would return my call. I left messages with other companies”.

“I have not yet updated you because none of the Green Deal providers I contacted have yet given me a definite appointment. All have said they would ring me back - so I planned to contact you when I had the first appointment.

This is where I am so far: -

- *Company X gave me a tentative date for next Monday, but when they phoned back they could not confirm this and promised to phone again tomorrow.*
- *Company Y who I also phoned yesterday said they would call back, I'm still waiting for their call.*
- *Company A who I called today asked me to complete an application on their website first, I did this and called them back and they said they would now contact an assessor in my area who would call me.*
- *Company B said they could not give me an appointment until the end of April, if at all - so I decided not to pursue this company.*
- *Another company I phoned said they were in a training stage for Green Deal Assessors and so could not give me an appointment.*
- *Two further companies said they could not provide assessments in my area - despite them being on the ESAS list for my postcode.*
- *Other numbers I tried just didn't pick up the phone or played recorded messages that no one was available.*

I also found that some of the people I spoke to seemed surprised that I should be phoning them to ask for a Green Deal assessment and almost tried to put me off. Is this a common reaction? I will continue calling and chasing up the companies tomorrow and contact you when I get the first definite appointment.”

I went through the whole list of Green Deal assessors and only one was based within 25 miles of my home. Many were in Scotland, others in Manchester, Liverpool, etc. From the given list one could not tell where they were based as one was given a phone no and email address. What a waste of time and money.

Four companies I contacted in the Midlands told me it was too far to justify the job.

One company with a Hereford (my county so I recognized it) no. told me it was too far to come. I asked why. She said that they were based in Glasgow and didn't have anyone in Herefordshire who could do the job.

And on and on.. So I'm left with these assessments above which obviously I cannot complete. Please look favourably on my efforts I really have spent hours and hours trying to do a decent job and have failed through no fault of my own.”

Annex D: Comparison of length of visit against participant perception of whether visit was long enough

Introduction

Comparison of responses to question 10-5 (“I felt the whole process was…Far too long/ Slightly too long/ About right/ Slightly short/ Far too short) and question 7-0 (“How long did the Green Deal Advisor spend at your home in total”).

	Total	Up to 60 min	61-120 min	>2 hours
Far too long	**6**	0	0	6
	3%	0%	0%	14%
Slightly too long	**30**	0	18	12
	16%	0%	17%	28%
About right	**116**	14	78	24
	64%	44%	74%	56%
Slightly short	**23**	13	10	0
	13%	41%	9%	0%
Far too short	**7**	6	0	1
	4%	18%	0%	2%

Base: All completed assessments (182)

Source: GfK NOP

Annex E: Detailed breakdown of the output from the assessments by the project's retained assessors (CADS HS)

Reference ID	Dwelling id 1	Mystery Shopper Assessment			
Measure/Observation	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Hot water cylinder thickness	38mm	38mm	38mm	25mm	38mm
Living room temperature	20^0 C	20^0 C	23^0 C	18^0 C	The thermostat is set at 20^0 C, this is in the hall so the living room temperature should be correctly identified as 23^0 C
Heating schedule	12%	21%	19%	12%	On – 6:30 – 7:30 and 17:30 – 20:30 on all 7 days of the week, i.e. 17%
Baths per day	0.29	0.18	0.25	0.29	0.14
Showers per day	1	1	1	1.43	1
Roof EE rating	4	3	4	4	Loft is easily accessed and average depth of Loft insulation = 200mm
Orientation		South	South	East	The property is orientated perfectly to receive PV (assume South)
Fuel bills					Fuel bills were provided but could not technically be used as the owner has changed provider and only provided a total of 9 months of bills

Improvements	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
Floor insulation						
Ground source heat pump						
Solar water heating						
Hot water cylinder insulation						
Door insulation						
Solar-PV						

Comments

The CADS assessor commented that this was a relatively straightforward EPC on a detached bungalow. No assessor had a clean bill of health compared to the CADS assessment. A significant variation in suggested improvement measures may indicate that training with respect to their applicability is either inadequate or is not being applied.

Reference ID	Dwelling id	Mystery Shopper Assessment

	2				
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area	107m^2	109 m^2	110 m^2	107 m^2	109 m^2
Cylinder insulation	25mm	12mm	25mm	38mm	Measured at 32mm, no value in the drop down so next lowest should be used – 25mm
Room thermostat	25°C	25°C	21°C	22°C	Set at 21/22^0 C – so should be input at 25^0 C
Heating schedule	67%	65%	65%	65%	66.7%

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Floor insulation						
Loft insulation						
Heating controls upgrade						
Upgrade boiler						
SWH						
Insulated doors						
PV						

Comments
Fairly straight forward but “converted” garage and first floor set back may have caused issues.

Reference ID	Dwelling id 3	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area		218 m^2	204 m^2	176 m^2	192 m^2	217m^2
Room thermostat		none	At least 2	none	none	None present
Lighting EE		5	1	1	1	Mixture of tungsten and LELB
Orientation		East	East		South East	South

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
Internal wall insulation						
Solid wall insulation						
Floor insulation						
Hot water cylinder insulation						
Heating controls						
Replacement boiler						
Biomass wood pellets room heater with boiler						
Biomass wood logs boiler						
Solar water heating						
Door insulation						
Solar-PV						
Wind turbine						

Comments
The CADS assessor commented that this was a very complicated property with lots of indentations and nooks making it easy to incorrectly record floor areas.
Significant disparity between the mystery shopper inputs and those defined by the CADS assessor
Again there is unanimity about measures

Reference ID	Dwelling id 4	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area		62 m^2	53 m^2	52 m^2	57 m^2	61m^2
Living room temperature		16^0 C	17^0 C	19^0 C	21^0 C	The room stat is in the hallway and is set at 17^0 C, this should be increased by 3^0 C to provide the temperature in the main living room, 20ºC is the correct setting
Secondary heating						
	Type	Open	Not recorded	Convector	Fire with open flue	Flame effect gas fire in the living room
	Fuel	Gas		Electric	gas	
	Efficiency	20%		100%	63%	
Showers per day		1	1	0.86	0.86	1 shower per day and 8 baths per week
Baths per day		1	3	1.14	1	

Improvement measures	A1	A2	A3	A4	CADS	Comments from CADS Assessor
External wall insulation with Cavity wall insulation						
Floor insulation						
Waste water with heat recovery						
Door insulation						
Micro-CHP						
Solar-PV						

Comments

The CADS assessor commented that this was a relatively straightforward ex-local authority ground floor flat

Thermostat settings may have been altered in between visits

Reference ID	Dwelling id 5	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area		80 m^2	72 m^2	80 m^2	80 m^2	80m^2
Heating controls		As per CAD	As per CAD	No TRV	No TRV	Programmer/TRV's/Room thermostat
Thermostat set point		17ºC	17ºC	17ºC	20ºC	19ºC
Secondary heating system		As per CAD	Not stated	Not stated	Not stated	Electric room heater

Improvement measures	A1	A2	A3	A4	CADS	Comments from CADS Assessor
Heating controls						
Upgrade boiler						
Insulate doors						
SWH						
PV						

Comments

The CADS assessor commented that some rooms did not have TRVs but that the living room did. Convention is to record living room controls.

The CADS assessor commented that the client on occasion has the thermostat set at 21ºC (18 + 3ºC) but the 4 assessors all recorded a temperature that was different to either the CADS assessor's input or the additional information provided about the variability of thermostat set point.

Reference ID	Dwelling id 6	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor Area		54m^2	54m^2	62m^2	51m^2	53m^2
Hot water Cylinder Insulation thickness		12mm	50mm	38mm	25mm	Cylinder insulation measured with a probe was 32mm. No choice of this dimension so convention is to use the next lower thickness – 25mm
Secondary heating		None	Open fire	Open fire	Open fire	Open fire in lounge
Wall construction						Extension is suitable for cavity fill (subject to more thorough investigation)
						Main building is off solid wall construction and could be insulated externally
Lighting EE rating		1	3	1	4	Some CFL but mostly tungsten
Orientation				South	North	South South West
Billing information						Gas and electric bills were available. Spending on secondary fuel should be marked as unknown

Improvement measures	A1	A2	A3	A4	CADS	Comments from CADS Assessor
Loft insulation						
Cavity wall insulation						
Solid wall insulation						
Floor insulation						
Hot water cylinder insulation						
Draught proofing						
Lighting						
Hot water cylinder thermostat						
Replacement boiler						
Solar water heating						
Double glazing						
Door insulation						
Solar-PV						
Wind turbine						

Comments

CADS assessor commented this assessment was fairly straightforward

There is a significant disparity in recommended measures

Reference ID	Dwelling id 7				
Comments from Mystery Shopper Assessment					**Comments from CADS Assessor**
Measure	**A1**	**A2**	**A3**	**A4**	
Floor area	171 m^2	133 m^2	139 m^2	155 m^2	147m^2
Secondary Heating	Closed room heater	Closed room heater	Not recorded	Closed room heater	Wood burning stove in the main living room
Glazing EE rating	3	3	3	3	Double glazing present but is very old
Orientation	n/a	South	East	South West	No need to supress any recommendation for PV as the property has 4 acres of garden, i.e. orientation South
Room in the roof insulation					Difficult to verify but thought unlikely to be present

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
Room in roof insulation						
Internal wall insulation						
Cavity wall insulation						
Solid wall insulation						
Floor insulation						
Heating controls						
Replacement Boiler						
Air Source Heat Pump						
Solar water heating						
Double glazing						
Solar-PV						
Wind turbine						

Comments

This was a tricky property which had a well-disguised extension that appeared to be stone built but was actually cavity (with partial fill). The floor area in the room-in-roof was difficult to calculate. The owner reported that they were very unhappy with the professionalism of one of the assessors.

Variation in choice of measures is again the most striking aspect.

Reference ID	Dwelling id 8	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Roof EE rating		4	3	1	3	3
Glazing EE rating		3	3	1	3	3
Lighting EE rating		5	4	4	5	5
Heating controls		No RT	As per CAD	As per CAD	As per CAD	Programmable RT with TRV
Baths per day		-1	-1	-1	0	
Showers per day		0.7	1	1	0.71	
Thermostat settings		22ºC	19ºC	21ºC	21ºC	22ºC
Heating schedule		38%	34%	34%	30%	39%
Orientation		West	East		East	East

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft Insulation						
Internal wall insulation						
SWI						
Floor insulation						
D/Proof						
Insulated doors						
SWH						
PV						

Comments
Low complexity/ straight forward

Reference ID	Dwelling id 9	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
HW cylinder thickness		25mm	25mm	25mm	38mm	38mm
Loft EE rating		3	1	3	3	Access available – 100mm
Secondary heating system		Yes - 612	Yes - 612	Yes - 612	Not stated	Not safe to use
Thermostat set point		20°C	21°C	24°C	23°C	Thermostat set to 21°C in hallway therefore 24°C
Tumble dryer present		10%	15%	10%	0%	Combined washer dryer (33% of washes)
Available energy data		yes	yes	yes	Yes	Only 9 months made available – therefore no bill data
Roof orientation			South + SE	East		SE and SW for SWH and PV respectively

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
CWI						
Floor insulation						
Heating controls						
Upgrade boiler						
SWH						
PV						

Comments

This was a very simple property to assess- no extensions, access available to loft etc. Possible slight complication only with the roof pitch as there were 4 different pitches.

Reference ID	Dwelling id 10	Mystery Shopper Assessment			
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area	94 m^2	97 m^2	92 m^2	118 m^2	96
Loft Insulation	4	4	4	3	4
Lighting EE rating	4	3	4	2	4
Thermostat set point	19°C	22°C	18°C	19°C	22
Active heating time	44%	38%	39%	36%	44%
Baths per day	2	1.43	1.43	1.43	1.43
Showers per day	2	2.43	2.57	2.43	2.57

Improvement measures	A1	A2	A3	A4	CADS	Comments from CADS Assessor
Loft insulation						
Floor insulation						
Heating controls						
Upgrade boiler						
SWH						

Comments
Only complexity was PV and its power and the occupant knew.

Reference ID	Dwelling id 11	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area		115m^2	115m^2	115m^2	115m^2	115m^2
Roof EE rating		4	3	3	3	3
Window EE rating		3	4	3	3	3
Thermostat set point		18°C	19°C	21°C	19°C	22°C
Boiler code		Not stated	16414	Not stated	16414	Viessman Vitodens 200
Baths per day		1	1	0.57	1	0.42
Showers per day		0.71	0.86	0.29	0.71	0.71
Orientation		East	East	East	South	South

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
Floor insulation						
Insulated doors						
SWH						
PV						

Comments
The only complexity is that the second extension includes an integral garage which has since been converted to a utility room but should be measured out and the extension is not as deep at first floor level.

Reference ID	Dwelling id 12	Mystery Shopper Assessment			
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area	72m^2	72m^2	75m^2	53m^2	71m^2
Roof EE rating	4	1	4	1	1
Lighting EE rating	5	5	4	5	4
Bath usage per day	1	0.86	0.86	0.71	0.86
Shower usage per day	1.71	1.71	1.57	2.57	1.71

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
External wall insulation						
Solid wall insulation (ins)						
Solid wall insulation (unins)						
Floor insulation						
SWH						
PV						

Comments
Straight forward

Reference ID	Dwelling id 13	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Walls EE rating (EPC)		2	4	2	2	Walls are unfilled cavity
Living room temperature		0	19	21	0	No thermostat present
Heating schedule		32%	44%	46%	13%	33%
Baths per day		1	1	1	0.29	No shower, the owner has a bath every day
Orientation			East		South	South
Fuel bills						The owner has less than 12 months of bills so these are discounted

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
Flat roof insulation						
Cavity wall insulation						
Floor insulation						
Hot water cylinder insulation						
Hot water cylinder thermostat						
Heating controls						
Replacement boiler						
Solar water heating						
Wind turbine						
Solar-PV						

Comments

The CADS assessor commented that this was a straight forward property

A thermostat setting was defined when no thermostat was present, even though assessors A2 and A3 correctly defined the heating controls as being a programmer with no room thermostat.

The heating schedule variation was substantial

There was some, though not complete, consistency in the improvements selected.

Reference ID	Dwelling id 14	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area		251m^2	225m^2	235m^2	226m^2	223m^2
Roof EE rating		1	4	4	4	There are two roofs. One dates from 1909 and pitched, the second is flat. No additional insulation is suggested on the former (assume that the CAD assessor assumes a high roof EE, insulation is recommended on the flat roof (low roof EE)
Living room temp		21ºC	Not recorded	Not recorded	19ºC	
Occupants		2	4	4	4	4
Orientation		East	South	South	South	South
Secondary heating		Not recorded	Gas fire, closed fronted, fan assisted	Gas fire, closed fronted, fan assisted	Gas fire or wall heater, balanced flue	Secondary heating is from a gas fire
Draught Proofing						Minimal

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Room in roof insulation						
Internal wall insulation						
Solid wall insulation						
Floor insulation						
Heating controls						
Draught proofing						
Double glazing						
Solar water heating						
Solar-PV						

Comments
The CADS assessor commented that this was a really complicated property with a number of issues that could be interpreted differently depending on the surveyor.
The CADS assessor commented that the level of draught proofing in the property was minimal but did not then suggest it as an improvement measure.

Reference ID	Dwelling id 15	Mystery Shopper Assessment			
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Wall EE rating	2	3	3	1	Predominantly solid brick; small extension at rear which is assumed to be uninsulated cavity
Roof EE rating	4	4	5	4	Predominantly 150mm
Hot water cylinder insulation thickness	80mm	38mm	50mm	38mm	Factory applied jacket
Thermostat setting	20°C	24°C	21°C	21°C	21ºC
Baths per day	0.57	0.5	0.57	0.57	
Showers per day	2.29	2	2.29	2.29	
Orientation	E	E		S	NW

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft Insulation						
Cavity wall insulation						
Solid wall insulation						
Hot water cylinder insulation						
Floor insulation						
Insulated doors						
SWH						
PV						

Comments
Fairly straight forward but additional under floor heating complicated this one.

Reference ID	Dwelling id 16	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Total floor area		88 m^2	90 m^2	95 m^2	92 m^2	91m^2
Roof EE rating		4	1	4	4	There is access to the roof and there is boarding in place which has been raised 100mm above the joists, with boarding and no evidence of insulation below we should record unknown which A2 has done giving a rating of 1*, however on looking around the loft there was plenty of evidence of 200mm of insulation under the boarding and this gives a rating of 4*.
Heating controls		None; 21ºC	None; 21ºC	None; 21ºC	Programmer + thermostat; 21ºC	No thermostat or TRV;therefore default of 21ºC
Lighting EE rating		5	5	5	4	5
Orientation		South		South West	East	South

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
CWI						Metal Frame with an outer leaf of brickwork; i.e. cavity can't be filled
SWI						
Floor insulation						
Heating controls						
Insulated doors						
SWH						
PV						

Comments
The main issue in terms of complexity is wall type and how to generate the necessary recommended measures.
If you identify it as system build with the software used then external wall insulation is not recommended on the EPC in spite of external wall insulation being an appropriate improvement measure. Furthermore, you cannot record dry lining with system build as it assumes it already has it but the dry lining in this property was a retro fit. I therefore described the property as solid wall with dry lining in order to recommend external wall insulation and record the dry lining.

Reference ID	Dwelling id 17	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Total floor area		136 m^2	101 m^2	100 m^2	99 m^2	99m^2
Secondary heating		Not stated	605	Not stated	603	605
Roof EE rating		3	3	2	3	3
Glazing EE		3	3	3	4	3
Lighting EE		3	5	5	4	4
Thermostat setting		17ºC	17ºC	17ºC	21ºC	20ºC

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
SWI						
Heating controls						
Insulated doors						
PV						

Comments

Reference ID	Dwelling id 18	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Dwelling type		Semi	Semi	Semi	Mid	Semi
Roof EE rating		4	4	5	5	Not stated
Window EE rating		2	1	1	1	1
Lighting EE rating		4	4	5	5	Not stated
Wall EE rating		1	1	4	1	Not stated
Thermostat set point		19ºC	19ºC	19ºC	20ºC	19ºC
Secondary heating type		601	605	Not stated	612	Gas Fire
Boiler type (Sedbuk d/base)		294	294	294	8070	Gas Non-condensing boiler

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Internal wall insulation						
SWI						
D/Proof						
Floor insulation						
Cylinder thermostat						
Heating controls						
Heating controls (warm air)						
Upgrade boiler						
Double glazing						
SWH						
Secondary Glazing						
Insulated doors						
PV						

Comments
This is a particularly complicated property. There are complexities with the floor areas, construction and elements.
The GDAR was straightforward, although not able to verify electric and gas rates given due to no bills, just recorded data.

Reference ID	Dwelling id 19	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area		175 m^2	144 m^2	171 m^2	141 m^2	140m2
Built form		Top floor flat	Mid floor flat	Top floor flat	Enclosed end terrace house	End terrace
Heating control		manual	automatic	automatic	automatic	Manual
Cylinder insulation		50mm	38mm	80mm	50mm	50mm
Roof EE rating		1	1	3	1	100mm of insulation
Wall EE rating		2	1	2	2	Stone built – 1
Window EE rating		4	3	3	3	4
Thermostat set point		21°C	18°C	21°C	21°C	No thermostat (default = 21°C)
Orientation				East	South	East

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Room in roof insulation						
Loft insulation						
Internal wall insulation						
SWI (insulated)						
SWI (uninsulated						
Fan assisted storage heaters						
New/replace storage heaters						
SWH						
PV						

Comments

The CADS assessor comments that the property is definitely a flat above a community hall and could be seen as end terrace or enclosed end terrace, however around 55% of the rear elevation is exposed with 45% attached to another dwelling and in this respect I have recorded it as an end terrace (albeit with an attachment at the rear which reduces the heat loss perimeter.

Reference ID	Dwelling id 20	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor Area		118m^2	101m^2	124m^2	128m^2	124m^2
Living room temperature		20^0 C	19^0 C	19^0 C	19^0 C	19^0 C
Hot water Cylinder Insulation thickness		25mm	Not recorded	38mm	120mm	The cylinder has approximately 38mm of foam and 80mm of jacket (jacket recorded as half efficiency of foam, therefore 80mm of insulation should be recorded)
Bath/shower usage		0.6/4	0.57/4	0.6/4	0.57/4	4 showers per day and 2 baths per week, i.e. 0.29/4
Wall EE rating		1	1	1	4	Had sandstone to front, solid rendered brickwork to the rear, i.e. 1
Heating controls		Programmer, RT and TRVs	Programmer + RT	Programmer, RT and TRVs	Programmer, RT and TRVs	Programmer, RT
Orientation		South	East	n/a	n/a	South East

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Room in roof insulation						
Internal wall insulation						
Heating controls						
Loft insulation						
Solid wall insulation (Ins)						
Solid wall insulation (unins)						
Floor insulation						
Draught proofing						
Waste water with heat recovery						
Double glazing						
Triple glazing						
Door insulation						
Solar-PV						

Comments

There was some degree of complexity associated with this assessment. The wall may have had a cavity, the owner had lodgers who were present for more than half the year and therefore should be included in the OA, the age of the room in the roof was unknown, bill data may be slightly different as owner is constantly upgrading. This is another example where the measures suggested vary widely from assessor to assessor including the final CADS assessment.

Reference ID	Dwelling id 21	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Shower usage per day		4	3	4	4	Not stated
Heating controls		As per CAD	As per CAD	As per CAD	As per CAD	No thermostat
HW cylinder insulation thickness		50	80	50	Not stated	50mm – was an encased insulated cylinder. Thickness could not be measured so industry default of 50mm should be used
Floor area		130m^2	130m^2	131m^2	133m^2	

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
SWI						
Floor insulation						
Draughtproofing						
Heating controls						
Upgrade boiler						
Flue gas heat recovery						
SWH						
Double glazing						
Door insulation						
PV						

Comments

Property was tricky and did not sit well with RdSAP methodology – the dwelling is a converted shop with large glazing area, part of the roof is flat and has an octagonal turret room. Given this apparent complexity it is noteworthy how consistently the assessors measured the floor area. The software used by the CADS assessor did not permit heating control upgrade.

Reference ID	Dwelling id 22	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Thermostat set point		21°C	21°C	20°C	23°C	23
Heating schedule		25%	21%	29%	29%	25%
Baths per day		1	2	1	0	2.29
Showers per day		4	3	3	4	2.29
Roof EE rating		4	3	4	4	4
Orientation		S	S	S	S	SE
Viability of ASHP						No (not available on the BRE software)

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Floor insulation						
Loft insulation						
ASHP with radiators						
SWH						
PV						

Comments

Reference ID	Dwelling id 23	Mystery Shopper Assessment			
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Thermostat set point	21°C	21°C	21°C	19°C	21°C (no thermostat)
Number of occupants	3	3	3	2	3
Baths per day	1	1	1	-1	1
Showers per day	2	2	1.43	14	1
Window EE rating	4	4	4	3	Not stated
Lighting EE rating	3	5	1	4	Not stated
Heating schedule	21%	25%	13%	6%	25%

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
Room in roof insulation						
SWI						
Floor insulation						
Heating controls						
Upgrade boiler						
SWH						
Insulate doors						
PV						

Comments
The CADS assessor commented that no option came up to upgrade heating controls with their software

Reference ID	Dwelling id 24	Mystery Shopper Assessment			
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area	70m^2	69m^2	80m^2	69m^2	69m^2
Thermostat set point	24°C	21°C	21°C	21°C	Not working at the moment (normally 21°C)
Heating schedule	25%	27%	25%	31%	25%
Lighting EE rating	1	1	3	2	2
Orientation	SW	E			SW

Improvement measures	A1	A2	A3	A4	CADS	Comments from CADS Assessor
Loft Insulation						
Floor insulation						
Hot water cylinder insulation						
Heating controls						
Upgrade boiler						
SWH						
PV						

Comments
Only difficulty might be in how to properly record information relating to the non-separated conservatory. The bills sent to me by e mail were incomplete and not usable.

Reference ID	Dwelling id 25	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area		188m^2	215m^2	220m^2	201m^2	212m^2
Wall construction/EE rating		4	1	2	1	The property is of solid wall construction with a cavity wall front elevation, albeit a narrow cavity which cannot be insulated. A1 must have recorded the construction as Cavity with filled cavity to score 4*, the front wall has had wall tie replacement which they may have confused for CWI.
Lighting EE rating		4	3	4	5	There are 11 low energy light fittings and 11 tungsten giving a ratio of 50% and a score of 4*
Baths per day		1	0	0.57	1	The Client reported a figure of 0.43 baths and 3.57 showers a day
Showers per day		3.43	4	2.29	3	
Thermostat setting		19	19	19	19	The Client reported the thermostat was set at 19 degrees but it was in the hallway so we should add on 3 degrees giving a setting of 22

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Cavity wall insulation						
Solid wall insulation (ins)						
Floor insulation						
Solar water heating						

Comments
Floor insulation would be impractical and too costly to access the sub floor spaces. The cavity front wall has much too narrow a cavity for CWI. The property would benefit from external wall insulation. The pay back on SW heating does not meet the golden rule.

Reference ID	Dwelling id 26	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Total floor area		148 m^2	140 m^2	138 m^2	136 m^2	136m^2
Roof EE rating		4	5	1	5	300mm – EE rating should be 5
Heating controls		No time or thermostatic control	No time or thermostatic control	Programmer, no thermostat	TRV's and bypass	No programmer or room thermostat – TRV's on most radiators
Heating hours		23%	21%	68%	27%	19%
Secondary heating						Pre-1980
Baths		0.57	0.5	-1	1	0.29
Showers		1.43	1	2	2	2.29
Orientation		E	S	SW		SW

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Internal wall insulation						
Solid wall insulation						
Floor insulation						
D/proofing						
Heating controls						
Upgrade boiler						
Insulated doors						
PV						

Comments

The inclusion/integration of rooms from next door into the envelope of this property could be misleading, otherwise reasonably straight forward.

The disparity in description of secondary heating systems stands out as does the lack of consistency in specifying measures. It would be very interesting to understand the logic process that allowed A3 to specify a micro-CHP system for this dwelling for instance.

Reference ID	Dwelling id 27	Mystery Shopper Assessment			
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area	88 m^2	101 m^2	92 m^2	95 m^2	Unheated rear conservatory of 8m^2 might explain the discrepancy in areas
Thermostat set point	18°C	19°C	16°C	17°C	15/16ºC is stated so add on 3 to get the living room temp of 18/19ºC
Restrictions for double glazing/suitability for secondary					None
Orientation	South		North	South	Slightly north of west
Roof EE rating	4	4	4	5	200mm of insulation

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
SWI						
Floor insulation						
D/Proof						
Upgrade boiler						
SWH						
Double glazing						
Secondary glazing						
Insulated doors						
PV						

Comments
Fairly simple building with several small issues that could affect the overall results
Complex and unreliable energy data that probably isn't consistent

Reference ID	Dwelling id 28	Mystery Shopper Assessment				
Measure		**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Boiler type		Not stated	as per CAD	Not stated	As per CAD	Ariston Eurocombi
Secondary heating type		Open fire in grate	Not stated	Gas fire, open to chimney	Gas fire, open to chimney	Flush fitting Live Fuel Effect gas fire (open fronted), sealed to fireplace opening
Roof EE rating		3	1	3	3	100mm or below
Glazing EE rating		4	3	4	3	4
Hot water EE rating		2	4	4	4	4

Improvement measures	**A1**	**A2**	**A3**	**A4**	**CADS**	**Comments from CADS Assessor**
Loft insulation						
EWI						
Heating controls						
Upgrade boiler						
Insulated doors						
SWH						
PV						

Comments

Reference ID	Dwelling id 29	Mystery Shopper Assessment			
Measure	**A1**	**A2**	**A3**	**A4**	**Comments from CADS Assessor**
Floor area	78m^2	77m^2	78m^2	67m^2	76m^2
Secondary heating type	605	605	605	Not stated	605
Roof EE rating	3	3	4	3	3
Windows EE rating	4	4	4	3	4
Suitability of wall insulation					No – property age was 1994
Available energy bill data					No, the CAD assessor stated they were misleading

Improvement measures	A1	A2	A3	A4	CADS	Comments from CADS Assessor
Loft Insulation						
Floor insulation						
EWI with CWI						
SWH						

Comments

Little complexity, just need to include porch as it is non-separated and spot the PV panels and give an accurate power rating.

Annex F: Thermostat temperature set points and chosen software

Dwelling ID	A1	A2	A4	A4	CADS	Comments
	Darker colours and bold text are used to indicate the dwellings in which the project's retained assessor identified a thermostat located external to "living room" (thus incurring a 3°C increase to the thermostat temperature set point used in the calculation). Note the names of software programmes have been replaced by letters A-H.					
1	**20 A**	**20 B**	**23 B**	**18 A**	**23**	
2	**25 D**	**25 B**	**21 B**	**22 B**	**25 E**	
3	21 C	21 A	21 D	21 C	21 E	No thermostat
4	**19 F**	**21 B**	**17 D**	**16 B**	**20 E**	
5	**17 A**	**17 B**	**17 B**	**20 B**	**20 E**	
6	23 C	23 C	23 A	23 C	- E	
7	21 A	21 A	21 C	21 D	- E	
8	22 C	19 C	21 C	21 A	22 E	
9	**20 B**	**21 B**	**24 B**	**23 B**	**24 E**	
10	**19 B**	**22 B**	**18 B**	**19 A**	**22 E**	
11	**18 D**	**19 A**	**21 B**	**19 D**	**22 E**	
12	18 A	19 A	18 C	18 A	- E	
13	21 F	19 A	21 C	21 D	21 E	No thermostat
14	21 C	21 H	21 A	19 D	21 E	No thermostat
15	20 A	24 D	21 D	21 A	21 E	
16	21 C	21 D	21 H	21 C	21 E	No thermostat
17	**17 G**	**17 A**	**17 D**	**21 B**	**20 E**	
18	19 H	19 D	19 A	20 C	19 E	
19	21 A	18 D	21 A	21 C	21 E	No thermostat
20	20 C	19 A	19 A	19 C	19 E	
21	21 A	21 C	21 F	21 C	21 E	No thermostat
22	**21 B**	**21 B**	**20 D**	**23 B**	**23 E**	
23	21 A	21 C	21 C	19 C	21 E	No thermostat
24	24 C	21 A	21 A	21 C	21 E	Thermostat not working
25	**19 D**	**19 B**	**19 A**	**19 B**	**22 E**	

26	21 A	21 C	21 C	21 C	21 E	Thermostat lost
27	**18** C	**19** A	**16** C	**17** D	**19** E	
28	21 C	21 D	21 C	21 C	-	
29	21 C	21 C	21 C	21 C	-	

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