Department
of Energy &
Climate Change

Evaluation of the Renewable Heat Premium Payment Scheme Phase Two

Technical Report

January 2015

Contents

1. Introduction

This technical report provides additional information to the *Renewable Heat Premium Payment Scheme: Phase Two Evaluation Report.* It includes further details on the methodologies and analysis employed for each of the individual quantitative and qualitative research projects.

1.1. The Renewable Heat Premium Payment Scheme Phase Two (RHPP2)

The primary objective of RHPP2 Scheme was to encourage uptake of, and capture information from, a significant number of domestic renewable heat installations; with information to be collected across different customer types (private households, social landlords and tenants, community groups and related demographics) and types of housing (e.g. terraced houses, detached houses).

The scheme was expected to contribute towards:

- maintaining the supply chain;

- learning about the supply, demand, performance and use of domestic renewable heating systems; and

- driving improvements in technical system performance, future uptake and delivery.

The second phase of the RHPP scheme comprised three elements:

- one-off grants, paid through vouchers issued to householders to help with the cost of installing renewable heating technologies, and redeemed on certified completion;

- competitions for social landlords to bid for grants to cover some of the costs of installing renewable heat technologies into social housing; and

- a Communities Scheme to install renewable heating technologies in private homes, facilitated by Community Groups.

1.2. Research design

1.2.1. Research aims and objectives

The overall aims of the RHPP2 evaluation were to gain a better understanding of:

- the value and effectiveness of different mechanisms and incentives employed to influence consumers to take up renewable heating technology;

- the impact of the RHPP2 Scheme on the installer market;

- the renewable heating technologies themselves and how people used them; and

- whether the RHPP2 scheme met its objectives.

The specific research objectives for the RHPP2 scheme were to:

- provide an overview of the take up of renewable heat installations across different consumer groups, types of individuals and building stock;

- explore how and why consumers are engaging, or not engaging, with the scheme;

- examine the role of RHPP in driving improvements in the performance of renewable heating systems;

- develop an understanding of how installers are engaging with the scheme and assess the impact on their business and wider market;

- assess the scheme delivery and administration; and

  explore the effectiveness of engaging private householders, social landlords and communities to deliver renewable heating technologies.

1.2.2. Methodology

The research method was structured according to four strands:

- different customer groups (individual private households; households organised by Community Groups; social landlords and their tenants) that had applied to the Scheme and either chosen to use the Scheme or not; and

- installers and certification bodies responsible for RHT installation standards as a complementary strand.

Combinations of quantitative and qualitative research methods were applied to address for each of the five research strands the evaluation questions, summarised in Annex 1 of this Technical Report.

The quantitative research comprised four censuses, mainly using online questionnaires, as follows:

- -installation e-census and later follow-up e-census with all private households (owner occupiers only) that had redeemed a voucher;

- An e-census of all private households (owner occupiers only) that had not redeemed a voucher by the original end of the scheme (i.e. March 2013);

- An e-census of all households that had redeemed a voucher through the Communities Scheme;

- A census of all tenants that had received an installation from those Registered Social Landlords that agreed to participate in the study (e-census and paper-based response option).

The qualitative research comprised semi-structured telephone and face to face interviews with purposively selected samples among four large user or stakeholder groups:

- Private households

    - Telephone interviews with 50 households that redeemed vouchers and completed post installation and follow-up questionnaires;
    - Telephone interviews with 36 households that had not redeemed vouchers.

- Community groups

    - Face to face (6) and telephone interviews (14) with 20 Community Group Leads participating in the scheme.
    - Face to face (1) and telephone interviews (4) five Community Group representatives not participating in the scheme;
    - Analysis of 38 Project Reports submitted by Community Group Leads at the end of their community project.

- Registered social landlords and tenants

    - Face to face (4) and telephone interviews (26) with 30 Registered Social Landlords participating in the scheme.
    - Telephone interviews with 10 Registered Social Landlords that chose not to engage in the scheme.
    - Face to face interviews with 30 social tenants receiving an installation.

- Installers and certification bodies

    - Telephone interviews with 30 installers.
    - Face to face interviews with all 7 certification bodies.

Semi-structured interviews with each group were based on explicit and purposive sample frames and piloted. Interviews were recorded unless interviewees declined. Interview findings were written up and coded for analysis.

1.3. Research overview

0 overleaf provides a summary of the research undertaken including the sample frames and response rates for each participant group. Subsequent chapters of this technical report contain the details of the quantitative and qualitative data collection and analysis under these four research strands.

Table 1 Summary of research activity

Research focus	Research activity	Sample frame	Method	Number of responses	Response rate
Private Householder's motivations for, and experiences of, installing a renewable heating technologies as part of the RHPP2 Scheme	A census of all renewable heating technologies that were installed as part of the RHPP Scheme - Post-installation	All installations for which a voucher was redeemed	Online census	Households = 4,136 Installations = 4,358	Households = 84% Installations = 84%
	Follow-up questionnaire (conducted in two waves)	All installations for which a voucher was redeemed and a Post Installation questionnaire was completed	Online census	Households = 3,692 Installations = 3,869	Households = 89% Installations = 89%
	Qualitative interviews with owner occupiers who redeemed a voucher	Responses to the Post Installation and Follow-up questionnaires	Telephone interviews	Households = 50	N/a
Reasons for non-redemption of vouchers	Census of households that made an application to the scheme that did not result in a voucher being redeemed	All households that applied for and received a voucher that was not redeemed	Online census	Households = 351[1]	Households = 26%
	Qualitative interviews with owner occupiers who did	Responses to the census of Applied not Redeemed	Telephone interviews	Households = 36	N/a

[1] In total, 595 responses were received to the questionnaire. However, just 351 are eligible, while the other 244 indicated that they did not receive a voucher.

Research focus	Research activity	Sample frame	Method	Number of responses	Response rate
	not redeem a voucher	questionnaire			
Operation and effectiveness of the Communities Scheme	In-depth qualitative interviews with participating community groups	Leaders of community groups that received approval	Face-to-face and telephone interviews	Interviewees = 20	N/a
	In-depth qualitative interviews with non-participating community groups	Leaders of community groups not participating in the Scheme	Telephone interviews	Interviewees = 5	N/a
Motivations and experiences of private households in the Communities Scheme	Census of all renewable heating technologies that were installed as part of the Communities Scheme	All installations for which a voucher was redeemed	Online census	Households = 222 Installations = 234	Households = 65% Installations = 64%
Operation and effectiveness of the RSL Scheme	In-depth qualitative interviews with participating RSLs	Registered Social Landlords who received a grant award in Phase 2	Face-to-face and telephone interviews	Interviewees = 30	N/a
	In-depth qualitative interviews with non-participating RSLs	Registered Social Landlords who participated in Phase 1 but not in Phase 2	Telephone interviews	Interviewees =10	N/a
Motivations and experiences of social tenants installing through the RSL Scheme	Census of all renewable heating technologies that were installed as part of the RSL Scheme	Social tenants resident in a property in receipt of an installation	Online census and paper census	Households = 1,356 Installations = 1,378	Households = 38% Installations = 37%

Research focus	Research activity	Sample frame	Method	Number of responses	Response rate
	Qualitative interviews with RSL tenants who had a renewable heating technology installed in their home	Social tenants responding to the census	Face-to-face interviews	Households = 30	N/a
Role of installers and impact of the Scheme	In-depth qualitative interviews with installers	Sample drawn from various databases of installers	Telephone interviews	Interviewees = 30	N/a
Impacts of the Scheme on suppliers	In-depth qualitative interviews with certification bodies	All certification bodies responsible for micro-generation certification (MCS)	Face-to-face interviews	Interviewees = 7	N/a

1.4. Interpreting findings from the quantitative studies

1.4.1. General interpretation of all census data

As part of the RHPP2 evaluation, censuses were administered for all four of the sub-populations. These were administered to all the installations in the population via online or paper questionnaires. The questionnaires were developed through detailed consultation and piloted before finalising. Introductory letters, reminders, and in some cases incentives were used to encourage respondents to take part. Despite this, the attempted censuses had varying level response rates:

- Private householder census (75%-84%[2]);
- Applied not redeemed census (43%[3]) ;
- Communities households census (64%);
- Social tenants census (37%).

Where the level of non-response was high, there is a possibility that bias may have arisen in the census results. Normally, potential bias can be addressed through (post-stratification) weighting. However, due to issues experienced in the data collection phase and the complex nature of the population (further discussed in this Technical Report) it has not been possible to apply a robust weighting method to the census results to remove any potential non-response bias. Consequently, caution needs to be exercised when interpreting the data as representative of all participants on the RHPP2 scheme.

Due to the nature of the populations and the mode (online and paper) of data collection, a number of decisions have been made to facilitate clear and meaningful analysis.

Households in the RHPP2 scheme could install more than one technology and questionnaires were administered for each technology. This means that the data can be analysed at two different levels: the household level and the installation level. Most questions have been analysed at the installation level, but some household-specific characteristics (e.g. household income, awareness of the RHI scheme etc.) have been analysed at the household level. For the analysis at household level, the first of the installation questionnaires submitted by that specific household was selected. The report and accompanying tables make clear which unit of analysis has been used.

While most of the questionnaires were administered online, some were paper questionnaires. Data cleaning has removed any responses which were invalid because the respondent did not strictly follow given routing rules. However, it was not possible for a number of questions to establish – for instance because of missing answers in questions - whether or not the response is valid. These have been included in the analysis.

As with any census and survey results, where the population is broken down for analysis at a more disaggregated level (which in turns leads to a small base number) or the initial base is small (for example, due to routing from a preceding question), interpretation of the findings which are based on these small sample sizes needs to be done with care. Due to the size of the populations, this applies in particular to some of the subgroups in the

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[2] The response rates were 84 per cent to the post-installation survey and 75 per cent for the follow-up survey (and 89 per cent of installations for which a post-installation questionnaire was received were also covered by the follow-up survey).

[3] There are two additional possibilities to calculate response rates, please cf. to Section 2.3.4.

applied not redeemed census and to the biomass technology subgroup of the social tenant census.

1.4.2. Reporting conventions

Confidence intervals have not been reported in line with usual practice. This is because the installations for which questionnaires were actually received cannot be considered a random sample of all RHPP2 installations. As noted above, it was not possible to control for non-response bias, given the complexity of the subpopulations and the lack of post-stratification weighting.

In general, cross-tables showing substantive associations between variables were included in the report. For such cross-tabulations, Cramer's V was calculated as a measure of association for categorical data or Kendall's tau-b for ordinal data.

Cross-tabulations between variables that are statistically significant and have an association measure (Cramer's V or Kendall's Tau-B) of greater than 0.1 were reported as a general rule throughout the study. This is referred to as 'substantive significance' – i.e. the differences between subgroups are large enough to be meaningful.

Cramer's V is a statistic measuring the strength of association (from 0 to 1) between two categorical variables in a contingency table. It is based on the calculated chi2 statistic, and considers the number of observations as well as the number of categories under each of the two categories used. The formal definition is

$$V = \sqrt{\frac{\chi^2}{n \min(M-1, N-1)}}$$

where n stands for the number of observations; and M and N for the number of categories under each of the two categorical variables.

Kendall's tau rank correlation coefficient is a statistic measuring the direction and strength of association (from -1 to 1, where 0 signals the absence of association) between two variables in a contingency table, where both variables are measured on ordinal scale (in this analysis one was a binary variable, i.e. tau-b was used for measuring association between two groups). The coefficient measures the similarity of the orderings of the data when ranked. The tau-b variant makes specific adjustments for ties. The coefficient is defined as

$$\tau_B = \frac{n_c - n_d}{\sqrt{(\frac{n(n-1)}{2} - \sum \frac{t_i(t_i-1)}{2})(\frac{n(n-1)}{2} - \sum \frac{u_j(u_j-1)}{2})}}$$

where n stands for the number of observations, n_c for the number of concordant pairs, n_d for the number of discordant pairs, t_i and u_i for the number of tied values in the ith set of ties under the first variable; or the jth set of ties under the second variable, respectively.

2. Private households research strand

2.1. Census of renewable heating technologies that were installed as part of the RHPP2 Scheme for private householders

2.1.1. Research aims

A census of renewable heating technologies that were installed as part of the RHPP2 Scheme was designed to understand household experiences with the installation and use of their newly installed renewable heat technology (RHT). The census was taken in two stages: households were first contacted shortly after installation, and then again after the first winter had passed. The census was restricted to owner occupied properties even though the private householder scheme received applications from private landlords and private tenants. The latter were excluded to maintain consistency with the data collection in RHPP Phase 1.

The questions looked at:

- motivations to engage with RHPP2;

- the reasons for selecting the renewable heat technologies subsequently installed;

- financing arrangements in place to cover the costs not reimbursed by the RHPP2 scheme;

- customers' experience of the installation process including training on the use of the new technology;

- the perceived performance of the new RHTs and general satisfaction;

- customer views on the benefits and disadvantages of the installed technology;

- experiences of using the technology and how this compares to their previous heating system; and

- customer perceptions concerning energy consumption, heating costs, quality of installation.

2.1.2. Census methodology

Choice to use a census approach

The two-stage census comprised the population of installations in eligible homes (owner-occupiers who installed a supported renewable heating installation) who had redeemed the corresponding issued RHPP voucher.

The census approach was chosen over an alternative random sampling mainly because there were uncertainties at the outset of the research as regards to the anticipated response rates. The census was the best option to maximise the number of responses, required for robust findings. It was important to reduce the impact of non-response bias as well as to ensure a sufficiently large sample for subsequent statistical analysis, various measures were taken to boost the response rate: two reminders were administered and those who requested were supplied with a paper-based version of the questionnaire.

Census frame

The census frame used for the two-stage census was the RHPP2 database of funded renewable heating installations compiled by the Energy Saving Trust. The units of observation were individual installations rather than households/properties. Multiple applications could be made for RHPP2, where, for example both a heat pump and solar thermal system were being installed. In these cases, private households that installed more than one type of technology and received a payment for each, were invited to complete a post-installation and follow-up questionnaire for each renewable heat installation.

A total of 5,170 installations where installed and completed by a total of 4,898 owner-occupier households (some households may have applied for, and redeemed more than one renewable heating technology while the RHPP2 scheme was open for applications.

The database included a set of additional descriptive information for each of the records, such as: the technology installed, type of installation, country, property type, number of bedrooms, date of build, existing technology, household composition by age etc. The quality of the census frame was good: the population variables contained only a few missing values and were used well to understand patterns of non-response.

Questionnaire

The research was an e-census, covering all private householders (owner-occupiers) who redeemed their RHPP2 voucher following the installation of a renewable heat technology. The census comprised two questionnaires:

- a post-installation (PI) questionnaire to primarily collect household experiences with the installation of and use of their newly installed renewable heat technology; and

- a follow up (FU) questionnaire, in two waves, to review levels of satisfaction of householders following the first winter using the new technology.

The two separate questionnaires were used for owner-occupiers who installed a renewable heating technology as part of the householder voucher scheme. The questionnaires used for the research were designed by DECC and almost identical to the questions asked of households that participated in the predecessor scheme RHPP1 (this has been analysed by AECOM with the report published in December 2013) to ensure comparability with the predecessor study. Hence, the questionnaires were already tested and found effective - for this reason, no piloting was necessary.

2.1.3. Fieldwork

Pilot

As explained above, no piloting was undertaken for this strand, as the questionnaires were already developed and tested in the predecessor study (on the evaluation of RHPP1).

Main stage field work

The online questionnaires were administered to 5,170 installations, implemented by a total of 4,898 households. This number includes 186 questionnaires that were sent to private landlords and private tenants. These questionnaires were removed from the analysis to maintain consistency with the data collection in RHPP Phase 1.   Households were sent – in two stages - a web link to the two online questionnaires.

The first questionnaire, a 'post-installation questionnaire' (PI), was sent to eligible households upon their claim being paid. It consisted of approximately 50 questions that focused on motivations for taking part in the scheme and experiences of installation.

The 'follow-up questionnaires' (FU) were similar in length and focused on experiences and patterns of use following the first winter of operation. The follow-up questionnaires were issued four to nine months after completing the PI questionnaire to allow all participants to answer questions about the use of the renewable heating system for a period of time during the winter. In practice, RHPP2 participants who installed their renewable heating technology up to 31 December 2012 were issued with the FU questionnaire in May and June 2013 (Wave 1), with the remainder being issued in January and February 2014 (Wave 2). Data collected up to 13 March 2014 was included in the analysis. Two reminders were sent to non-responders during the fieldwork.

2.1.4. Responses received

A total of 4,543 post-installation questionnaires were returned by the households contacted (for one or more installations), of which 4,358 were eligible, as the remaining 186 were submitted not by owner-occupiers but by private landlords or tenants. This corresponds to a response rate of 84 per cent.

With regards to the follow-up questionnaires, 4,029 were received, of which 3,869 were sent by owner-occupiers, yielding a response rate of 75 per cent. Most of the responses (3,609) came from installations for which a PI questionnaire was also previously submitted. For 89 per cent of installations for which a questionnaire was returned in the post-installation survey, a follow-up questionnaire has also been received.

Table 2 Number of responses received (includes multiple responses from those households that installed more than one technology)

Response categories	Post installation questionnaire (PI)	Follow-up questionnaires		
		Wave 1 (FU1)	Wave 2 (FU2)	Total
Questionnaires issued (installations under the RHPP2 scheme)				
Air source heat pump	1,928	1,182	746	1,928
Biomass boiler	637	365	272	637
Ground/Water source heat pump	694	493	201	694
Solar thermal	1,911	1,590	321	1,911
Total	**5,170**	**3,630**	**1,540**	**5,170**

Response categories	Post installation questionnaire (PI)	Follow-up questionnaires		
		Wave 1 (FU1)	Wave 2 (FU2)	Total
*Total number of questionnaires returned**				
Owner Occupier	4,358	2,932	937	3,869
Landlord (not eligible)	161	106	36	142
Tenant (not eligible)	25	18	6	24
Total	**4,543**	**3,056 (1)**	**979**	**4,028**
Total number of eligible questionnaires returned				
Air source heat pump	1,669	999	450	1,449
Biomass boiler	563	316	194	510
Ground/Water source heat pump	607	419	116	535
Solar thermal	1,519	1,198	177	1,375
Total	**4,358**	**2,932**	**937**	**3,869**
Response rates				
Air source heat pump	86.6%	84.5%	60.3%	75.2%
Biomass boiler	88.4%	86.6%	71.3%	80.1%
Ground/Water source heat pump	87.5%	85.0%	57.7%	77.1%
Solar thermal	79.5%	75.3%	55.1%	72.0%
Total	**84.3%**	**80.8%**	**60.8%**	**74.8%**

Notes: (1) Excluding one response with an unidentifiable respondent code

2.1.5. Data processing

The responses to the questionnaires were downloaded from SNAP, initially migrated in Excel as well as SPSS formats. The latter was subsequently exported into the statistical software package Stata which was used for data inspection and analysis.

Unique questionnaire codes were matched with the census frame. Those that could not be matched were checked for possible typos (only one code remained unassigned to a specific element of the census frame following this procedure). Duplicate responses were identified and removed from the database.

Open-ended questions were examined and where possible coded. Where responses are of a sufficiently large number, they have been reported as a supplementary table in the data tables.

2.1.6. Weighting

The data from the census was analysed to identify any bias resulting from unit non response (i.e. installations for which no questionnaire was returned). Although response rates were generally high, the possibility of bias in the results still exists, because those installations for which the questionnaire was not returned might be different in terms of experience or in their unique characteristics which may lead to different household experiences and attitudes.

Responses were therefore explored on the basis of factors which we would expect to be associated with people's responses to see if there were differences between the characteristics of those who took part in the census and those who did not. Non-response patterns were measured for both questionnaire stages - the post-installation questionnaire and the follow-up questionnaire.

Possible significant differences in non-response rates by category were explored with the help of classical statistical tests. As a general test of association for full cross-tables, the non-parametric chi^2-test was used when the category was measured on a nominal scale, and the (the equally non-parametric) Mann-Whitney U-test was used when the category was measured on an ordinal scale. For testing the association between non-response and one specific sample subcategory against the remainder of the sample, the (parametric) t-test was used.[4]

The tests were conducted on the following population variables that could potentially have a relevant effect of non-response - and for which data was available for all or at least the large majority of units in the census frame:

- Type of technology installed (4 types: Air source heat pump; Biomass; Ground source heat pump; Solar thermal);
- Country (3 countries: England, Scotland, Wales);
- Type of property (3 aggregate groups);
- Number of bedrooms (5 bands);
- Year property was built (6 bands);
- Installation type;
- Age of oldest household member (5 bands);
- Installation cost (4 bands);
- Value of voucher (4 standard values).

The examination of non-response patterns under the above variables indicated some statistically significant differences between subgroups, although the differences in response rates observed were not too large – generally they did not differ from the overall population response rate by more than 5 percentage points.

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[4] Cell sizes were generally large enough to be able to assume the normal distribution of the dependent variable (i.e. the proportion of respondents)

The results are presented below in a number of cross-tables, together with the outcomes of statistical tests verifying non-randomness of non-response patterns. The cross-tables give frequencies, proportions in percentage and the calculated probability values for the null-hypothesis of the statistical test[5] (H_0 = response or non-response is *not* associated with the given independent variable). They show that the degree of non-response was influenced by all the demographic variables examined.

Stage 1 non-response (PI questionnaire/population)

The outcomes of the statistical tests – test score and corresponding probability value for the null-hypothesis - are given in the tables below. The probabilities from the t-test for specific subcategories are given in the rightmost column. Probability values below the 5 per cent threshold for the significance level are marked with asterisk.

The statistical analysis did not detect statistically significant differences when analysing the year when the property was built; the type of property; the installation type (stand-alone or not) or installation costs.[6]

Statistically significant differences were found, on the following key population characteristics:

(i) the type of technology installed, with Solar Thermal being underrepresented and Biomass and GSHP being somewhat overrepresented among the respondents;

(ii) the country, with Scottish households more likely to respond and Welsh less likely to do so;

(iii) the number of bedrooms, with owner-occupiers of very small properties (1-2 bedrooms) being less likely to respond;

(iv) the age of the oldest household member, with the oldest cohort (65+) less likely to respond, whilst households headed by 35-44 year olds more likely to participate; and

(v) voucher value, with those receiving a grant of only 300 GBP being less likely to send back the questionnaire.

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[5] The non-parametric Chi[2]-test was used.

[6] Certain sub-categories showed a statistically significant difference in response rates, but there was no clear pattern and the test of overall association (at the cross-table level) did not reject the null hypothesis of no association at the 5 per cent significance level.

Table 3 PI response rates by type of technology installed

Type of technology (1)	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Air Source Heat Pump	288	1,640	1,928	85.1	0.2304
Biomass	78	559	637	87.8	0.0100*
Ground Source Heat Pump	91	603	694	86.9	0.0421*
Solar Thermal	356	1,555	1,911	81.4	0.000*
Total	813	4,357 (2)	5,170	84.3	-

Pearson chi2(3) = 22.4580   Pr = 0.000*

Notes: (1) Data on the type of technology installed was taken in this statistical test from the original application data linked by the voucher code. There is a difference between this data and the respondents' reported technology, so the breakdown in this table will not match with the summary table in the main report. (2) One voucher could not be matched to the application data.

Table 4 PI response rates by country

Country	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
England	657	3,404	4,061	83.8	0.0869
Scotland	72	600	672	89.3	0.0001*
Wales	84	352	436	80.7	0.0338
Total	813	4,357	5,170	84.3	-

Pearson chi2(2) = 17.4834   Pr = 0.000*

Table 5 PI response rates by type of property

Type of property	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Detached (1)	641	3,504	4,145	84.5	0.3001
Semi-detached (2)	126	624	750	83.2	0.3820
Flat/other (3)	46	229	275	83.3	0.6391
Total	813	4,357	5,170	84.3	-

Pearson chi2(2) =   1.0748   Pr = 0.584.

Notes: (1) Detached house or bungalow. (2) Semi-detached house or bungalow. (3) End-terraced or mid-terraced house; maisonette; flat.

Table 6 PI response rates by number of bedrooms in property

Number of bedrooms	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
1 to 2	111	421	532	79.1	0.0006*
3	283	1,482	1,765	84.0	0.6608
4	290	1,692	1,982	85.4	0.0886
5	98	595	693	85.9	0.2185
6+	31	167	198	84.3	0.9784
Total	813	4,357	5,170	84.3	-

Mann-Whitney z = -2.907   Prob > |z| =   0.0037*

Table 7 PI response rates by year property was built

Year built	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Before 1919	209	1,104	1,313	84.1	0.6997
1919-1944	87	355	442	80.3	0.0129*
1945-1964	88	443	531	83.4	0.5075
1965-1980	96	558	654	85.3	0.4934
1981-2000	80	510	590	86.4	0.1489
After 2000	228	1,298	1,526	85.1	0.4063
Unknown (1)	*25*	*89*	*114*	-	-
Total	813	4,357	5,170	84.3	-

Mann-Whitney z = -1.503   Prob > |z| = 0.1328.

Notes: (1) Omitted by test

Table 8 PI response rates by installation type

Installation type	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Non-standalone	584	3,301	3,885	85.0	0.4168
Standalone	173	1,055	1,228	85.9	0.4168
Unknown(1)	*56*	*1*	*57*	-	-
Total	813	4,357	5,170	84.3	-

Pearson chi2(1) = 0.6595   Pr = 0.417.

Notes: (1) Omitted by test

Table 9 PI response rates by age of oldest household member

Age group	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
-35	42	232	274	84.7	0.8361
35-44	91	702	793	88.5	0.0003*
45-54	167	987	1,154	85.5	0.1645
55-64	173	1,038	1,211	85.7	0.1009
65+	281	1,068	1,349	79.2	0.0000*
Unknown (1)	*59*	*330*	*389*	*84.8*	*-*
Total	813	4,357	5,170	84.3	-

*Mann-Whitney z = 5.383   Prob > |z| = 0.0000.**

Notes: (1) Omitted by test

Table 10 PI response rates by installation cost

Installation cost	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Less than 5,000 GBP	195	1,094	1,289	84.9	0.5083
5,000-7,499 GBP	240	1,130	1,370	82.5	0.0318*
7,500-9,999 GBP	163	791	954	82.9	0.1956
10,000 GBP or more	214	1,342	1,556	86.2	0.0112*
*Unknown**	*1*	*0*	*1*	*-*	*-*
Total	813	4,357	5,170	84.3	-

Mann-Whitney z = -1.282   Prob > |z| = 0.1998.

Notes: (1) Omitted by test

Table 11 PI response rates by value of voucher

Value of voucher	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
300 GBP	356	1,555	1,911	81.4	0.0000*
850 GBP	288	1,640	1,928	85.1	0.2304
950 GBP	78	559	637	87.8	0.0100*
1250 GBP	91	603	694	86.9	0.0421*
Total	813	4,357	5,170	84.3	-

Mann-Whitney z = -4.611   Prob > |z| = 0.0000*

Stage 2 non-response (FU/population)

The review of non-response rates in the follow-up questionnaire did not detect any statistically significant association between response and country; the year when the property was built; or the installation cost.

An association was identified in

(i)   the type of technology installed, with Biomass being overrepresented and Solar thermal underrepresented;

(ii)   type of property, with those living in detached houses or bungalows being more likely to respond;

(iii)   size of the property, with owners of very small properties less likely to send back the questionnaire;

(iv)   type of installation, with those installing standalone technologies less likely to fill in the FU questionnaire;

(v)   the age of the oldest household members, with those aged 65 and above responding in lower proportions; and

(vi)   the value of the voucher – households receiving only £300 vouchers being underrepresented among questionnaire respondents.

Table 12 FU response rates by type of technology installed

Type of technology (1)	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Air Source Heat Pump	480	1,448	1,928	75.1	0.6068
Biomass	129	508	637	79.7	0.0017*
Ground Source Heat Pump	160	534	694	76.9	0.1438
Solar Thermal	539	1,372	1,911	71.8	0.0002*
Total	1,308	3,862 (2)	5,170	74.7	-

Pearson chi2(3) = 19.1432   Pr = 0.000*

Notes: (1) Data on the type of technology installed was taken in this statistical test from the original application data linked by the voucher code. There is a difference between this data and the respondents' reported technology, so the breakdown in this table will not match with the summary table in the main report. (2) Seven vouchers could not be matched to the application data.

Table 13 FU response rates by country

Country	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
England	1,031	3,031	4,062	74.6	0.7957
Scotland	159	513	672	76.3	0.2948
Wales	118	318	436	72.9	0.3759
Total	1,308	3,862	5,170	74.7	-

Pearson chi2(2) = 1.6879 Pr = 0.430

Table 14 FU response rates by type of property

Type of property	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Detached (1)	988	3,157	4,145	76.2	0.0000*
Semi-detached (2)	97	178	275	64.7	0.0001*
Flat/other (3)	223	527	750	70.3	0.0025*
Total	1,308	3,862	5,170	74.7	-

Pearson chi2(2) = 26.9727 Pr = 0.000*

Notes. (1) Detached house or bungalow. (2) Semi-detached house or bungalow. (3) End-terraced or mid-terraced house; maisonette; flat.

Table 15 FU response rates by number of bedrooms in property

Number of bedrooms	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
1 to 2	187	345	532	64.8	0.0000*
3	474	1,291	1,765	73.1	0.0640
4	458	1,524	1,982	76.9	0.0043*
5	140	553	693	79.8	0.0009*
6+	49	149	198	75.3	0.8554
Total	1,308	3,862	5,170	74.7	-

Mann-Whitney z = -5.851 Prob > |z| = 0.0000*

Table 16 FU response rates by year property was built

Year built	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Before 1919	311	1,002	1,313	76.3	0.1760
1919-1944	139	303	442	68.6	0.0012*
1945-1964	147	384	531	72.3	0.1434
1965-1980	170	484	654	74.0	0.5631
1981-2000	109	481	590	81.5	0.0001*
After 2000	392	1,134	1,526	74.3	0.5114
Unknown (1)	*40*	*74*	*114*	-	-
Total	1,308	3,862	5,170	74.7	-

Mann-Whitney z = -0.260   Prob > |z| =   0.7946.

Notes: (1) Omitted by test

Table 17 FU response rates by installation type

Installation type	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Non-standalone	926	2,959	3,885	76.2	0.0269*
Standalone	331	897	1,228	73.0	0.0269*
Unknown	*51*	*6*	*57*	-	-
Total	1,308	3,862	5,170	74.7	-

Pearson chi2(1) =   4.8962   Pr = 0.027*

Notes: (1) Omitted by test

Table 18 FU response rates by age of oldest household member

Age group	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
-35	80	194	274	70.8	0.1016
35-44	181	612	793	77.2	0.1155
45-54	282	872	1,154	75.6	0.5893
55-64	244	967	1,211	79.9	0.0000*
65+	410	939	1,349	69.6	0.0000*
Unknown (1)	*111*	*278*	*389*	-	-
Total	1,308	3,862	5,170	74.7	-

Mann-Whitney z = 2.686   Prob > |z| = 0.0072*

Notes: (1) Omitted by test

Table 19 FU response rates by installation cost

Installation cost	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Less than 5,000 GBP	318	971	1,289	75.3	0.5577
5,000-7,499 GBP	402	968	1,370	70.7	0.0001*
7,500-9,999 GBP	222	732	954	76.7	0.1129
10,000 GBP or more	365	1,191	1,556	76.5	0.0473*
Unknown*	*1*	*0*	*1*	-	-
Total	1,308	3,862	5,170	74.7	-

Mann-Whitney z = -1.789   Prob > |z| = 0.0737.

Notes: (1) Omitted by test

Table 20 FU response rates by value of voucher

Value of voucher	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
300 GBP	539	1,372	1,911	71.8	0.0002*
850 GBP	480	1,448	1,928	75.1	0.6068
950 GBP	129	508	637	79.7	0.0017*
1250 GBP	160	534	694	76.9	0.1438
Total	1,308	3,862	5,170	74.7	-

Mann-Whitney z = -4.040   Prob > |z| = 0.0001*

Whilst the possibility to apply post-stratification weighting to the achieved sample, correcting for non-response bias under variables indicated above, it was decided not to weight the responses for two key reasons:

- The census has high response rates, the weighting would only have minimal influence on the results for all substantive questions.

- Although statistically significant differences were detected in non-response rates across several of the grouping variables (population demographics), there was no credible theory to confirm that these variables - and not other, unobserved characteristics – are the ones that really explain the propensity of households to respond or not.

2.1.7. Data analysis

It was decided that 'don't knows' and 'refusals' would be retained in the analytical tables as valid response categories, and only excluded from cross-tabulations as subgroup categories. For attitudinal questions in particular it is informative to know how many people give these questions.

Some households had multiple technologies installed. The usual unit of analysis was unique installations/technologies, with the exception of questions pertaining to a specific household or property (such as, for instance, household income; or prior heating technology) where data are analysed at the household level. For households sending back more than one installation questionnaire, such household-level information was taken from the questionnaire first submitted.

2.1.8. Specific limitations of this study

A slight limitation could come from the possibility of some non-response bias - as explained above, post-stratification weighting to correct for such bias was not undertaken.

In addition, some respondents completing the questionnaire as a paper version did not answer questions they were eligible to answer resulting in some item non response. This is flagged in the data tables by reporting the "base" of people who would have been legible to answer the question separately to the "total" of people who actually answered it.

As a result of slight differences in the analytical approach taken here and in the analysis of private householder questionnaire data in RHPP1, direct comparison with the RHPP1 data cannot be made.

For a small number of questions in the post installation questionnaire, 'don't know' responses from the preceding questions have been routed into the subsequent question and included in analysis for that question. It is possible that their responses are less valid, however this is not likely to have a significant impact on the percentages.

2.2. Qualitative study of households that redeemed a voucher as part of the RHPP2 private householder scheme

2.2.1. Research aims

The aim of this strand of the research was to complement the census of applicants who installed a renewable heating technology as part of the RHPP2 private householder scheme, by conducting in depth interviews with a sample of owner-occupiers exploring their:

- motivations for installing a renewable heating technology;
- experiences of the installation process;
- awareness and experience of making an application to the RHPP2 Scheme;
- views on the performance of, and satisfaction with, their renewable heating technology; and
- perceptions on fuel bills.

2.2.2. Sample

A purposive sample of interviewees was drawn from respondents who returned a questionnaire as part of the census of households that redeemed a voucher, and consented to be contacted for further research (see chapter **Error! Reference source not ound.**).

Of the eligible responses to the census, 2,043 people expressed a willingness to be contacted for further research in their follow-up questionnaire. Targets were set for a sample that was organised by:

- the type of renewable heating technology installed;
- nation;
- income;
- change in satisfaction between the Post Installation and Follow-up questionnaires; and
- likelihood of installing a renewable heating technology in the absence of the RHPP2 private householder scheme.

Targets were set for three key variables:

- type of technology;
- change in satisfaction;
- likelihood of installing.

A screening questionnaire was developed and as the sample was recruited a balance was sought by nation and income. People who had had Biomass Boilers and Ground Source Heat Pump installations were prioritised, due to their low numbers overall. Higher targets than the proportions in the census population were set for decreased satisfaction, to explore this issue.

In total, telephone interviews were conducted with 52 respondents. Interviews were conducted during the day and evening on both weekdays and weekends.

2.2.3. Data collection

In-depth interviews were conducted by BMG research under subcontract to ICF, during April and May 2014. The mode of data collection was a telephone interview (scheduled for 20 minutes) with the main applicant. Each interview followed a structured topic guide, developed by the researchers and DECC covering the following areas of interest:

- The awareness of Renewable Heat Premium Payment scheme 2;
- Motivation for installing the technology type;
- Experience of selecting an installer and role of installer;
- Performance of the technology after installation;
- Influence of the new system on household heating and hot water use;
- Impact on fuel bills;
- Awareness of the Renewable Heat Incentive (RHI).

The design of the topic guide was driven by preliminary analysis of the private householder census data which highlighted key areas of inquiry that would be beneficial to explore in greater detail. The guide is appended here. All interviewees granted permission for their interview to be digitally recorded.

Prior to commencing fieldwork, a briefing session was convened by ICF for BMG researchers, attended by DECC. The briefing comprised a presentation about RHPP2, details of the different technologies and a discussion of the purpose of the interviews and the topic guide.

The topic guide was piloted with two interviewees. Following this, several questions were refined to make questions clearer and the overall interview shorter in length.

Their interviews were written up by the interviewers. A 'grid' approach was used. This is a framework approach to analysis that organises respondent's answers (in this case, using a spreadsheet). Each page corresponds to an interview topic and each column to a question within that. In addition to BMG's internal quality assurance, ICF reviewed the content of a sample of grids against the recorded interview as a further quality check.

Once completed, the grids were imported into NVivo 10 for analysis, where the sheet provided the top level code, the column the second level code, and sub codes were then applied within it. Census data were included so that information about income and housing type were included alongside the sample variables.

2.2.4. Analysis

For this element of the research, an analysis grid was developed, structured by the topic guide and providing an initial organisation of the data into high level codes (as outlined above). Example grids were completed by BMG interviewers, summarising the interview discussion and including quotes, and passed to ICF for review and comment. Subsequently, all interviews were entered into these finalised grids.

A coding frame was developed by the ICF research team building from the grid high-level codes and the topic guide, and further developed through application to a sample of the grid write-ups. This coding frame was shared with BMG for comments, and a second draft version was shared with DECC for discussion. The coding frame was entered into NVivo, together with the grids, whereas the grid headings provided initial, high level coding.

Members of the ICF research team who had worked on other elements of the RHPP2 evaluation applied it to a sample of the interviews and it was reviewed again through team discussion. The dataset was then coded using this finalised coding frame.

The analysis plan for the interviews was developed setting out key issues to be explored. It was shared with DECC for comment and subsequently used as an initial guide for the content analysis. However, additional combinations were also explored as issues emerged, so that the analysis could be seen as an iterative process.

2.2.5. Specific limitations of this study

While the authors of the report are confident that a cross section of views is presented, the aim of the study was not to produce findings which were representative of the population who installed a renewable heating technology as part of the RHPP2 Scheme. Also, there are a small number of limitations associated with a study of this kind and we have outlined these for the benefit of the reader.

When reading the main report, it is helpful to put the findings into context. The reader is advised to consider the following when interpreting the findings within the main report:

- Difficulties were encountered in securing interviews with those whose satisfaction had decreased. Most interviews were with respondents who reported no change. The final sample was broadly representative of the census population but the target for this group was higher, proportionally, to explore dissatisfaction.

- For some respondents the interview took place some months after the installation of their renewable heating technology. In some cases, this may have affected memory recall when it came to questions about decision-making, awareness of the RHPP2 Scheme requirements, installation process and performance of their renewable heating technology over time.

- Some respondents had installed a further renewable heating technology since the one for which they claimed as part of the RHPP2 Scheme. While interviewers made it clear which renewable heating technology they wanted respondents to focus upon, we cannot be sure that respondents were able to make the distinction and so may have given their views on a technology that was not funded by the RHPP2 Scheme. This was evidently the case in one interview.

It should be noted that these are all minor points which are unlikely to affect the quality of the data or robustness of findings.

2.3. Census of applications made to the RHPP2 Scheme that did not result in a voucher being redeemed by the applicant (Applied not redeemed questionnaire)

2.3.1. Research aims

The 'applied not redeemed' (AnR) census targeted households - owner occupiers only - that applied for and were granted a voucher under the RHPP2 scheme to contribute to funding the cost of installing a renewable heating technology (RHT), but did not subsequently redeem the voucher (at least one voucher if they applied for more) within the available time.

The aim of the census was to understand the reasons for the householder decision not to redeem the voucher and what if any action was taken to install a RHT in the absence of the voucher. The main questions looked at:

- awareness of the RHPP scheme and reasons to apply;
- the reasons for not redeeming a voucher the renewable heat technologies subsequently installed;
- plans to reapply to RHPP2 or RHI;
- installation of the RHT without claiming the grant or abandoning plans to install entirely, and the reasons for it;
- if installed – the type of technologies installed, experiences with the installation, the costs involved and the financing these costs.

2.3.2. Census methodology

Choice to use a census approach

The research was based on an e-census of all households recorded by EST as failing to redeem a voucher issued after April 2012 by the deadline of 31 March 2013 (the 'Applied not Redeemed' (AnR) population). The population of interest for this census was households that had applied for and received their vouchers but failed to redeem them.

Households that did not receive their voucher for any reason are not included because they had no option to redeem it, and would have been unable to provide about barriers to redeeming a voucher which was the focus of this study.

The census approach was chosen over the alternative of a random sample because the population size was relatively small, and it was expected that response rates would be low (as the households in question did not benefit in the end from the scheme). Hence, the original sample size required for sufficient statistical power would have already covered the full eligible population.

Despite being administered as a census it was anticipated that the response rate would be significantly below 100 per cent. As it was important to reduce non-response bias as well as to ensure a sufficiently large sample for subsequent statistical analysis, various measures were taken to boost the response rate: two reminders were sent out to non-responders, and those who requested it were supplied with a paper version of the questionnaire.

Census frame

The dataset used to identify vouchers issued but not redeemed was compiled the Energy Saving Trust, the administrators of the RHPP Scheme, and sent to ICF. This database consisted of 1,356 vouchers. Two cases were identified as invalid records and removed from the database, and a further record was incomplete, leaving usable data on 1,353 vouchers.

The unit of analysis, as for the census of redeemed vouchers, was installations. In this census installations are equivalent to households as there were no households with more than one voucher not redeemed.

The EST records contained a number of additional variables characterising the population element: the technology installed, type of installation, country, property type, number of bedrooms, date of build, existing technology, household composition by age etc.

Prior to the fieldwork going live no under- or over-coverage was identified in the census frame. However, during the fieldwork, over-coverage was identified due to the following two reasons:

- Some respondents reported not receiving an RHPP2 voucher; and

- Some respondents were unsure/unaware as to whether they have received a RHPP2 voucher

This means that only a subset of the records could be considered as the basis of the eligible population. This information on ineligibility was only discovered for those households who replied to the questionnaire, but not for those who did not respond. Given this issue, the actual size of eligible population (the census frame) is unknown. An attempt was made to estimate this using an iterative proportional fitting procedure (considering the type of installation, country, and number of rooms in the property as stratification variables), yielding a figure of 819 installations/households.

Questionnaire

The questionnaire was designed to collect information about:

- receipt of the email voucher;

- awareness of the RHPP2 scheme;

- the reasons behind the installation, and the type of renewable heating technology that they were considering installing;

- the reasons for not redeeming the vouchers;

- the reasons for choosing to install a renewable heat technology that did not qualify for a grant under the RHPP2 scheme;

- the cost of installation, and the ways in which the installation was financed;

- understanding about warranties;

- reasons for not installing a renewable heating technology; and

- participants' understanding of Domestic Renewable Heat Incentive.

The questionnaire was drafted by ICF and discussed with DECC. The second draft, taking on board the outcomes of the discussion was then piloted and refined before rolling it out in the main stage fieldwork.

The first question of the questionnaire filtered respondents into three groups, with each group answering a tailored set of questions. The three groups for analysis are:

- Group 1: Households that did not redeem any vouchers (189 responses);
- Group 2: Households that redeemed the voucher, but after the deadline (144 responses);
- Group 3: Households that received multiple vouchers but did not redeem them all (18 responses).

As Group 2 did in fact redeem vouchers, albeit after the deadline for doing so, they received a shorter questionnaire and are excluded from some questions. It also filtered out respondents who had in reality never received a voucher and were therefore not part of the eligible population for the census. These were identified as a result of piloting.

Copies of the final questionnaire can be found in the Annexes to this Technical Report.

2.3.3. Fieldwork

Pilot

A pilot was carried out between 19 December and 6 January 2013 with 100 purposively selected households not redeeming a voucher to test the questionnaire and look at response rates. The respondents were chosen because they covered different types of private households and technologies and so offered an opportunity to test the questionnaire and response rate with a broad coverage of the underlying eligible population.

As a result of the pilot it was identified that a proportion of people had not received a voucher or were not aware they had done so. An initial question was added into the questionnaire at the start to identify these respondents so that they did not need to complete the questionnaire. In addition, some of the routing was amended and clearer labelling included for those answering questions on more than one technology.

Main stage field work

Questionnaires were administered to 1,356 installations (this corresponds to the same number of households) between January and February 2013. Households were sent a web link to the online questionnaire. 17 households were sent a hard copy of the questionnaire (with a closing date of 1 March)

Two reminders were sent at two and three week intervals from issue.

2.3.4. Responses received

A total of 595 household responses were received for the Private Household Applied not Redeemed Census from the 1,356 households that were contacted. Of these, 351 were eligible for analysis in one of the three population subgroups (not redeeming any vouchers; redeeming after deadline; not redeeming one voucher but redeeming others). The remaining 244 reported that they did not receive a voucher - or they did not know whether or not they received the voucher - and hence were not part of the eligible population. These respondents were removed from the analysis.

0 below shows the breakdown of responses by questionnaire population subgroup. Of the 351 eligible respondents to the questionnaire, 144 in fact redeemed their voucher after the deadline, but 189 did not redeem a voucher at all.

Table 21 Number of responses received, breakdown by population subgroup

Population subgroup	Total responses
Eligible responses	351
Received a voucher but did not redeem	189
Received a voucher but redeemed late	144
Received multiple vouchers and did not redeem one of them	18
Did not receive the voucher / does not know	244
Total	**595**

In compliance with the approach followed in the other quantitative research strands, the response rate is calculated on the basis of eligible responses (351). This number, divided by an estimated number of eligible installations (819, see Section 2.3.2), corresponds to a response rate of 43 per cent. This approach aims at identifying the real response rate on the eligible population and hence produces figures comparable with the other censuses. A limitation of the approach is that the divisor in the equation is only an estimate which may differ from the true value of eligible installations.

An alternative response rate may be calculated by dividing the total number of responses (595) by the total number of questionnaires administered (1,356), yielding 44 per cent. This result is accurate as it does not involve any estimation work, but would not be fully consistent with the approach taken elsewhere in the study.[7] A third approach would divide the number of eligible responses (351) by the total number of questionnaires, producing a response rate of 26 per cent – this method however would mix eligible and non-eligible subpopulations and produce a misleadingly low figure.

Some households who received multiple vouchers for multiple installations and did not redeem one of them are part of both the 'Applied not Redeemed' population and the redeeming population (Section 2.1): 30 households that submitted a response to the AnR questionnaire also submitted a response to the e-census of private households who redeemed their voucher.

2.3.5. Data processing

The responses to the questionnaires were downloaded from SNAP, initially migrated in Excel as well as SPSS formats. The latter was subsequently exported into the statistical software package Stata which was used for data inspection and analysis.

Unique questionnaire codes were matched with the census frame. Those that could not be matched were checked for possible typos (only one code remained unassigned to a specific element of the census frame following this procedure). Duplicate responses were

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[7] Ineligible responses – from landlords and tenants - were also omitted from the analysis in the census of private householders ('Redeemed').

identified and removed from the database. Open-ended questions were examined and where possible coded. Where responses were of a sufficiently large number, they have been reported as a supplementary table in the data tables.

2.3.6. Weighting

Possible non-response bias was investigated by applying tests of statistical significance between the difference of the sample responding to the AnR census and the AnR population as a whole under a set of population demographic variables. The significance of the differences in non-response rates were assessed through applying chi2-test when the category was measured on a nominal scale, and the Mann-Whitney U-test when the category was measured on an ordinal scale. For associations of non-response between one specific subcategory and the remaining sample, the (parametric) t-test was used.

The population demographic variables tested were the following:

- Type of technology installed (4 types: Air source heat pump; Biomass; Ground source heat pump; Solar thermal);
- Country (3 countries: England, Scotland, Wales);
- Type of property (3 aggregate groups);
- Number of bedrooms (5 bands);
- Year property was built (6 bands);
- Age of oldest household member (5 bands);
- Installation cost (4 bands); and
- Value of voucher (4 standard values).

The outcomes of the general tests – test score and corresponding probability value for the null-hypothesis - are given below the cross-tables below. The probabilities from the t-test for specific subcategories are given in the rightmost column. Probability values below the 5 per cent threshold for the significance level are given in bold.

The differences in response rates were not statistically significant between population subgroups when looking at the type of property; the year when it was built; and the number of bedrooms.

Significant differences were identified only under the following population characteristics:

(i)   the type of technology installed, with Solar Thermal being underrepresented and Biomass and GSHP being overrepresented;

(ii)   the country, with Scottish households more likely to respond and English less likely to do so;

(iii)   the age of the oldest household member, with the those between 55 and 46 the most likely to respond;

(iv)   investment cost, with households with the least costly installations being underrepresented among the respondents; and

(v)   the voucher value, with those receiving a grant of only Ł300 being less likely to send back the questionnaire.

Table 22 AnR response rates by type of technology installed

Type of technology	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Air Source Heat Pump	300	138	438	31.5	0.6789
Biomass	95	79	174	45.4	0.0000*
Ground Source Heat Pump	128	52	180	28.9	0.5476
Solar Thermal	266	82	348	23.6	0.0004*
Total	789	351	1,140	30.8	-

*Pearson chi2(3) = 26.3744 Pr = 0.000**

Table 23 AnR response rates by country

Country	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
England	619	247	866	28.5	0.0032*
Scotland	118	72	190	37.9	0.0201*
Wales	52	32	84	38.1	0.1320
Total	789	351	1,140	30.8	-

*Pearson chi2(2) = 8.6948 Pr = 0.013**

Table 24 AnR response rates by type of property

Type of property	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Detached (1)	606	284	890	31.9	0.1222
Semi-detached (2)	122	42	164	25.6	0.1206
Flat/other (3)	61	25	86	29.1	0.7197
Total	789	351	1,140	30.8	-

Pearson chi2(2) = 2.7087 Pr = 0.258

Notes: (1) Detached house or bungalow. (2) Semi-detached house or bungalow. (3) End-terraced or mid-terraced house; maisonette; flat.

Table 25 AnR response rates by number of bedrooms in property

Number of bedrooms	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
1 to 2	103	40	143	28.0	0.4356
3	232	115	347	33.1	0.2556
4	257	116	373	31.1	0.8746
5	139	58	197	29.4	0.6526
6+	58	22	80	27.5	0.5091
Total	789	351	1,140	30.8	-

Mann-Whitney z = 0.479 Prob > |z| = 0.6317

Table 26 AnR response rates by year property was built

Year built	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Before 1919	228	117	345	33.9	0.1165
1919-1944	63	26	89	29.2	0.7559
1945-1964	70	26	96	27.1	0.4255
1965-1980	76	33	109	30.3	0.9246
1981-2000	51	25	76	32.9	0.6638
After 2000	285	115	400	28.8	0.2982
Unknown (1)	*16*	*9*	*25*	-	-
Total	789	351	1,140	30.8	-

Mann-Whitney z = 1.341 Prob > |z| = 0.1799.

Notes: (1) Omitted by test

Table 27 AnR response rates by age of oldest household member

Age group	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
-35	61	19	80	23.8	0.1420
35-44	167	53	220	24.1	0.0118*
45-54	177	82	259	31.7	0.8055
55-64	140	105	245	42.9	0.0000*
65+	159	58	217	26.7	0.1214
*Unknown**	*85*	*34*	*119*	*-*	*-*
Total	789	351	1,140	30.8	-

*Mann-Whitney z = -2.048   Prob > |z| = 0.0405**

Notes: (1) Omitted by test

Table 28 PI response rates by installation cost

Installation cost	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Less than 5,000 GBP	222	64	286	22.4	0.0004*
5,000-7,499 GBP	170	92	262	35.1	0.0841
7,500-9,999 GBP	140	62	202	30.7	0.9739
10,000 GBP or more	257	133	390	34.1	0.0807
Total	789	351	1,140	30.8	-

*Mann-Whitney z = -2.707   Prob > |z| = 0.0068**

Table 29 PI response rates by value of voucher

Value of voucher	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
300 GBP	266	82	348	23.6	0.0004*
850 GBP	300	138	438	31.5	0.6789
950 GBP	95	79	174	45.4	0.0000*
1250 GBP	128	52	180	28.9	0.5476
Total	789	351	1,140	30.8	-

Mann-Whitney z = -3.276   Prob > |z| = 0.0011*

Despite the relatively low response rates and statistically significant differences in responses rates under various population characteristics, no post-stratification weights were used to correct for the bias. The main reasons for not applying weights were:

- lack of clarity about the size of the eligible population, against which the weights should have been established, and its various breakdowns across key variables; and

- lack of robust evidence of which observed or unobserved characteristics account for non-response.

2.3.7. Specific limitations of this study

The main limitation of this strand of the research comes from the possibility of a considerable non-response bias, given the relatively low response rate of 43 per cent[8]. This bias, as explained above, was not corrected by post-stratification weighting.

It should also be noted that the original population to whom this questionnaire was sent, included 41 per cent of households/installations who said they had not received a voucher, or didn't know whether they had received a voucher. These questionnaires were removed from the analysis. An attempt was made to estimate the true population (in particular in order to allow weighting for non-response to take place) but, without knowing whether or not the rate of over coverage identified was applicable across the non-responding recipients, this was not possible to do. This means that the data collected can only be interpreted as respondents to the census, rather than being representative of the overall population of households who applied for a voucher but didn't redeem it.

A limitation of this data also comes from the small overall sample size and resulting subgroup sizes. As a result of this, responses to some questions are very small (especially when analysed by group). This has limited some of the analysis which could be done with the data, although key headline barriers have been identified.

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[8] Note that this response rate is measured as the number of eligible responses divided by the estimated size of the true eligible population.

2.4. Qualitative study of households that received but did not redeem a voucher as part of the RHPP2 private householder scheme

2.4.1. Research aims

The purpose of undertaking data collection with households that applied to the RHPP Scheme but did not redeem a voucher was to explore applicants:

- awareness of, and motivations for installing a renewable heating technology;
- awareness and understanding of the RHPP Scheme;
- views on barriers to installing a renewable heating technology and/ or participating in the RHPP2 Scheme; and
- awareness of the Domestic Renewable Heat Incentive (RHI).

2.4.2. Sample

A purposive sample of interviewees was drawn from respondents who returned a questionnaire as part of the census of households that received, but did not redeem a voucher, and consented to be contacted for further.

Of the 351 eligible responses to the census, 197 people expressed a willingness to be contacted for further research. Targets were set for a sample that was organised by:

- the type of renewable heating technology for which the voucher was issued;
- renewable heating technologies installed that were MCS certified and eligible for RHPP Payment;
- renewable heating technologies installed that were not MCS certified and consequently ineligible for the RHPP2 Scheme; and
- where no renewable heating technology was installed.

The above criteria were selected to stratify the sample but were very restricted because of the low overall population to sample ratio. A screening questionnaire was developed and recruitment focused upon the groups with the smallest populations (i.e. 'not installed' and 'installed non-eligible'). Multiple calls were made during the day and evening and during both the week and weekend. Type of technology was used as a secondary variable, although there was no scope to select by 'type of technology' amongst the two smaller groups due to low sizes. A spread across nations was sought but the primary organiser was the type of respondent as set out in the bullets above.

In total, telephone interviews were undertaken with 36 respondents.

2.4.3. Data collection

The mode of data collection was a short telephone interview with the main applicant. Interviews were scheduled to last for 15 minutes and followed a structured topic guide covering the following:

- Awareness of Renewable Heat Premium Payment scheme 2
- Interest in Renewable Heat Technology (RHT)

- Specific questions for those who didn't install a technology subsequent to receiving an RHPP2 voucher;
- Specific questions for those who did install;
- Awareness of the Renewable Heat Incentive (RHI).

The design of the topic guide was driven by preliminary analysis of the 'Applied not Redeemed' census data, which highlighted key areas of inquiry that would be beneficial to explore in greater detail. The guide is appended here. All interviewees granted permission for their interview to be digitally recorded.

Prior to commencing fieldwork, a briefing session was convened by ICF for BMG researchers, attended by DECC. The briefing comprised a presentation about RHPP2, details of the different technologies and a discussion of the purpose of the interviews and the topic guide.

Initially, BMG researchers piloted the topic guide with two interviewees. The topic guide was too long and interviews lasted around thirty minutes. Some questions had been tailored to the interviewee's census questionnaire responses and these did not always work. As a result, open questions were asked. The main change was that some sections of the guide were removed to shorten the interview and maintain a focus on key issues of interest. For instance, detailed questions on the performance of the technology and questions about how and when the interviewee became aware of RHPP2 were removed.

The interviews were written up by the BMG researcher who conducted the interview. A 'grid' approach was used. This is a framework approach to analysis that organises respondent's answers using a spreadsheet. Each page corresponds to an interview topic and each column to a question within that. In addition to BMG's internal quality assurance, ICF reviewed the content of a sample of grids against the recorded interview as a further quality check.

Once completed, the grids were imported into NVivo 10 for analysis, where the sheet provided the top level code, the column the second level code, and sub codes were then applied within it. Census data was included so that information about income and housing type were included alongside the sample variables.

The topic guide is appended to this report (see the Annexes). All interviewees granted permission for their interview to be digitally recorded. Telephone interviews were conducted by BMG Research under contract to ICF. Their interview write-ups are produced in 'grids', a framework approach to analysis that organises respondent's answers into columns associated with each question. These grids were then imported into NVivo 10 for analysis where the sheet provided the top level code, the column the second level code, and sub codes were then applied within it.

Their interviews were written up by the BMG interviewer who conducted the interview. A 'grid' approach was used. This is a framework approach to analysis that organises respondent's answers using a spreadsheet. Each page corresponds to an interview topic and each column to a question within that. These grids were then imported into NVivo 10 for analysis, where the sheet provided the top level code, the column the second level code, and sub codes were then applied within it. Census data was included so that information about income and housing type were included alongside the sample variables.

2.4.4. Analysis

For this element of the research, an analysis grid was developed, structured by the topic guide and providing an initial organisation of the data into high level codes (as outlined above). Example grids were completed by BMG, summarising the interview discussion and including quotes, and passed to ICF for review and comment. Subsequently, all interviews were entered into these finalised grids.

A coding frame was developed by the ICF research team building from the grid high-level codes and the topic guide, and further developed through application to a sample of the grid write-ups. This coding frame was shared with BMG for comments, and a second draft version was shared with DECC for discussion. The coding frame was entered into NVivo, together with the grids, whereas the grid headings provided initial, high level coding. Members of the ICF research team who had worked on other elements of the RHPP2 evaluation applied it to a sample of the interviews and it was reviewed again through team discussion. The dataset was then coded using this finalised coding frame.

The analysis plan for the interviews was developed setting out key issues to be explored. It was shared with DECC for comment and subsequently used as an initial guide for the content analysis. However, additional combinations were also explored as issues emerged, so that the analysis could be seen as an iterative process.

2.4.5. Specific limitations of this study

While the authors of the report are confident that we present a cross section of views, the study was not designed to be representative of the population who applied for but did not redeem an RHPP2 voucher. Also, there are a small number of limitations associated with a study of this kind and we have outlined these for the benefit of the reader.

When reading the main report, it is helpful to put the findings into context. The reader is advised to consider the following when interpreting the findings within the main report:

- Difficulties were encountered in securing interviews with those who had installed a non-eligible technology, against the target set.   Nonetheless, a quarter of those who had done were successfully interviewed.

- For some respondents the interview took place some months after their participation in the Scheme. In some cases, this may have affected memory recall when it came to questions about decision-making, awareness of the RHPP2 Scheme requirements, installation process and performance of their renewable heating technology over time.

It should be noted that these are all minor points which are unlikely to affect the quality of the data or robustness of findings.

3. Community Groups research strand

3.1. Census of renewable heating technologies that were installed as part of the RHPP2 Scheme for Community Groups

3.1.1. Research aims

The census of renewable heating technologies that were installed as part of the RHPP2 Scheme for Community Groups was designed to explore the customer journey for participating households in relation to the installation of and use of their newly installed renewable heat technology. The questions looked at:

- awareness of the RHPP2 scheme and motivations to engage with RHPP2;

- the reasons for selecting the renewable heat technologies subsequently installed;

- financing arrangements in place to cover the costs not reimbursed by the RHPP2 scheme;

- the perceived benefits of having Community Groups as intermediaries working with the installers;

- customers' experience of the application and installation process (including training on the use of the new technology), as well as the claim process;

- the perceived performance of the new renewable heat technologies and general satisfaction

- customer views on the benefits and disadvantages of the installed technology;

- experiences of using the technology and how this compares to the previous heating system; and

- customer perceptions concerning energy consumption, heating costs, quality of installation.

3.1.2. Census methodology

Choice to use a census approach

The research was administered as an e-census of households participating in the Community Group scheme. These households were issued and subsequently redeemed a voucher. Households that were issued and did not redeem the voucher were not included in the census.

The census approach was chosen rather than selecting a random sample because the population size consisted of 365 installations in total, which would be too small to generate a resulting sample with sufficient statistical power, especially after factoring in expected non-response rates.

It was anticipated that the response rate to the census would be significantly below 100 percent, with the response rate for the pilot being 72 per cent. As it was important to reduce non-response bias as well as to ensure a sufficiently large sample for subsequent

statistical analysis, various measures were taken to boost the response rate: two reminders were issued and 38 respondents were issued on request with a paper copy of the questionnaire. The response rate for this census was 64 per cent.

Census frame

The population database received contained a total of 365 installations (from 341 households allowing for multiple applications) in 28 Community Groups. Initially, a total of 1,712 vouchers were notionally awarded to 39 community projects, delivered by 36 Community Groups (one group had four projects), but only a fifth of all vouchers were redeemed by a household.

In the database containing administrative records of the vouchers redeemed by the Energy Saving Trust, information was generally complete for the most important population demographics (technology, installation country, property type, number of bedrooms, date of build, household composition by age, etc.). This database, assuming there was no over- or under-coverage, served as a good quality census frame for the census.

Questionnaire

The questionnaire developed for this strand of the research was designed by ICF and discussed with DECC. It was piloted and further refined before rolling it out in the main stage fieldwork.

The questionnaire was aimed at collecting information to answer the evaluation questions outlined in the introductory section of this chapter.

Where possible and relevant, questions from the private householder and social tenant householder questionnaires were included in the communities householder questionnaire, allowing comparisons to be made between the experiences of the three populations at the analysis stage.

Unlike the private householder questionnaires (where both a post installation questionnaire and a subsequent questionnaire were administered), a post installation questionnaire wasn't administered to community group householders immediately following installation. The questionnaire used a single questionnaire combining questions about the installation process and experience of the technologies. This was the same approach as was taken with households in the social landlords scheme.

The final questionnaire can be found in the Annexes to this Technical Report.

3.1.3. Fieldwork

Pilot

The on-line census questionnaire was piloted over a 10-day period in March 2014 with 29 householders with an achieved a response rate of 72 per cent (21 responses). Lessons from the pilot stage informed the final version of the Communities Group householder questionnaire, which was slightly shortened and certain questions or answer options were refined/completed.

Main stage field work

In April 2014 all 341 eligible households in the Communites Group database were sent an email invitation to complete the finalised version of the on-line questionnaire, or letter if no email address had been provided for each of their installations. A small number of emails were undeliverable and these householders were then contacted via letter. Reminder emails were sent two weeks later.

3.1.4. Responses received

A total of 247 responses were received. Of these the number of eligible responses was 234 once 10 duplicates and 3 responses without a valid questionnaire code were removed. Because some customers had applied and redeemed more than one voucher, there is a difference between the number of customer responses and the number of installation responses. Customers with multiple installations complete a questionnaire response for each installation. Twelve households sent back two questionnaires – one for each of two RHTs that they had installed. This provides base figures of 222 households and 234 installations.

A relatively high response rate was secured (see table below).

Table 30 Census of Communities Scheme households and response rate

Responses by category	Questionnaires administered		Response rate
	No.	% breakdown	
Number of households returning a questionnaire	**222**		**65%**
Air source heat pump	65	28%	73%
Biomass boiler	86	37%	65%
Ground/Water source heat pump	4	2%	80%
Solar thermal	79	34%	57%
Total number of questionnaires returned	**234**	**100%**	**64%**
Proportion of households with more than one installation per address	5.4%		

Source: Application and grant dataset, Communities Scheme household census

3.1.5. Data processing

Data was first entered onto a SNAP questionnaire platform and descriptive statistics generated and reported. The full data set was then analysed using the statistical software package Stata.

Responses were matched to unique households. Where households sent more than one reply (for different installations), the first response received from that household was included in the dataset for household-level analysis.

Possible significant differences in response rates by category were explored for the data set as a whole using the non-parametric chi2-test (the null-hypothesis was that the response was not associated with the independent variable).

Open-ended questions were examined and where possible coded. Where responses are of a sufficiently large number, they have been reported as a supplementary table in the data tables.

3.1.6. Weighting

There were visible differences in response rates between categories of key independent variables reviewed, i.e.:

(1) technology installed;

(2) country of installation;

(3) number of bedrooms; and

(4) age of oldest household member.

However, the association between response rate and the independent variables was not statistically significant when testing using the non-parametric chi^2-test or (the equally non-parametric) Mann-Whitney U-test when the category was measured on an ordinal scale in any of the above cases (the null-hypothesis was that response or non-response is *not* associated with the given independent variable).

The following tables summarise the outcome of the statistical tests – test score and corresponding probability value for the null-hypothesis. The probabilities from the t-test for specific subcategories are given in the rightmost column. Probability values below the 5 per cent threshold for the significance level are marked with asterisk.

Table 31 CG response rates by type of technology installed

Type of technology	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Air Source Heat Pump	57	79	136	58.1	0.0649
Biomass	2	4	6	66.7	0.8956
Ground Source Heat Pump	24	65	89	73.0	0.0437*
Solar Thermal	48	86	134	64.2	0.9832
Total	131	234	365	64.1	-

Pearson chi2(3) = 5.2408   Pr = 0.155

Table 32 CG response rates by country

Country	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
England	93	158	251	62.9	0.4938
Scotland	15	46	61	75.4	0.0439*
Wales	23	30	53	56.6	0.2190
Total	131	234	365	64.1	-

Pearson chi2(2) = 4.8302   Pr = 0.089

Table 33 CG response rates by number of bedrooms in property

Number of bedrooms	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
1 to 2	10	25	35	71.4	0.3438
3	49	93	142	65.5	0.6612
4	50	86	136	63.2	0.7891
5	20	20	40	50.0	0.0488*
6+	2	10	12	83.3	0.1589
Total	131	234	365	64.1	-

Mann-Whitney z =   1.196   Prob > |z| =   0.2316

Table 34 CG response rates by age of oldest household member

Age group	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
-35	6	11	17	64.7	0.9829
35-44	32	39	71	54.9	0.0616
45-54	40	62	102	60.8	0.3614
55-64	30	69	99	69.7	0.2030
65+	21	53	74	71.6	0.1501
Unknown (1)	*23*	*53*	*76*	*-*	*-*
Total	131	234	365	64.1	-

Mann-Whitney z = -2.253   Prob > |z| = 0.0243*

Notes: (1) Omitted by test

Given the good quality of the census frame and a visible variation in response rates, the application of post-stratification weights to the responses was considered. However, as for the other censuses, it was decided not to use this option, as it was established through testing a possible post-stratification weighting that a weighting would have made minimal difference in the estimates, and because there was a possibility that it could have brought in additional bias as possibly more important stratification variables were unobserved.

3.1.7. Specific limitations to the study

The main limitation of this strand of the research comes from the possibility of some non-response bias, which could not be corrected by post-stratification weighting.

It should be noted that for 16 per cent of respondents who completed the questionnaire as a paper version were not routed automatically through the questionnaire (as would be the case online). Some did not follow the written instructions and answered questions they would not have been routed to. Where responses to later questions are clearly invalid, these have been excluded. In cases where respondents may have missed the routing question and their response to a later question could be valid, the data has been included.

As with the tenants questionnaire, a single questionnaire was administered to households in the communities scheme covering the installation and technology experience (this differs to the private householder questionnaires which were administered as a post installation shortly after installation and a follow up questionnaire asking about experience with the technology after winter). For some households their reporting of installation experience was a considerable time later than when their technology was installed which may have affected their recall and which should be considered when comparing their post installation experiences alongside that of the private households.

3.2. Qualitative study of Community Group representatives that participated in the RHPP2 Communities Competition

3.2.1. Research aims

The aim of this strand of the research was to examine the customer journey of community groups installing clusters of domestic renewable heating systems as part of the RHPP2 Communities Scheme – as well as community groups where in the end no renewable heating technology was installed. The research was based on semi-structured interviews with a sample of community groups leads exploring their own and their groups':

- knowledge and experience of renewable heat technologies prior to involvement with RHPP2;

- motivations for submitting a proposal for the RHPP2 Communities Scheme;

- experience of project application, development and implementation experience of activities undertaken by community group leads;

- perceptions of group members' motivations for installing a renewable heating technology (or for not implementing the installation plan);

- experiences of engagement with installers and the installation process;

- perceived benefits to group members' of installations.

3.2.2. Sample

A purposive sample of interviewees was drawn from the Communities Scheme Application data. There were a total of 35 Community Groups that participated in the scheme and 39 individual community group projects (one community group had four projects and this group participated in the research).

Six (out of 39) projects did not complete any installations. Five of these community group leads were selected for interview.

Of the 33 projects that did achieve installations, a sample of 20 were selected based on consideration of the following:

- the type of renewable heating technology installed;

- English region and nation (England, Wales, Scotland);

- number of installations in each project; and

- projects involving only one technology and a mix of technologies.

The above criteria were selected on the basis that these factors may have influenced the customer journey for community groups and may have determined how many installation were achieved by each project.

3.2.3. Data collection

Out of the 25 semi-structured interviews with community group leads, seven were completed face-to-face, and 18 by telephone, depending on interviewee preferences. With the participant's consent the interview was recorded and each interview was written-up by the interviewer, including quotes. Interviews were completed between October and November 2013.

Each interview lasted between 40 and 90 minutes and followed a structured topic guide, developed for this research addressed the evaluation questions and to explore the stages of the Communities Scheme. The draft was discussed and agreed with DECC, and

subsequently piloted. The first four interviews with community group leads acted as a pilot and the topic guide was found to be effective. No changes were made following the pilot. The final topic guide is provided in the Annexes to this Technical Report.

The guide was organised around the following key themes:

- Initial engagement with RHPP2;
- Lessons of the project grant application;
- Award decision;
- Key lessons of project implementation; and
- Experience with the use of the Renewable Heat Technology

Within each theme there was a set of questions and each question had accompanying prompts. The research team were briefed on the final topic guide at a meeting that included representatives from both DECC policy team and research team.

Immediately after the interview, interviewers made detailed notes while listening back to the recording where available.

3.2.4. Analysis

A coding frame was also developed through an initial review of the interviews and to reflect the interview topic guide. This was applied to a sample of the interviews by two researchers who had undertaken interviews and further developed, and was then shared with the research team for comment. Following amendments it was provided to DECC for review. Comments made by DECC were implemented and this revised coding frame was subsequently applied to a further sample of interviews. At the end of this iterative process a final coding frame was agreed. The coding included categorical codes – organising information about the community groups – and content codes – organising data from the interviews. It was then entered into the qualitative analysis software NVIVO 10 and applied to the full interview dataset.

Upon completing the interviews, an analysis plan was developed and agreed with DECC. The analysis plan identified the codes and combinations of codes that would be explored to answer the evaluation questions. The dataset – the pool of coded responses - was analysed using NVIVO. Additional combinations above the pre-agreed ones were also explored as issues emerged, so that the final analysis can be seen as an iterative process.

In addition, a content analysis of 38 Project Reports completed by Community Group Leads was also undertaken. Again, categorical codes were applied to organise the features of the community groups and content codes were applied to the themes in the reports. References are made to the findings from this within the sections discussing the qualitative analysis.

3.2.5. Specific limitations of this study

As a result of the relatively small sample size, there were some limitations to the level of subgroup analysis possible. However, this is a minor point and unlikely to affect the quality of the data or robustness of findings.

4. Social landlords and tenants research strand

4.1. Census of tenants of social landlords who participated in the RHPP2 Landlords Competition

A census of social tenants who had renewable heating systems installed under the RHPP2 scheme was designed to explore the customer journey experienced by tenants under the RHPP2 scheme. The questions looked at:

- the way tenants were consulted by their registered social landlord (RSL) prior to the installation of the new heating technology;

- tenants' experience of installation;

- their satisfaction with the performance of the new heating system;

- their views on the benefits disadvantages of the technology;

- their experiences of using the technology and how this compares to the previous heating system;

- their perceptions concerning energy consumption and heating costs.

4.1.1. Census methodology

Choice to use a census approach

A census approach was chosen to collect data from social tenants, i.e. the study team tried contact all social tenants of the RSLs who agreed to participate in the study and supplied tenants' postal addresses or distributed the questionnaire themselves. The census option was favoured over a random sample for a number of reasons:

- On the basis of general experience with surveying socially disadvantaged population it was expected that response rates among social tenants will be small, even with reinforced follow-up work to boost participation in the questionnaire. Under these circumstances the original sample size which would have been required for sufficient statistical power would have been very large; not substantially smaller than the full population.

- A complete enumeration of the social tenant population for sampling purposes was not possible as some RSLs did not provide prior data on tenants and distributed the questionnaires themselves - only reporting the number of questionnaires handed out to tenants in retrospect.

- Preferably, additional data on the properties and tenants would have needed to be collected from social landlords to stratify the sample.

- Given the need to access one part of the tenants via social landlords (and another directly), a fairly complex clustered sampling strategy with associated weighting would have been required.

Despite being administered as a census it was anticipated that the response rate would be significantly below 100 percent. As it was important to reduce non-response bias as well as to ensure a sufficiently large sample for subsequent statistical analysis, various measures were taken to boost the response rate (see description under the main stage fieldwork section).

Census frame

The census frame used to administer the census was a database of RHPP2 registered social landlord grants, received from the Energy Saving Trust (EST). Due to the need to carry out fieldwork in time to feed into the development of the social tenant qualitative interviews, the original enumeration of the census population – and the assigning of questionnaire codes – was undertaken on an interim database which was almost complete pending the finalisation of payment of some installations (for which the relevant administrative paperwork was outstanding). This database listed 79 participant RSLs holding a total of 113 RHPP2 grants, and contained information on 3,772 individual installations/properties. All 79 social landlords were contacted and invited to either send the personal details of their tenants (with tenant permission) or to agree to pass the questionnaires onto their tenants directly. 35 landlords passed on their tenants details, 39 agreed to administer the questionnaire themselves and 5 opted not to take part or could not be reached. Where tenants had more than one renewable technology installed in their home, they received a separate questionnaire for each of these.

A second database was received later from EST which covered 60 new installations and supplementary questionnaires were sent out to these contacts. This database contained slightly more detail on properties/tenants. Where possible, this new information was added to the final census frame and used in the assessment of non-response bias.

Figure 1 Schematic presentation of the census frame
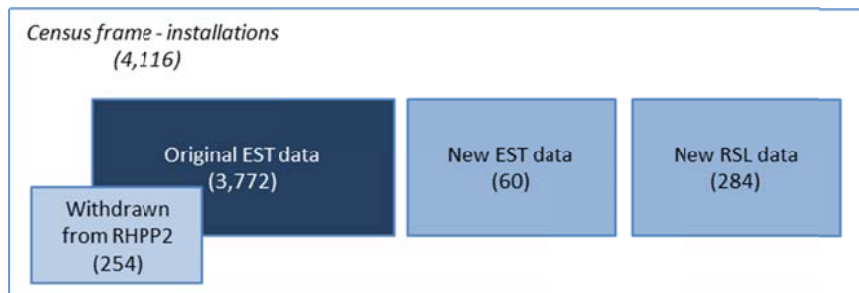
Comparing the final and interim census frames also showed that 254 installation records which were present in the interim census frame were no longer present in the final frame. These represented installations which dropped out from the scheme. However, as questionnaires had already been sent to them, it was too late to exclude them from the fieldwork. Of these 254 questionnaires sent out, 25 were returned. These were included in the analysis although they were not funded by the RHPP2 Scheme.

Above the data received from EST, the RSLs contacted indicated that they have installed RHTs in additional properties not contained in the EST records (284), hence the final count of supported RHT installations climbed to 4,116 (79 RSLs, 113 projects). A total of 3,971 questionnaires were sent out – directly or in a pack via the RSL - considering that some RSLs did not want to participate or the address of the property was unknown (and the RSL did not distribute the questionnaire).

Demographic information on the population in the 'census frame', even when taking into account additional details from the second database, was not fully complete. Notably, information on tenant households' socio-economic grading and their composition was missing for several records.

One questionnaire (paper and online mode) was developed for each technology. The questionnaire design was informed by findings from the qualitative interviews with RSL leads, the research questions, questionnaires used for the householder strand and DECC input. The questionnaire was designed to collect information about

- the situation before the installation of the new heating system, satisfaction with the legacy heating system and engagement with the landlord concerning the new installation
- the installation process
- information on the new system and its use
- performance of the hot water system
- energy use patterns
- satisfaction with the performance of the new heating system
- information about the household

Where possible and relevant, questions from the private householder and communities households questionnaire were included in the social tenant questionnaire, allowing comparisons to be made between the experiences of the three populations at the analysis stage.

Unlike the private householder questionnaires (where both a post installation questionnaire and a subsequent questionnaire were administered), a post installation questionnaire wasn't administered to social tenants immediately following installation. The census used a single questionnaire combining questions about the installation process and experience of the technologies. This was the same approach as was taken with households in the communities scheme.

The questionnaire was drafted by ICF and discussed with DECC. It was then piloted and refined before rolling it out in the main stage fieldwork.

4.1.2. Fieldwork

Pilot

A pilot was carried out with the 145 tenants of two social landlords in February and March 2014 to test the questionnaire and look at response rates. The landlords were chosen because they covered different types of tenants and technologies and so offered an opportunity to test the questionnaire and response rate with two different groups of tenants.

As a result of the pilot changes were made to include additional response options in a small number of questions and minor changes to the formatting of the paper questionnaire design to improve legibility.

Main stage field work

All 79 landlords with installations in the "March 2014 All Installations" database (i.e. RSLs that applied to the scheme and have not withdrawn until March 2014) were contacted to request their cooperation with implementing the census. Landlords were asked and had a

choice to either (a) undertake the distribution of questionnaires to individual tenants from a pack sent by ICF to their office or (b) pass tenant contact details to ICF in a secure manner and provided they had tenant consent to do so.

One questionnaire was sent per installation. The questionnaires were distributed in April 2014. Envelopes with the following were prepared for each installation address: a letter containing the invitation to participate in the research and including a link to complete the questionnaire online; the paper questionnaire; a postage-paid pre-addressed envelope. To encourage participation in the census, a prize draw for the chance to win one of three prizes (high street vouchers worth £150, £100 and £50) was offered. The envelopes were then sent either directly to tenant addresses provided by RSLs or sent to RSL leads for distribution to their tenants.

Reminder letters were sent directly to the tenant or to the landlord for distribution a week before the closing deadline. Returns were monitored to identify landlords with low participation and landlords were reminded to distribute the invitation letters and reminder letters.

Copies of the questionnaires (separate for the four main technologies: air source heat pump, biomass, ground source heat pump, and solar thermal) can be found in the Annexes.

4.1.3. Responses received

By the end of the fieldwork a total of 1,378 questionnaires were received representing a response rate of 35 per cent of installations. From these 1,378 questionnaires, 1,350 came from tenants identified in the Energy Saving Trust data and whose landlords installed the technology under the RHPP2 Scheme. 25 came from installations where the landlord did not claim the RHPP2 voucher, and 28 came from additional solar thermal installations identified by RSLs (but later found not to have been installed under the RHPP2 Scheme).

Table 35 Number of responses received

Response categories	Not responding	Responding	Total eligible population
Matched with census frame, of which:	2,542	1,350	3,892
Record only in first database (possibly ineligible)	229	25	254
Record in both databases	2,313	1,325	3,638
Not matched (supplementary codes)	53	28	79
Total	**2,595**	**1,378**	**3,971**

As tenants who had more than one renewable technology installed in their home, received a separate questionnaire for each of these, there were a number of households where multiple questionnaires were returned. More information on how these two units of

analysis (installation and household) have been dealt with in the analysis of the data that are included in the section on data processing below.

4.1.4. Data processing

The responses to the questionnaires received in paper form were encoded and uploaded to the survey software, to complement those received online. The final dataset was extracted from SNAP, initially in Excel as well as SPSS formats. The latter was migrated into the statistical software package Stata which was used for data inspection and subsequent analysis.

The unique questionnaire codes were matched with the census frame and those that could not be matched were checked for possible typos. Duplicate responses were identified and removed from the database. Responses were matched to unique households. Where households sent more than one reply (for different installations), the first response received from that household was include in the dataset for household-level analysis.

Open-ended questions were examined and where possible coded. Where responses are of a sufficiently large number, they have been reported as a supplementary table in the data tables.

4.1.5. Weighting

The data from the tenant census were analysed to see if there was any bias resulting from non-response. Two possible areas of non-response bias exist in the data. The first is a result of the social landlords who didn't take part and the second is from tenants who didn't respond to the questionnaire.

The number of landlords who didn't take part on the census was small. Out of 79 landlords, 5 did not take part and a further 2 dropped out and didn't distribute the questionnaires. While this introduces the possibility of some bias in the census, it is expected that this is minimal because of the small proportion of RSL non-cooperation. An examination of these 7 landlords who did not take part to identify particular characteristics of clustering in terms of geography, type of technology, or type of property was not possible lacking data.

The second opportunity for bias comes from the 65.3 per cent of questionnaires not returned by social tenants among the landlords who did take part in the census. The low response rate introduces the possibility of bias in the results, because those installations for which the questionnaire was not returned might be different in terms of user satisfaction etc.

Responses were therefore explored on the basis of factors which we would expect to be associated with people's responses to see if there were differences between the characteristics of those who took part in the census and those who did not. The characteristics explored were those for which population data was available:

- Type of technology
- Age of oldest household member
- Annual estimated generation of installation
- Declared net capacity

Indeed the examination of non-response patterns under the above variables shows that these were not purely random. For instance, response rates for solar thermal technologies, or from the youngest households, were significantly lower than for other technologies and

from households including older members. The cross-tables together with the outcomes of statistical tests verifying non-randomness of non-response patterns are presented below.

The cross-tables give frequencies, proportions in percentage and the calculated probability values for the null-hypothesis of the statistical test[9](H_0 = response or non-response is *not* associated with the given independent variable) show that the degree of non-response was influenced by all the demographic variables examined. Probability values for given tests below the 5 per cent threshold are marked with asterisk.

Table 36 Social tenant response rates by type of technology installed

Type of technology	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Air Source Heat Pump	1,602	1,079	2,680	40.3	0.0000*
Biomass	23	14	37	37.8	0.6824
Ground Source Heat Pump	234	122	356	34.3	0.8741
Solar Thermal	736	163	898	18.2	0.0000*
Total	2,595	1,378	3,971	34.7	-

Pearson chi2(3) = 146.3683   Pr = 0.000*

Table 37 Social tenant response rates by age of oldest household member

Age group	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
-35	195	65	260	25.0	0.0000*
35-44	262	83	345	24.1	0.0000*
45-54	305	124	429	28.9	0.0000*
55-64	277	168	445	37.8	0.5303
65+	787	732	1,519	48.2	0.0000*
Unknown (1)	*769*	*206*	*973*	*-*	*-*
Total	2,595	1,378	3,971	34.7	-

Mann-Whitney z = -11.125   Prob > |z| = 0.0000*

Notes: (1) Omitted from the test

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[9] The non-parametric Chi[2]-test was used.

Table 38 Social tenant response rates by estimated annual generation of installation

Est. annual generation	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
<5000 kWh	801	314	1,115	28.2	0.0000*
5000-10000 kWh	590	481	1,071	44.9	0.0000*
10000-12000 kWh	375	252	627	40.2	0.0518
>12000 kWh	448	242	690	35.1	0.2947
Unknown (1)	*381*	*89*	*468*	*-*	*-*
Total	2,595	1,378	3,971	34.7	-

Mann-Whitney z = -3.794   Prob > |z| = 0.0001*

Notes: (1) Omitted from the test

Table 39 Social tenant response rates by declared net capacity

Declared net capacity	Not responding	Responding	Total eligible population	Response rate (%)	Pr(t-test)
Less than 5	627	293	920	31.8	0.0002*
5-5.99	413	290	703	41.3	0.0090*
6-8.49	516	360	876	41.1	0.0037*
8.5 or more	614	332	946	35.1	0.1521
Unknown (1)	*425*	*103*	*526*	*-*	*-*
Total	2,595	1,378	3,971	34.7	-

Mann-Whitney z = -1.320   Prob > |z| = 0.1867.

Notes: (1) Omitted from the test

The possibility of post-stratification weighting the data to account for these differential response rates was explored. However, due to the lack of census frame data for the tenants, it was not possible to do. The only near complete information available in the census frame was the technology installed. Other characteristics (e.g. property type, socio-economic status, household composition, net capacity, estimated generation and commissioning date) were missing for a considerable proportion of census frame records. No possibility for imputing the missing data was found (given the general scarcity of population data).

As a large proportion of the census frame contained important missing data, only a subset of the response could have been weighted. Also, as the most likely reasons for not responding (such as: medium levels of satisfaction; specific socio-economic characteristics of tenants) were unobserved, weighting on other – available – variables would have only introduced additional bias. Weighting was therefore rejected as unsuitable.

4.1.6. Data analysis

It was decided that 'don't knows' and 'refusals' would be retained in the analytical tables as valid response categories, and only excluded from cross-tabulations as subgroup categories. This approach is certainly justified for attitude/opinion questions, when a 'don't know' is a useful feedback in its own right. In discussions with DECC it was also agreed that the same approach will be taken for factual questions.

Some properties had multiple technologies installed. The usual unit of analysis was unique installations/technologies, excluding questions pertaining to a specific household or property (such as, for instance, household income; or prior heating technology). The RSL level was not specifically analysed.

4.1.7. Specific limitations of this study

The main limitation with this data comes from the possibility of considerable non-response bias, introduced by a low (37 per cent) response rate. As the census frame data did not allow for the possibility of robust weighting to account for potential bias arising from this response rate, some caution needs to be exercised when interpreting the data as representative of all social tenants on the RHPP2 scheme.

Social tenant data includes a small percentage (4 per cent) of tenant installations which may not have been carried out under the RHPP2 scheme. 25 of the 1378 questionnaires came from installations which were originally planned for completion under the RHPP2 scheme but where the RSL didn't eventually claim the grant. A further 28 came from questionnaires administered to tenants where the RSL installed an RHT (but it doesn't appear to be have been under the RHPP2 scheme). This means that it is possible what a small percentage of social tenant views come from people who installed technologies not 100% attributable to the RHPP2 scheme.

It should be noted that respondents who completed the questionnaire as a paper version were not routed automatically through the questionnaire (as would be the case online). Some did not answer questions they were eligible to answer resulting in some item non response. This is flagged in the data tables by reporting the "base" of people who would have been legible to answer the question separately to the "total" of people who actually answered it.

In addition, some respondents didn't follow the written instructions and answered questions they would have been routed out of. Where responses to later questions are clearly invalid (established through a logical check), these have been excluded. In cases however where the respondent has missed the initial routing question but responded to a subsequent question dependent on this initial routing question, the answer has been included in the analysis.

It should be noted that, as with the communities questionnaire, a single questionnaire was administered to social tenants covering the installation and technology experience. (This differs to the private householder questionnaires which were administered as a post installation shortly after installation and a follow up questionnaire asking about experience with the technology after winter). For some tenants their reporting of installation

experience was a considerable time later than when their technology was installed which may have affected their recall and which should be considered when comparing their post installation experiences against the perceptions of private household.

4.2. Qualitative study of social landlords who participated in the RHPP2 Landlords Competition and social landlords who did not participate in RHPP2 Landlords Competition

4.2.1. Research aims

The aim of the research was to examine the customer journey experienced by RSLs and tenants under the RHPP2 scheme. It aimed to investigate:

- take-up and motivation for use of the scheme
- awareness of the scheme
- experience with the application process
- the installation process and the related experience of RSLs and tenants
- experience with the technology post installation
- reflections on the Domestic Renewable Heat Incentive (RHI)

Also, a specific strand of the research sought to explore why certain RSLs which applied successfully to the first wave of the scheme (RHPP1) did not participate in RHPP2 - submitting an unsuccessful application or withdrawing after the offer.

4.2.2. Sample

The research targeted two separate groups: RSLs leading projects under the RHPP2 scheme, and RSLs that participated in the predecessor wave of the scheme (RHPP1) but did not apply to RHPP2.

As for the first group, i.e. project leads from RSLs that were successful in the RHPP2 competition, 30 qualitative interviews were undertaken. A purposive sample of interviewees was drawn from RSL staff who were in charge of the delivery of the RHPP2 projects. The sample was developed to achieve a balanced mix of RSLs according to the following criteria:

- installations across the four technologies;
- number of proposed installations;
- achievement of installation (as at September 2013);
- ONS urban/rural classification by postcode; and
- geographical coverage

Under the second strand of the research, 10 qualitative interviews were undertaken with project leads from RSLs that applied to RHPP1 but did not participate in the RHPP2 competition; These 10 RSLs were drawn from a list of 93 non-participating RSLs. The sampling sought to achieve a good balance of eligible RSLs considering the following factors:

- technology applied;
- type of non-participation (unsuccessful application; withdrawal);
- size of project;
- geographical coverage; and
- type of RSL.

4.2.3. Data collection

Out of the 30 interviews with participant RSLs, 4 were completed face-to-face, and 26 by telephone, depending on interviewee preferences. With the participant's consent the interview was recorded. Interviews were completed between October 2013 and January 2014. Each interview lasted between 40 and 90 minutes and followed a structured topic guide, developed by the researchers and DECC covering the following areas of interest:

- Initial engagement with RHPP2;

- Lessons of the project grant application;

- Award decision;

- Key lessons of project implementation; and

- Experience with the use of the Renewable Heat Technology

Immediately after the interview, interviewers made detailed notes while listening back to the recording where available.

All 10 interviews with non-participating RSLs were by telephone and were completed between November 2013 and March 2014. It should be noted that RHPP1 ran from 1 August 2011 to 31 March 2012. With the participant's consent the interview was recorded.

Each interview lasted between 45 minutes to an hour and followed a structured topic guide, developed by the researchers and DECC covering the following areas of interest:

- Prior engagement with RHPP

- Circumstances of the unsuccessful applications or withdrawal following successful application;

- Reasons RSL considered when applying for RHPP2; or for not considering applying;

- General reflections on the scheme.

Immediately after the interview, interviewers made detailed notes while listening back to the recording where available.

4.2.4. Analysis

The interviews were undertaken by ICF. All interviews with RSL leads were semi-structured, using a topic guide that was organised by theme. Within each theme there was a set of questions and each question had accompanying prompts. The topic guides (for participating and non-participating) were developed to address the evaluation questions and to cover each stage of the customer journey for RSLs. These were agreed with DECC and piloted. The research team was briefed at a meeting that included representatives from both DECC research and policy teams. Each interview was written-up by the interviewer, including quotes.

A coding frame was developed through an initial review of the interviews and to reflect the interview topic guide. The frame was imported into the qualitative analytical software package NVIVO 10. This frame was applied to a sample of the interviews by two ICF researchers who had undertaken interviews and further developed. It was then shared with the research team for comment. Following amendments it was provided to DECC for review. The coding frame was then applied to a further sample of interviews. At the end of this iterative process the final coding frame was agreed. It was then entered into specialist qualitative analysis software and applied to the full interview dataset.

An analysis plan was developed which identified the codes and combinations of codes that would be explored to answer the evaluation questions. The dataset was analysed using the specialist software and the coding explored. Additional combinations were explored as issues emerged, so that the final analysis was an iterative process.

4.2.5. Specific limitations of this study

While the authors of the report are confident that we present a cross section of views, the findings cannot be deemed representative of the RSL population who applied to the RHPP2 Scheme – or did only apply to the predecessor scheme RHPP1. Also, there are a small number of limitations associated with a study of this kind and we have outlined these for the benefit of the reader.

When reading the main report, it is helpful to put the findings into context. The reader is advised to consider the following when interpreting the findings within the main report:

- For some respondents the interview took place some a year after the application process. In some cases, this may have affected memory recall when it came to questions about decision-making, awareness of the RHPP2 Scheme requirements and application process.

- Interviews were undertaken before the scheme was completed and this meant that impacts are only representative at the time that the interview was undertaken.

- Those RSLs who did not participate in RHPP2 were drawn from list of RSLs that participated in RHPP1 and as such are not fully representative of unknown RSLs as they had previous knowledge of the RHPP scheme.

It should be noted that these are all minor points which are unlikely to affect the quality of the data or robustness of findings.

4.3. Qualitative study of tenants who participated in the RHPP2 through RSLs

4.3.1. Research aims

The aim of the research was to examine the customer journey experienced by social tenants under the RHPP2 scheme. It aimed to investigate the experience of tenants with the installation process and the use of the new heating technology.

4.3.2. Sample

During the census of social tenants (see chapter **Error! Reference source not found.**) espondents were asked whether they would agree to participate in further research. Of the 1,378 eligible responses to the census, 526 people expressed a willingness to be re-contacted. From this group, a sample of 30 tenants was drawn, by considering the following factors:

- the technology installed;
- sufficient number of respondents from the corresponding RSL;
- geographical representation of the corresponding RSLs;
- whether tenants moved in the property following the installation;
- previous heating type;
- having or not having a choice in the installation;
- judgement on the ease of installation process; and
- overall satisfaction with the new technology.

The above criteria – of which the last five were sourced from responses given to the census questionnaire - were selected because the research team sought to include a wide range of user experiences into the sample.

4.3.3. Data collection

The in-depth interviews with social tenants were conducted during June and July of 2014. The mode of data collection was a 45 minute to an hour face to face interview with the main applicant. Each interview followed a structured topic guide, developed by the researchers and DECC covering the following areas of interest:

- Household context;
- Situation before the installation;
- The installation process;
- Experience with using the technology;
- Views on the performance of the technology;
- The influence of the new system on household heating and hot water use; and
- Perceived impacts on energy bills.

The design of the topic guide was driven by preliminary analysis of the private householder census data which highlighted key areas of inquiry that would be beneficial to explore in greater detail. An example guide is appended here. Prior to commencing fieldwork, a briefing session was convened for ICF researchers. The briefing comprised client and researcher presentations, a short teach in about renewable heating technologies and analysis of the topic guide.

The topic guides were developed to address the evaluation questions and to cover each stage of the customer journey for the tenant. These were agreed with DECC and piloted with two tenants. The research team was briefed at a meeting that included representatives from the DECC research team. Following the piloting, a small number of additions to the topic guide were agreed with DECC.

All interviews were face-to-face in the tenant's home. Interviews were recorded with the tenant's consent. Immediately after the interview, when available, interviewers made detailed notes while listening back to the recording.

4.3.4. Analysis

A coding frame was developed through an initial review of the interviews and to reflect the interview topic guide. This was applied to a sample of the interviews by two researchers who had undertaken interviews and further developed. It was then shared with the research team for comment. Following amendments it was provided to DECC for review. The coding frame was then applied to a further sample of interviews. At the end of this iterative process the final coding frame was agreed. It was then applied to the full interview dataset.

An analysis plan was developed which identified the codes and combinations of codes that would be explored to answer the evaluation questions. The dataset was analysed and the coding explored. Additional combinations were explored as issues emerged, so that the final analysis was an iterative process.

4.3.5. Specific limitations of this study

While the authors of the report are confident that we present a cross section of views, the findings cannot be deemed representative of the social tenants population of RSLs who applied to the RHPP2 Scheme. Also, there are a small number of limitations associated with a study of this kind and we have outlined these for the benefit of the reader.

When reading the main report, it is helpful to put the findings into context. The reader is advised to consider the following when interpreting the findings within the main report:

- Our sample frame comprised those who had returned both a post installation and follow-up questionnaire. To this end, it is possible that our sample, under or over represented those who were either satisfied or dissatisfied with their renewable heating technology.

- For some respondents the interview took place a year after the installation of their renewable heating technology. In some cases, this may have affected memory recall when it came to questions about decision-making, awareness of the RHPP2 Scheme requirements, installation process and performance of their renewable heating technology over time

- Some respondents had installed a further renewable heating technology since the one for which they claimed as part of the RHPP2 Scheme. While interviewers made it clear which renewable heating technology they wanted respondents to focus upon, we cannot be sure that respondents were able to make the distinction and so may have given their views on a technology that was not funded by the RHPP2 Scheme.

5. Installers research strand

5.1. Qualitative study of past and current installers who installed renewable heating technologies as part of the RHPP2 scheme

5.1.1. Research aims

The aim of this strand of the research was to understand the impact of the RHPP2 on the installer component of the renewable heat supply chain and to explore the experiences of the scheme.

In addition, the research also aimed to assess the impact of the RHPP2 scheme on certification bodies and to understand their market response (including their service offers and interactions with installers).

5.1.2. Sample

The study primarily involved qualitative research with renewable heat installers and certification bodies.

A database of interviewees was established from three different sources under the Private Householder, Registered Social Landlord (RSL) and Community Group (CG) schemes, The Private Householder application database provided the name of the installer that was submitted with each application. Installer names associated with householder vouchers that are "expired" or "rejected" were excluded. The Community Group application data was used to identify installers associated with this mechanism; Community Group householder vouchers with status of Paid, Accepted, or sent for Payment were included. Installers identified in RSL applications were also included. We purposively sampled on the basis of:

- Size of installer company (indicative size of company using number of RHPP2 installations as a proxy – 4 size bands were identified and the size bands varied depending on the technology);
- Geography (to replicate regional distribution); and
- Technology coverage of the RHPP2 scheme.

The above criteria were selected to allow for a simple stratification of installers, assuming that the size of the installer, as well as possibly the technologies covered will have an impact on their experience with the scheme. The location of the installer was considered as an additional variable to account for possible differences across geographies.

In total over 60 installers were invited for interview and ultimately, the research achieved a sample size of 29 installers,

Additionally, interviews were conducted with representatives from certification bodies who had members installing renewable heat technologies. All seven certification bodies that had members installing renewable heat technologies were interviewed by telephone. A manager with Gemserv, the responsible body for administering the Microgeneration Certification Scheme (MCS) was also interviewed face-to-face.

5.1.3. Data collection

Interviews with installers were conducted between December 2013 and February 2014. Interviews with the certification bodies were conducted between January and February 2014. The MCS interview was conducted in April 2014.

Interviews followed a structured topic guide covering the following areas of interest:

- installer engagement with the RHPP Scheme;
- installer perceptions of consumer knowledge and choice of technologies and marketing approaches;
- renewable heat technologies, including sourcing and quality;
- MCS standards, RHPP Scheme compliance standards and skills training; and
- overall impact of the RHPP Scheme on the supply side.

5.1.4. Analysis

The interviews were undertaken by ICF. For the analysis of interview responses, an analysis grid was developed, structured by a topic guide and providing an initial organisation of the data into high level codes. Within each theme of the guide there was a set of questions and each question had accompanying prompts. Each interview was written-up by the interviewer, including quotes.

A coding frame was developed through an initial review of the interviews and to reflect the interview topic guide. This frame was applied to a sample of the interviews by two ICF researchers who had undertaken interviews and further developed. It was then shared with the research team for comment.

Following amendments it was provided to DECC for review. The coding frame was then applied to a further sample of interviews. At the end of this iterative process the final coding frame was agreed. It was then entered into specialist qualitative analysis software and applied to the full interview dataset.

An analysis plan was developed which identified the codes and combinations of codes that would be explored to answer the evaluation questions. The dataset was analysed using the specialist software and the coding explored. Additional combinations were explored as issues emerged, so that the final analysis was an iterative process.

5.1.5. Specific limitations of this study

While the authors of the report are confident that we present a cross section of views, the findings cannot be deemed representative of the total population of installers who engaged with RHPP2. Also, there are a small number of limitations associated with a study of this kind and we have outlined these for the benefit of the reader.

When reading the main report, it is helpful to put the findings into context. The reader is advised to consider the following when interpreting the findings within the main report:

- Installers that had not conducted installations under the RHPP were not interviewed. As such, it has not been possible to determine the reasons why installers may not have engaged with the scheme at all. As a proxy, installers with only a very low number of RHPP installations were used to explore any reasons that might explain why more installations were not completed.

- There was a high degree of drop-out among interviewees, even after interviews had been scheduled. In total 29 out of a target of 30 interviews were conducted. As noted above, over 60 installer companies were contacted in total. Scheduling interviews was particularly challenging for micro businesses however, we do not believe that these groups are under-represented by the sample.

Annex

Annex 1 The evaluation questions

Table 40 Evaluation questions for Strand 1 – Private households with redeemed vouchers

Theme	Evaluation question
Characteristics of installer HH (Section 2 of the report)	■ What are the characteristics of consumers (e.g. demographics, building type etc.)? ■ How do RHPP funded installers compare with target population? ■ How do consumers in Phase 2 compare with Phase 1?
Motivations of installer HH (Section 3 of the report)	■ How and why did consumers engage or not?' ■ What are the reasons for consumers selecting the renewable heat technologies they have installed?' ■ What factors affected take-up & fall-out (e.g. barriers, enablers, motivations)?'
Experience of installation (Section 4 of the report)	■ What financing arrangements do consumers have in place to cover the remaining costs of purchasing and installing renewable heat technologies?' ■ What was the customer journey for participants and what were customers' perceptions of the application and claim process?' ■ What are consumers' experience of installation and training given to them about using the technology?
Performance of RHTs (Section 5 of the report)	■ How satisfied are consumers with performance?' ■ What do they see as the benefits or otherwise of the technology?' ■ How does it compare to their expectations pre-installation?' ■ What are consumers' experiences of using the technology and how does this compare to their previous system?' ■ What has been learnt about the performance of renewable heating systems once installed ■ What are customer perceptions, in terms of: energy consumption; heating costs; quality of installation; performance
Living with RHTs (Section 6 of the report)	■ How do consumers manage the new RHT under different weather conditions, do they use supplementary systems ■ Do respondents consider their energy usage more ■ Consumer use of fuel used in biomass boilers

Table 41 Evaluation questions for Strand 2 – Applied not redeemed vouchers

Theme	Evaluation question
Awareness of the scheme and motivation	■ How and when were customers aware of the RHPP scheme? ■ What was the main reason for the application?
Reasons for non-redemption / non-installation	■ What were the reasons for not redeeming a voucher? ■ For which technologies were vouchers not redeemed? ■ Are there any plans to reapply to RHPP2 / RHI ■ Where no installation – what are the reasons for a loss of interest in RHT?
Installation without the voucher	■ Which technologies were installed without a voucher? ■ What was the installation experience? ■ What were the costs of the installation? ■ How were costs financed?

Table 42 Evaluation questions for Strand 3 – The Registered Social Landlords scheme

Theme	Evaluation question
Take-up and motivation for use of the scheme (Section 2)	■ What are the characteristics of RSLs and tenants? ■ How many installations were achieved by the scheme and how does this compare with expectations? ■ How and why did RSLs engage or not? ■ What are the reasons for RSLs selecting the renewable heat technologies they have installed? ■ What factors affected take-up & fall-out (e.g. barriers, enablers, motivations)
Customer journey – from awareness of the scheme to scheme application (Section 3)	■ When and how did RSLs first become aware of renewable heat technologies and the RHPP2 scheme? ■ How were social housing tenants consulted prior to installation? ■ What financing arrangements do RSLs have in place to cover the remaining costs of purchasing and installing renewable heat technologies? ■ What has been learnt about problems with compliance (e.g. Permitted Development Rights, planning regulations, etc.).
Customer journey – from award to installation and the experience of RSLs and tenants (Section 4)	■ What are RSLs experience of installation and training given to them about using the technology? ■ What is the tenant experience of installation?
Customer journey – post installation experience (Section 5)	■ For each technology, how satisfied are RSLs / tenants with performance? What do they see as the benefits or otherwise of the technology? ■ How does it compare to their expectations pre-installation? ■ What are tenants' experiences of using the technology and how does this compare to their previous system? ■ Has fuel use gone down since installing the technology?
Final reflections for domestic RHI (Section 6)	■ What has been learnt re the performance of renewable heating systems once installed, and tenant perceptions, in terms of: energy consumption; heating costs; quality of installation; performance. ■ Has the RHPP2 scheme made an impact on tackling fuel poverty? Have fuel poor households participated in the scheme?

Table 43 Evaluation questions for Strand 4 – Communities Scheme

Theme	Evaluation question
Uptake - Has RHPP2 encouraged the uptake of renewable heat installations across different individuals, consumer groups and domestic building stock?	■ What are the characteristics of consumers in each of the three delivery mechanisms where renewable heat technologies have been installed or where vouchers were issued but not claimed (i.e. those who dropped out of the scheme) (e.g. demographics, building type etc)? ■ When and how did consumers first become aware of renewable heat technologies and the RHPP2 scheme? How and why did consumers engage or not? What are the reasons for consumers selecting the renewable heat technologies they have installed? ■ What factors affected take-up and fall-out (e.g. barriers, enablers, motivations) ■ What financing arrangements do consumers have in place to cover the remaining costs of purchasing and installing renewable heat technologies?
Administration and delivery of the scheme	■ For householders working through community groups – were there any perceived benefits of having community groups as intermediaries working with installers? ■ What was the customer journey for participants and what were customers' perceptions of the application and claim process?
Experience of installation	■ What are consumers' experience of installation and training given to them about using the technology?

Performance and experience of using technology - Has the RHPP2 scheme driven improvements in technical system performance of renewable heating systems?	■ For each technology, how satisfied are consumers in the technology's performance? What do they see as the benefits or otherwise of the technology? How does it compare to their expectations pre-installation?
	■ What are consumers' experiences of using the technology and how does this compare to their previous system?
	■ What has been learnt about the performance of renewable heating systems once installed, and customer perceptions, in terms of:
	  – energy consumption
	  – heating costs
	  – quality of installation
	  – performance
	■ identification of problems with compliance (e.g. Permitted Development Rights, planning regulations, etc)
	■ Has the RHPP2 scheme made an impact on tackling fuel poverty?

Communities - How effective has the RHPP2 scheme been in engaging community based organisations to deliver renewable heating technologies?	■ What levels of discount were achieved across the technologies through different buying groups including purchasing discounts? ■ Were communities able to identify additional finance streams (e.g. private match funding, installation costs, interest free loans etc)? ■ Do the attitudes and perceptions of individuals towards heat technology vary when approached through a local peer network as opposed to individual households through commercial advertising?

Theme	Evaluation question
	■ What is the impact of the community board?
Additional questions to be explored	■ Views of RHI ■ Benefits to CG from involvement in scheme

Table 44 Evaluation questions for Strand 5 – Installers

Theme	Evaluation question
Installer engagement with the RHPP Scheme	■ How many (and what proportion of) renewable heat installers are taking part in the Scheme? ■ What are installers' reasons for taking part and not taking part (e.g. barriers, enablers, motivations)? ■ What was installer experience of being involved in the Scheme? ■ Have installers helped to advertise the Scheme to householders to improve their business / market share / sell other services?
Installer perceptions of consumer knowledge and choice of technologies and marketing approaches	■ How and why did consumers engage or not? ■ What are the reasons for consumers selecting the renewable heat technologies they have installed? ■ What factors affected take-up & fall-out (e.g. barriers, enablers, motivations) ■ What are installer experiences of working with social landlord and community groups?
Renewable heat technologies – sourcing and quality	■ If participated in RHPP1, has evidence of competition between technology providers (discounting etc.) been seen? ■ Who are the suppliers of the technology installed? Is it known where the equipment installed is manufactured? ■ Are technology specifiers aware of the full range of products available? ■ Are UK manufactured products being prioritised?*
MCS standards, RHPP Scheme compliance standards and skills and training	■ How did installers perceive the installer checklist? What were the advantages /disadvantages & how did it impact on participation? ■ To what extent has RHPP2 improved installers' knowledge and skills? ■ Was additional training necessary to participate? What costs to the business? ■ In what ways could supplier/installer skills be improved?
Overall impact of the RHPP Scheme on the supply side	■ Has RHPP2 helped to maintain the supply chain in renewable heat? What has been the impact of RHPP2 on the renewable heat supply chain? ■ Has the RHPP2 Scheme provided: - Greater choice of accredited installers/products? - Perceptions of lead in times to install technologies? ■ Have there been any other impacts on the installer market? - Changes to business models as a result of the RHPP - Strategic partnering - Increased competition between installers