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Home*Smart* Renovations: Householder Actions and Responses to Dwelling Performance

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About This Report

Title

HomeSmart Renovations: Householder Actions and Responses to Dwelling Performance

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Abstract

This report presents self-reported and monitored data from householders participating in the Home*Smart* Renovation Project. It describes the profile of those householders, their perceptions of house condition, and their past, intended and actual renovations. It considers the profile of house performance of the subset of householders whose dwellings were monitored for temperature and the impact of renovations on electricity and water consumption.

Reference

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1 Executive Summary

The Home*Smart* Renovations Project is a flagship live-research project for Beacon Pathway as the Consortium seeks to improve the performance of New Zealand's homes to reach the HSS High Standard of Sustainability® (HSS®). The intent of this research was to extend the learning from Beacon's Papakowhai Renovation project by developing a set of tools and guidelines to assist the home renovation industry, and homeowners, to retrofit and operate their homes to achieve a HSS®. To this end, households participating in the Home*Smart* Renovation Project received an assessment of their dwelling with a renovation plan designed to set them onto a journey to move their home performance towards Beacon's HSS®. A variety of data were collected to assess both take-up of advice and the impact on dwelling performance of performance-based retrofit.

This report presents self-reported and monitored data from participating households. It describes the profile of those householders, their perceptions of house condition, and their past, intended and actual renovations. It considers the profile of house performance of the subset of householders whose dwellings were monitored for temperature and the impact of renovations on electricity and water consumption.

Main conclusions from the project are:

- While Home*Smart* participants still tend to over estimate the condition and performancee in their homes, they are more likely to recognise the performance problems of their dwellings than most New Zealanders.
- The receipt of Home*Smart* Renovation In-Home Assessment and the Home*Smart* Renovation Plan has generated a more realistic understanding of the condition of the householders' dwellings.
- New Zealand dwellings are too cold and damp and this affects households whether they live in Auckland or Dunedin.
- New Zealand householders want to make their homes warmer and more comfortable.
- Participants report relatively low levels of spending given the condition of their homes and their stated performance outcomes.
- Renovation activity undertaken is well-orientated for thermal performance, less so for management of internal moisture, water efficiency measures and adoption of renewable energy, e.g. solar hot water heating.
- There is clear opportunity for the residential built environment to make considerable gains in resource efficiency and dwelling performance: residential water demand is significantly lower where households have clear pricing signals; few householders enquired or took up subsidies (for example, solar hot water despite a high proportion with suitable north-facing roof surface).
- While the independent information provided by the project both stimulated and shaped renovation action, further advice was sought on selection between products and service providers. It appears that, in the interaction with the product suppliers and installers, householders feel particularly vulnerable.

2 Introduction

The Home*Smart* Renovation Project is designed to take the learnings from the Papakowhai Renovation project, and develop a set of tools and guidelines (the Procedures) which would assist the home renovation industry and homeowners to retrofit and operate their homes to achieve the HSS High Standard of Sustainability® (HSS®).

The project involved an extended engagement with homeowners that enrol in the project. That engagement can be broadly divided into two types. There were, firstly, activities that provided home occupiers an assessment of their dwelling and a tailored plan for retrofitting that dwelling. Secondly, the Home*Smart* Renovation Project involved home occupiers in a variety of data gathering activities to allow Beacon to establish the extent to which independent advice impacts on occupiers' renovation and retrofit plans, decisions and actions.

The research component involved gathering and analysing four types of data. Those were:

- Self-reported data around renovation intentions prior to receiving independent assessment and planning advice.
- Data related to occupiers current dwelling and appropriate pathways to improve dwelling performance *vis à vis* the HSS®.
- Independent data on energy, water and as well as data on the humidity and temperature component of Indoor Environmental Quality (IEQ).
- Data collected from occupiers after receiving home assessments and renovation plans.

This report presents an analysis of that data and sets out findings related to five key questions. Those key questions are:

- Do people act on advice and action plans to improve the performance of their houses?
- What are the patterns of those actions?
- What are the determinants of those actions?
  - Socio-demographic characteristics
  - Dwelling characteristics
  - Climate characteristics.
- Do sustainability directed renovations impact on house performance?
- What renovations and dwelling conditions optimise house performance in relation to the HSS® benchmarks?

The report is structured as follows:

- Section 3 sets out the objectives of the Home*Smart* Renovation Project and provides a brief overview of the phases of the Home*Smart* Renovation Project.
- Section 4 provides an overview of the research methodology, progress on the implementation of that method and some of the barriers to research implementation.
- Section 5 is concerned with the characteristics of the participant households and dwellings.

- Section 6 focuses on energy and water consumption.
- Section 7 presents data related to householders renovation activities
- Section 8 is concerned with the impact of the Renovation Plan on shaping action
- Section 9 identifies some of the key implications and learnings from the Home*Smart* Renovation Project.

3 Home*Smart* Renovations Objectives

The Home*Smart* Renovation Project had five main objectives. They were to:

- Develop and implement Home*Smart* Renovation In-Home Assessments, Procedures and Plans which will facilitate retrofitting of retrofitting of existing homes to meet Beacon's HSS High Standard of Sustainability®.
- Contribute to market transformation by providing householders independent advice on retrofitting and pathways to achieve effective retrofit of existing homes which acknowledge the financial constraints that households face.
- Provide an opportunity for retrofit providers to develop capability delivering broader home assessment and retrofit planning tools than those currently available.
- Assess the impact of Home*Smart* Renovation In-Home Assessments and Plans on the pattern of take-up among renovating owner occupiers.
- Identify the factors that motivate and/or deter householders from retrofit pathways that will bring their dwellings closer to Beacon's HSS®.

The project implementation of Home*Smart* Renovations had a number of phases.

- The first phase involved establishing Home*Smart* Renovations procedures, delivery partners and the approach to the recruitment of householders. The development of the monitoring and evaluation framework was also part of that phase.
- The second phase was an implementation phase.
- The third phase was a review, analysis and reporting phase.

While these phases were broadly sequential, they did overlap.

4 Research Methodology

The research methodology for the Home*Smart* Renovation Project is inevitably complex. It not only attempted to provide an opportunity to establish the renovation actions of householders in different climate zones and income strata, it also attempted to assess the impact of renovations on dwelling performance. Consequently, data is drawn from a mix of administrative, monitoring and survey sources supported by an attempt to establish and recruit to a sample frame which addresses issues of both household income and climatic differences. This section describes the data sought through the Home*Smart* Renovation Project. It then sets out the sample frame, recruitment process and subsequent yield of households and data.

4.1 Data and Data Sources

Table 1 sets out the data specification of the Home*Smart* Renovation Project. In summary, data were collected from:

- Households wanting to participate in Home*Smart* Renovations.
- The community partners undertaking In-Home Assessments.
- Community partners' Renovation Plans provided to householders.
- Householders regarding retrofit uptake and renovation activities.
- Directly measure monitored data for temperature, water and hot water related energy for sub-sets of households.

Collected data relates to one or more of the following:

- IEQ performance;
- Energy performance;
- Water performance;
- Other components of the HSS®;
- Dwelling characteristics;
- Household characteristics; and,
- Household behaviours, perceptions and intentions.

Table 1: Summary of Intended Monitoring Methodology HomeSmart Renovation Pilot

Data Source	Instrument	Provider	When	Who/What
Potential Participants	Self complete application and registration questionnaire	Householder via questionnaire	Pre-retrofit	All potential participants
Dwelling In Home Assessment	In Home Assessment Tool	Partner assessor	Pre-retrofit	All assessed dwellings
Renovation Plan	Renovation Plan	Partner assessor	Pre-retrofit	All assessed dwellings
Retrofit Installation	Householder Survey	Surveyor	Post-retrofit	All installed dwellings
Administrative data	Reticulated energy	Householder via energy bills or by through supplier	Pre and post retrofit	All assessed dwellings
	Reticulated water	Householder via water bills or through supplier	Pre and post retrofit	All assessed dwellings if separate water billing
Direct monitored data	Temperature	Direct monitored	Pre-retrofit Post retrofit	200 dwellings-temperature
	Water			Up to 150 installed water meters
	Hot water (solar)			Up to 50 dwellings solar water heating
	Humidity			200 dwellings Fuginex tabs[1]
Participant survey	Householder survey	Surveyor	Pre-retrofit Post retrofit	200 householders

[1] ***These tabs change colour when exposed to humidity in excess of 75% relative humidity over an extended period of time (at least 4-8 hours).***

Direct monitoring of consumption patterns in relation to water and energy is limited to a sub-sample of dwellings but all householders were asked to provide reticulated energy data by way of permissions to access billing data from the household's supplier. Water data, except where meters were installed, can only be provided in areas in which the local authority meters water. In some cases there was direct billing and charging. In other cases, such as Christchurch, water was metered but the Christchurch City Council does not 'bill' for water. Water supply is included in council rates. Christchurch City Council reads water meters infrequently and only as a means of identifying leaks on private properties.

In relation to energy, energy data was collected from suppliers were householders in the interview process agreed that Beacon, through BRANZ, could access energy billing records. Where agreement was gained, BRANZ sent a consent form to the householder which BRANZ then used as a basis for a request to the energy supplier. Similarly, householders in water metered areas were also being separately approached with a request that they consent to Beacon through BRANZ accessing water consumption data. This involved the householder completing a consent form and returning it to BRANZ.

BRANZ also approached monitored dwellings without water meters in an effort to install water meters. In all, 16 were installed. Originally, it was intended that if monitored dwellings did not agree to water metering that they would be excluded from the monitored set. Recruitment of participants into the monitored set was slow, however. Consequently, pursuing that approach would have meant rejecting a number of dwellings with householders willing to be otherwise monitored. Overall, water data was acquired from 79 householders.

4.2 Data Matching and Analysis

The analysis presented in this report has taken data from each of the data sources in Table 1 and matched that data for each household.

In short, all data has been captured and stored on a variety of different databases using a unique ID which is used on database. For analytic purposes, key data has then been merged in a single meta-database using SPSS as a data platform. Data has been subject to uni-variate and bi-variate analysis with some testing for statistical significance in relation to key variables such as:

- Household income;
- Climate zone; and,
- Dwelling condition.

The analysis uses as the core data set, the households that have undertaken one post-plan interview.

4.3 Sample Frame

A sample frame targeting the recruitment of the 750 dwellings was developed. That framework specified two key sampling parameters – location and household income. A sub-sample frame for 200 dwellings to be subject to direct monitoring was also developed. The sample frame is set out in Table 2. The number of dwellings in each category in the sample frame allowed for over-recruitment to generate an eventual sample of 750 participant households. The sample of 750 dwellings has not been reached. Nevertheless, the achieved sample is sufficient to meet the analytic requirements of the study.

Table 2: Sample Frame for HomeSmart Renovations

Climate Zone	$0-25k	$25-50k	$50-100k	$100k+	Total
Auckland	30 (7)	30 (7)	48 (13)	42 (9)	150 (36)
Rotorua/Taupo	39 (8)	39 (8)	50 (10)	23 (5)	151 (31)
Wellington	35 (7)	35 (8)	47 (10)	34 (8)	151 (33)
Nelson/Marlborough	43 (9)	41 (9)	48 (10)	18 (4)	150 (32)
Christchurch	40 (9)	38 (9)	50 (11)	23 (6)	151 (35)
Dunedin/Invercargill	45 (10)	41 (9)	47 (10)	18 (4)	151 (33)
Total	232 (50)	188 (50)	290 (64)	158 (36)	904 (200)

4.4 Recruited Householders

Since the Home*Smart* Renovation Project commenced, more than 703 households expressed interest in participating. A number of those households were clearly ineligible because they did not fit the sample frame. In total, 676 households appeared to be eligible and were given a unique identifier. Of those, however, a number have subsequently been identified as outside the research study areas or duplicates. The total number of households actually eligible was 646. The total number of eligible households participating in the research as of May 2010 is 432.

Table 3 sets out the wastage associated with the reduction of the 676 potential participants to the current sample of active household participants. Active participant households are defined as households that have:

- Had an In-Home Assessment;
- Been sent a Renovation Plan; and,
- Had at least one post-plan interview.

It should be noted that active participation in the research does not mean that the householder has, to date, undertaken renovations or, indeed, since the post-plan interview, intends to undertake renovations within the next period. It merely means that the Home*Smart* Renovation Project has enough data in relation to that household to make an analysis of householder perception and action as well as dwelling performance.

Table 3: Reduction of the Number of ID Allocated Households to the Number of Participant Households

Total ID'ed Households		**676**
Non-participant Households		
Inactive households	135	
Duplicates	6	
Outside Area	17	
Switched area so new ID issued	4	
Non contacts	82	
Total Participant Households		432

As noted in the sample frame section, it was intended that 200 dwellings be monitored intensively through the installation of temperature loggers installed in living areas and the main bedroom and humidity gauges. A subset of dwellings also had water meters installed.

The numbers of recruited households by area and household income are set out in Table 4. Table 5 sets out the area and income of households subject to intensive monitoring. Of the dwellings recruited for intensive monitoring, data was actually received by BRANZ researchers for 183 households. Their distribution is also set out in Table 5. Due to loss of equipment and/or equipment failure full data is not available for the total number of dwellings in this set.

Table 4: Recruited Households by Region and Household income

Income group	Auckland	Rotorua -Taupo	Wellington	Nelson	Marlborough	Canterbury	Dunedin-Southland	Out of research area	Total
0-25k	2	0	6	0	2	10	6	0	26
26-50k	29	29	10	9	5	33	26	0	141
51-100k	85	46	50	12	12	62	31	0	298
101k+	51	13	62	2	8	12	7	0	155
Income not specified	10	2	1	0	3	1	1	0	18
Duplicates/outside area/switched area	5	1	1	0	1	6	6	18	38
Total	182	91	130	23	31	124	77	18	676

Table 5: Households with Direct Monitoring Devices by Region and Household income

Income group	Auckland	Rotorua -Taupo	Wellington	Nelson	Marlborough	Canterbury	Dunedin-Southland	Total
0-25k	1	0	3	0	2	5	2	13
26-50k	5	11	6	5	2	7	12	48
51-100k	17	14	10	7	1	13	15	77
101k+	11	7	8	0	4	6	3	39
Income not specified	0	2	0	0	3	0	1	6
Total	34	34	27	12	12	31	33	183

Annex A provides a more detailed analysis of progression of households through the Home*Smart* Renovation Project and the timing of various project contacts.

5 Households and Dwellings

This section examines the household characteristics and dwelling characteristics of households who have participated in the programme to one post-plan interview. It was through that interview that the most robust data related to household and dwellings was collected.

The telephone survey instrument (see Appendix B) elicited information from participants on the following aspects of households and dwellings.

- Households:
  - Life stage.
  - Household income.
  - Household size.
- Dwellings:
  - Stock typology
  - Perceived dwelling condition.

In addition, some dwellings were directly monitored in relation to indoor temperatures and humidity.

5.1 The Households

The participants in Home*Smart* Renovation Project that had at least one interview have a profile distinctly different from New Zealand households as a whole. They tend to be concentrated in the middle age and earning cohorts. Their incomes are higher than the New Zealand income pattern and they tend to be free of both young children and of older household members. Table 6 provides a comparison of the socio-demographic characteristics of the Home*Smart* Renovation interviewees compared to the profile of households found in the 2006 census. In summary, the key characteristics of the participant households are:

- Almost two-thirds are aged 31-50 years (64.7 percent).
- 64.3 percent have household annual incomes in excess of $70,000, and 79 percent of households have household incomes in excess of $50,000.
- Less than a fifth (18.9 percent) report being eligible for a Community Services Card.
- The largest single proportion of households has only two people, but 61.4 percent are households with 3 or more people.
- The vast majority (90 percent) of households have no household members aged 65 years or more.
- The vast majority (75.7 percent) of households have no children in the household aged 5 years or less.

Table 6: NZ Household and HomeSmart Renovation Household Socio-demographics (1st Interview)

Socio-demographic Characteristics	HomeSmart Renovation Households	NZ Households
Householder Age (n=430)		
Less than 25 years old	1.2%	6.1%[2]
25-60 years old	87.1%	67.2%
Over 60 years old	4.9%	26.8%
Household Income (n=415)		
$20,000 or less	4.9%	9.9%[3]
$20,001- $30,000	4.6%	10.8%
$30,001 - $50,000	11.3%	18.0%
$50,001 - $70,000	14.7%	16.1%
$70,001 - $100,000	25.5%	18.8%
Over $100,000	38.8%	26.4%
Household Size (n=428)		
1 person	8.4%	22.6%[4]
2 people	30.1%	34.0%
3 people	20.6%	16.5%
4 people	26.4%	15.2%
5 or more people	14.4%	11.7%
Average household size	3.1 people	2.7 people[5]

There is a predictable under-representation of young, as well as older, households and an income skew towards higher income households. Old and young households tend to have constrained income and smaller household sizes. Those characteristics are associated with lower levels of owner occupation and/or investment in repairs, maintenance and renovation.

[2] ***2006 Census***

[3] ***Customised data table from Statistics New Zealand using data from the Household Economic Survey year ended 30 June 2009.***

[4] ***2006 Census***

[5] ***2006 Census***

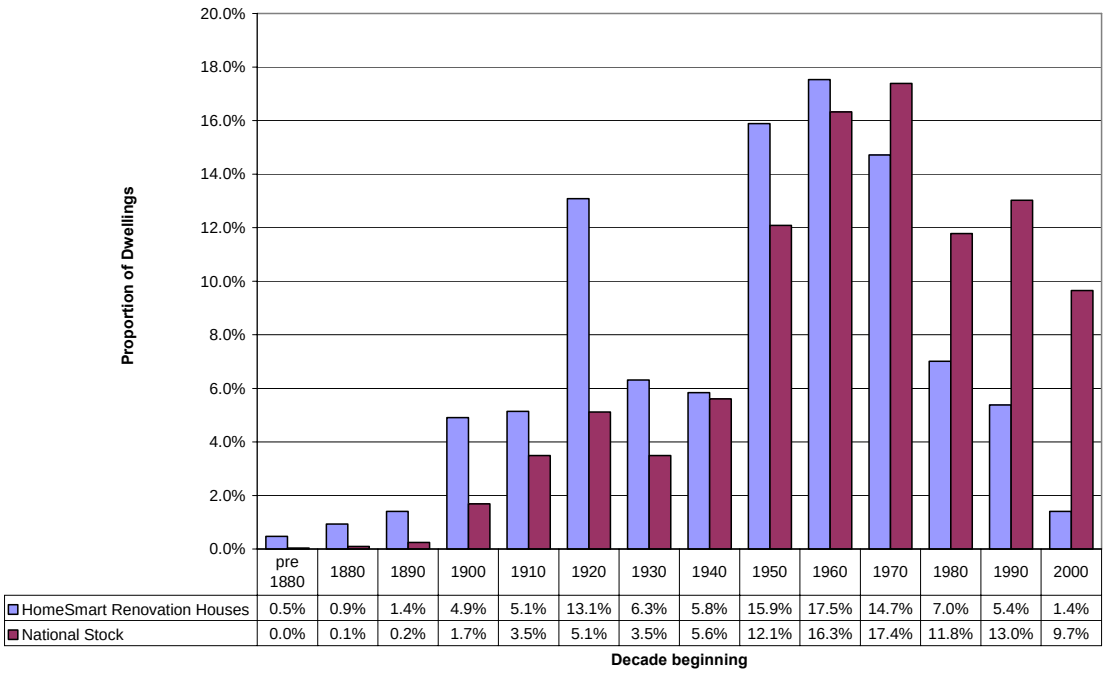
5.2 Stock and its Typology

Data related to the stock were collected by an In-Home Assessment instrument used by community providers (Community Energy Action, EcoMatters Trust, Energy Options, and Energy Smart) and in the householder's interviews. This section presents data on dwelling age, type, configuration, size and orientation.

5.2.1 Dwelling Age

Almost half the dwellings assessed of householders who remained in the Home*Smart* Renovation Project at the Wave 1 interviews had been built prior to 1957. 15.6 percent of dwellings were built in 1978 or subsequently. Figure 1 compares the age profile of Home*Smart* Renovation Project dwellings to the age profile of the National Stock.

Figure 1: Dwelling Age of the National Stock and Dwellings in the HomeSmart Renovation Project



	pre 1880	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
HomeSmart Renovation Houses	0.5%	0.9%	1.4%	4.9%	5.1%	13.1%	6.3%	5.8%	15.9%	17.5%	14.7%	7.0%	5.4%	1.4%
National Stock	0.0%	0.1%	0.2%	1.7%	3.5%	5.1%	3.5%	5.6%	12.1%	16.3%	17.4%	11.8%	13.0%	9.7%

Not surprisingly, the Home*Smart* Renovation Project houses have an older age profile than the national stock. The bulk of the Home*Smart* Renovation Project dwellings are in an age cluster spanning the 1950s through the 1970s. There is a smattering of dwellings being renovated that are less than twenty years old. Table 7 sets out the renovations undertaken by the 1st wave interviews and intended at that time in those dwellings.

Table 7: HomeSmart Renovation Dwellings Built After 1989 by Householders Past and Intended Renovations Wave 1 Interviews

(n=29)

Renovation Activity **(Multiple Response)**	**Renovations Undertaken in Previous Year**	**Intended Renovations**
Renovated bathrooms	23	1
Install underfloor insulation	2	4
Install ceiling insulation	1	12
Install double glazing	2	7
Install wall insulation	1	1
Install heat pump	1	2
Install solar hot water	1	2
Roof replacement	2	
Built garage	1	
Landscaping	2	1
Extending house	2	1
Changed room sizes or configuration	1	
Installed air conditioner	1	
Installed heat exchanger	1	
Replace significant areas of exterior cladding		1
Curtaining		4
Energy efficient lighting		1
Replumbing		1
Install extractor fan in bathroom		1
Install low flow shower head		1
Install woodburner		2
Full exterior repaint	2	
Install ventilation system (HRV/DVS)	1	1
Carpeting	1	
Install heat pump hot water		1
Install rangehood or kitchen extractor fan		1
Interior repainting/wallpapering	2	
Alternative energy – wind, solar		1
Install hot water cylinder insulation		1
Install pipe lagging		3

5.2.2 Dwelling Typology

Beacon has developed an analysis of residential dwelling stock typology. Its research in retrofit and stock typology suggests that certain types of dwellings are easier to retrofit than others.[6] Eighty percent of New Zealand's dwelling stock falls into one of the following categories:

- Early housing (pre-1890);
- Villa (1880–1920);
- Bungalow (1920–1930/40);
- Art Deco (1925–1935);
- State House and Mass Housing (1930–1970);
- 1960s Multi Unit Housing;
- 70s House (1970–1978 pre-insulation);
- 80s House (1978–1989);
- Early 90s (1990–1996 pre-revamped Building Code); and,
- Last decade (1996–2007 post-insulation upgrade).

Infobox 1 indicates the ease with which those different stocks types may be retrofitted for improved energy performance. In-home assessors were asked to use that typology structure to characterise the dwellings they assessed. Figure 2 sets out the typology of the Home*Smart* Renovation Project dwellings compared to the national stock.

There is typology data for 413 of the 432 dwellings that were occupied by householders participating in the Wave 1 interviews. The largest single category of dwelling type is mass housing/state housing prevalent in the post-war period. These are good candidates for retrofitting, especially for energy-saving and comfort-enhancing retrofits such as ceiling and under-floor insulation.

5.2.3 Stock Configuration and Size

The stock in the Home*Smart* Renovation Project, like New Zealand's residential stock generally, is overwhelmingly single storey. A small proportion of single storey dwellings are split level.

[6] ***Ryan, V., Burgess, G., and Easton L. (2008), New Zealand House Typologies to Inform Energy Retrofits. Report EN6570/9 for Beacon Pathway Ltd.***

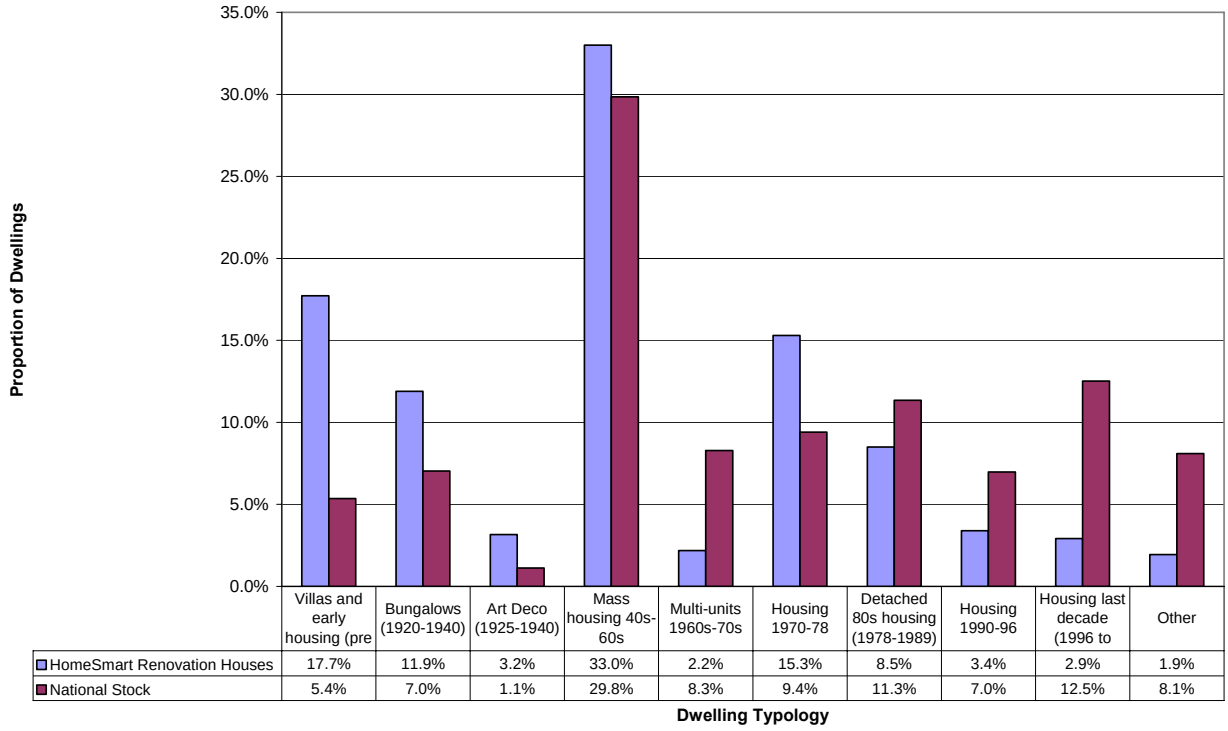
Infobox 1: Main house typologies in New Zealand

House typologies	
Early housing (pre-1890)	**Villa (1880–1920)**
	
Ease of retrofit will depend largely on access to ceiling and floor	Good retrofit candidates for better energy performance
Bungalow (1920–1940)	**Art Deco (1925–1935)**
	
Good retrofit candidates for better energy performance	Likely to require moderate to considerable effort and cost to energy retrofit

House typologies	
State House and Mass Housing (1930–1970)	**1960s Multi Unit Housing**
 Good candidates for energy retrofit, particularly the 50s classic	 A challenge – likely to require considerable effort and cost to energy retrofit
1970s House (1970–1978 pre-insulation)	**1980s House (1978–1989)**
 Wide variation in styles and generally moderately easy to energy retrofit	 Wide variation in styles and generally moderately difficult to energy retrofit

House typologies	
Early 90s (1990-1996) pre-revamped Building Code	**Last decade (1996-2007) post-insulation upgrade**
	
Wide variation in styles and generally moderately difficult to energy retrofit	Daunting retrofit option. Each case must be judged on its merits

Figure 2: Dwelling Typology of the National Stock and Dwellings in the HomeSmart Renovation Project



	Villas and early housing (pre	Bungalows (1920-1940)	Art Deco (1925-1940)	Mass housing 40s-60s	Multi-units 1960s-70s	Housing 1970-78	Detached 80s housing (1978-1989)	Housing 1990-96	Housing last decade (1996 to	Other
HomeSmart Renovation Houses	17.7%	11.9%	3.2%	33.0%	2.2%	15.3%	8.5%	3.4%	2.9%	1.9%
National Stock	5.4%	7.0%	1.1%	29.8%	8.3%	9.4%	11.3%	7.0%	12.5%	8.1%

As Table 8 shows there is also a cluster of dwellings in which living space tends to be on a single floor but there is some attic or basement space. The latter was particularly characteristic of dwellings built on hilly sites and dwellings built in the 1970s. Dwellings in buildings with more than two storeys are rare.

Consistent with the age profile and prevailing building practices, dwellings in the Home*Smart* Renovation Project tend to have cavity roofs with 86.4 percent of dwellings assessed as having a cavity roof of some kind. In most cases roofs also are high pitch although low pitch cavity roofs make up 24.1 percent of the dwellings. 9.3 percent of the dwellings had skillion roofs (Table 9).

Again consistent with the age profile of the dwellings, the majority (86.7 percent) of floors in single storey buildings are suspended timber/composite floors. The remainder are predominantly concrete slab (11.5 percent) the majority of which are un-insulated (Table 10). There are data regarding the ground level of 98 multi storey dwellings. Those floors show a similar pattern as single storey dwellings. 77.6 percent have suspended timber/composite floors and concrete slabs tend to be un-insulated (Table 11).

Table 8: Configuration of HomeSmart Renovation Dwelling Stock

Dwelling Configuration	Dwellings	% of Dwellings
Single floor	276	63.9
Single split level	16	3.7
Single floor with attic	6	1.4
Single living with basement/garage	36	8.3
2-storey	84	19.4
3 or more storeys	10	2.3
Other/Not stated	4	0.9
Total	*432*	*100*

Table 9: Primary Roof Type HomeSmart Renovation Dwellings (n=432)

Roof Type	Dwellings	% of Dwellings
Cavity Roofs	273	86.4
Skillion Roofs	40	9.3
Other and multiple	12	2.8
Not Recorded	7	1.6
Total	*432*	*100*
Cavity Roof Pitches		
High pitch	263	60.9
Low pitch	104	24.1
Flat roof	6	1.4
Skillion		
Exposed beams/rafters	22	5.1
No exposed beams/rafters	18	4.2
Other and Multiple	12	2.8
Not Recorded	7	1.6
Total	*432*	*100*

Table 10: Main Floor Type Single Storey Dwellings

Floor Types in Single Storey Dwellings	Dwellings	% of Dwellings
Suspended timber/composite	254	86.7
Uninsulated Concrete Slab	27	8
Insulated Concrete Slab	12	3.5
Other	6	1.8
Total	*339*	*100*

Table 11: Main Floor Type Multi-Level Dwellings

Floor Types in Multi-Storey Dwellings	Dwellings	% of Dwellings
Suspended timber/composite	76	77.6
Un-insulated Concrete Slab	14	14.3
Insulated Concrete Slab	6	6.1
Other	2	2.0
Total	*58*	*100*

5.2.4 Dwelling Size

Dwelling size data is most reliably captured through the In-Home Assessment. That data shows that the stock involved in the Home*Smart* Renovation Project is predominantly 3 bedroom dwellings. This is consistent with the stock profile for New Zealand. A comparison between New Zealand's national stock and the dwellings whose householders participated in Wave 1 interviews is found in Table 12.

Table 12: Bedroom Numbers in HomeSmart Renovation Dwellings and New Zealand's 2006 Census of Dwellings

Number of Bedrooms	% Home*Smart* Dwellings	% New Zealand Stock 2006
1 bedrooms	0.7	5.8
2 bedrooms	7.2	19.8
3 bedrooms	63.3	46.3
4 bedrooms	23.2	21.6
5 bedrooms	4.5	5.0
More than 5 bedrooms	1.0	1.5

According to data provided by 301 householders as they entered the Home*Smart* Renovation Project, 64.5 percent of the dwellings that were still participating at the Wave 1 interviews were less than 150 square metres. 17.9 percent were reported as being with the 150 square metres to 199 square metres category, while 15.6 percent were reported as 200 square metres or more. The remaining 2.5 percent of households provided no or clearly incorrect size data.

5.2.5 Orientation

Dwelling orientation is a critical issue for solar gain for heating and light within the dwelling. It can also determine the effectiveness of installing energy saving devices such as solar hot water. With regard to the latter the In-Home Assessment found that of the 432 dwellings

participating at the Wave 1 interviews, 83.6 percent had at least one suitable north facing roof pitch.

Among the 265 householders who completed a preliminary questionnaire and a Wave 1 interview there was evidence of some dwelling orientation problems. While only 2.6 percent of householders reported that they never got sunlight into the rooms when they wanted it, 40.8 percent reported that they did so only sometimes. 8.7 percent of householders reported that they had to use lights during the day for activities such as reading or sewing.

5.3 Dwelling Condition

A multitude of research has found that high proportions of New Zealanders tend to assess their dwellings as in *Excellent* or *Good* condition. Indeed, New Zealanders tend to believe that their dwellings are in better condition than they are.

In 2004 a matched data set of dwellings subject to both independent house condition surveying by BRANZ and householders participating in an associated repairs and maintenance telephone survey found that while 27.8 percent of dwellings were reported by householders to be in excellent condition only 16.8 percent met a House Condition Score of 'excellent' when independently surveyed.[7] Table 13 provides a cross study comparison of the New Zealanders' self assessment of their house condition.

What is striking about the interviewees in the Home*Smart* Renovation Project is the skew of assessed house condition towards *Average* and lower house condition categories. Of the householders that completed the Wave 1 interviews, just under half (47.6 percent) considered their dwelling in *Average* or worse house condition (Table 14).

[7] ***Clark, S.J., M. Jones and I.C. Page (2005). New Zealand 2005 House Condition Survey, BRANZ Ltd Study Report 142, Judgeford, Porirua.***

Table 13: NZ Household Assessments of Dwelling Condition: Cross Study Comparison

Study and Year	Percentage Assessed Dwelling Condition				
	Excellent	Good	Average	Poor	Very Poor
2004 Repairs and Maintenance Survey[8]	27.8%	50.9%	18.8%	2.3%	0.2%
Recent Movers Survey 2008[9]	45.6%	37.4%	15.2%	1.7%	0.1%
High Energy User Survey 2008[10]	32.7%	43.4%	19.7%	3.6%	0.6%
National Older People Repairs and Maintenance Survey 2008[11]	46.1%	42.7%	10.2%	0.8%	0.3%

Table 14: HomeSmart Renovations Household Perceptions on House Condition

Study and Year	Assessed Dwelling Condition				
	Excellent	Good	Average	Poor	Very Poor
No. Home*Smart* Renovation Households	56	169	151	44	10
% Home*Smart* Renovation Households	13%	39.3%	35.1%	10.2%	2.3%

There are two possible explanations for this pattern. Firstly, it might be a manifestation of self-selection bias. That is, it might be expected that those householders who see their dwelling as in relatively poorer condition are more likely to participate in the Home*Smart* Renovation Project. Second, it might be suggested that the receipt of Home*Smart* Renovation In-Home Assessment and the Home*Smart* Renovation Plan has generated a more realistic understanding of the condition of the householders' dwellings.

There is a strong body of research that shows that New Zealanders tend to de-couple house condition from house performance, just as they de-couple renovations from improving dwelling performance. Among older people, for instance, a 2008 national survey found that while 88.8 percent of older householders reported their dwellings to be in Good or Excellent

8 Saville-Smith, K., (2005) National Home Maintenance Survey 2004: The Telephone Interview Data, Technical Report prepared for BRANZ.
9 Annex A, Saville-Smith, K., 2008, House Owners and Energy – Retrofit, Renovation and Getting House Performance, EN-6570, Energy Report prepared for Beacon Pathways Ltd.
10 Annex B, Saville-Smith, K., 2008, House Owners and Energy – Retrofit, Renovation and Getting House Performance, EN-6570, Energy Report prepared for Beacon Pathways Ltd.
11 Saville-Smith, K., James, B., and R. Fraser, (2008) Older People's House Performance and Their Repair and Maintenance Practices: Analysis from a 2008 National Survey of Older People and Existing Datasets, Wellington: CRESA.

condition. Over half of older householders reported that their heating did not keep them warm in winter. 34.4 percent of older householders reported that they had problems with mould, damp and condensation[12].

Nevertheless, it must also be acknowledged that over the last year or so public discourse in product advertising, the delivery of retrofit programmes, and in the media generally have increasingly involved ideas about house condition, performance and comfort. What the Home*Smart* Renovation In-Home Assessment and the Home*Smart* Renovation Plans do is take those frequently amorphous media messages and make them both more specific while also detaching them from particular product and programme promotions. Under those circumstances, it is likely that many household participants have become both more aware and more realistic about the condition of their dwelling and its connection to dwelling performance.

The pattern of condition reported by the Home*Smart* Renovation households is closer to the pattern of actual condition of dwellings found in the 2004 House Condition survey. Making direct comparisons between these two datasets, however, needs to be treated with caution. The 2004 data is now quite old and the national survey of house condition will be undertaken by BRANZ in 2010. That data will provide a better comparison with the Home*Smart* Renovation data.

The evidence from the Home*Smart* Renovation Project does suggest, however, that participants may have a somewhat more realistic understanding of their dwellings than New Zealanders in general. The In-Home Assessment process found that of a series of fundamental deficiencies were found, including only 16.4 percent of dwellings being fully insulated. These are set out in Table 15.

Table 15: Dwelling Performance Deficiencies Identified in In-Home Assessment

Assessed Performance Deficiencies	Dwellings	% of Dwellings
Ceilings and Roofs		
No ceiling insulation	32	7.2
Less than 75% insulated	76	17.6
Ceiling insulation less than 76mm	140	32.4
Ceiling/Roof Maintenance required	64	14.8
Roof leaks	27	6.3

[12] ***Saville-Smith, K., James, B., and Fraser, R., 2008, Older People's House Performance and Their Repair and Maintenance Practices: Analysis from a 2008 National Survey of Older People and Existing Datasets, CRESA, Wellington; Saville-Smith, K., 2008, House Owners and Energy: Retrofit, Renovation and Getting House Performance Report EN-6570 for Beacon Pathway Limited.***

Assessed Performance Deficiencies	Dwellings	% of Dwellings
Main Floors		
Damp under floor	99	22.9
Ponding (leaks)	7	1.6
Ponding (drainage)	18	4.2
Blocked ventilation	5	1.2
No ventilation	13	3.0
Damp proof membrane required	72	16.7
No under floor insulation	178	41.2
Poor under floor insulation	11	2.5
Walls – 1st Floor		
Only partially insulated	105	24.3
Insulation	186	43.1
Windows		
Single glazing	315	72.9
Timber frames require maintenance	99	22.9
Timber frames require replacement	38	8.8
Aluminium frames require maintenance	35	8.0
Aluminium frames require replacement	3	0.7
Draught stopping required	160	37.0
Thermal covering average or poor	156	59.3
External doors		
Draught stopping required	234	54.2
Open fireplace		
Not blocked off	65	15.0
Both blocked and non-blocked	3	0.7
Hot Water System (Main System)		
No cylinder wrap	228	52.8
Pipe lagging required	242	56.0
Hot water above 55°C at nearest tap	236	54.6

Assessed Performance Deficiencies	Dwellings	% of Dwellings
Fire risk		
No fire alarms	138	32.1
Non-operational alarms	70	16.2
Old-type fuse fittings	182	42.1
Combination of new and old fuse fittings	22	5.1
Leaks		
Windows and doors	61	14.1
Pipes/toilets/taps	37	8.6
Gutters	95	22.0
Other		
Damage to cladding	55	12.7
External maintenance required	250	57.9

5.4 Indoor Temperatures

New Zealand has a history of low indoor temperatures in winter and, more recently, indications that overheating may develop in some living areas. Low indoor temperatures are associated with a wide variety of health problems. There is also emerging evidence that social interactions within the household as well as with people external to the household are also negatively impacted on excessively low indoor temperatures.[13] The analysis of indoor temperatures in the Home*Smart* Renovation households is divided into two sections. The first section is concerned with the 432 householders who completed a 1st Wave of interviewing and their perception of warmth and comfort in their dwellings. The second part of the discussion is concerned with the monitored temperature data.

5.4.1 Temperature and Comfort in Renovators' Dwellings

Of the 432 renovators that entered Home*Smart* Renovation Project and stayed to complete at least a 1st wave interview, 301 completed a preliminary questionnaire. That preliminary data indicates that the inability to maintain comfortable indoor temperatures was pervasive. 79.7 percent of householders reported that they were cold after an hour of heating on a cold winter morning.

Only 10.3 percent of householders reported that it was very easy to heat their house on a damp, winter day. A slightly higher proportion (15.6 percent) of householders reported that they found it 'very hard' to heat their house on a damp, winter day. In comparison, concerns with overheating expressed by householders were much less prevalent when they entered the Home*Smart* Renovation Project. 26.5 percent reported that on a hot summer day, rooms on the west side of their houses became very hot. But 22.6 percent reported that those rooms were not hot or were cool.

[13] ***Baker, M. et.al., 2000, 'Household crowding: a mojor risk factor for epidemic meningococcal disease in Auckland children', The Paediatric Infectious Disease Journal 19:983-990; Baker, M., Milosevic, J., Blackely, T., Howden-Chapman, P., 2004, 'Housing and crowding and health', in Howden-Chapman, P{., and Carroll, P., (eds) Housing and Health: Research, Policy and Innovation, Steele Roberts Ltd, Wellington; Howden-Chapman, P., et.al., 2007, 'Effects of insulating existing houses on health inequality: cluster randomised study in the community'. BMJ, doi:10.1136; Isaacs, N., et.al., 2006 Energy Use in New Zealand Households: Report on the Year 10 Analysis for the Household Energy End-use Project (HEEP), BRANZ Ltd Study Report 155, Judgeford, Porirua; Saville-Smith, K., James, B., Warren, J., and Fraser, R., 2008 Access to Safe and Secure Housing for At Risk and Vulnerable Young People, CHRANZ, Wellington; Saville-Smith, K., and Thorns, D., 2001, Community-based Solutions for Sustainable Housing, CRESA, Wellington.***

At the time of the 1st wave of interviews, this concern with thermal performance was still pervasive. 67.6 percent of householders reported that improved comfort of warmth mattered a lot and a further 24.3 percent of householders reported that it mattered "a little bit". This was the single outcome most commonly was cited by householders as mattering a lot (Table 16).

Table 16: Importance to Householders of Different Retrofit Outcomes

(n=432)

Outcome	Importance *A Lot*	Importance *A Little Bit*	Importance *Not At All*	*Not Stated/ Don't Know*
Improved Comfort and/or Warmth	67.6%	24.3%	3.2%	4.9%
Making Home Healthier	57.2%	31.5%	6.7%	4.7%
Making Home Better for the Environment	44.9%	40.5%	7.4%	7.2%
Savings on Power Bill	37.5%	42.8%	11.6%	8.1%
Making Home Easier to Sell	30.8%	44.4%	13.2%	11.6%
Adding to Value of Home	28.7%	48.6%	13.4%	9.3%

5.4.2 Temperatures in Monitored Dwellings

183 dwellings were monitored over the course of the Home*Smart* Renovation Project of whom 163 completed a 1st wave interview and 161 completed a 2nd wave interview. A number of temperature loggers were not retrieved or failed to download requisite data. Consequently, winter living room temperature data was captured for 163 dwellings and 151 dwellings provided winter bedroom temperature data. For living rooms in summer, data for 156 dwellings are available while 166 dwellings provided bedroom summer temperatures.

The data confirm that these dwellings tend to be cool. Patterns found in the Household Energy End-use Project[14] which indicate a pattern of heating later in the day into the evening and in living zones rather than bedrooms is also characteristic of the patterns found among the participants in the Home*Smart* Renovation Project.

Average winter living room temperatures in the morning from 7am to 9 am are a little under 14° C, rising to almost 16° C over the period 9am to 5 pm. Between 5pm and 11pm average living room temperatures are closer to 18° C but then fall again over night with the night average being just over 15° C (Table 17). Over the whole 24 hour period the average temperature of winter living rooms in 16° C.

14 Isaacs, N. Camilleri, M. French, L. Pollard, A. Saville-Smith, K. Fraser, R. Rossouw, P. and Jowett, J., 2006, Energy Use in New Zealand Households: Report on the Year 10 Analysis for the Household Energy End-use Project (HEEP), BRANZ Ltd Study Report 155, Judgeford, Porirua.

Table 17: Median, Mean and Minimum Average Living Room Winter Temperatures (n=163)

Period	Minimum	Mean	Median
Morning 7am-9am	8.78° C	13.98° C	13.88° C
Day 9am-5pm	9.85° C	15.91° C	15.87° C
Evening 5-11pm	11.86° C	17.79° C	17.85° C
Night 11pm-7am	10.05° C	15.26° C	15.29° C
24 hours	10.63° C	16.01° C	16.07° C

Although those winter living room temperatures do not meet optimal temperatures for health, they are considerably higher than average New Zealand winter bedroom temperatures. Table 18 shows that average temperatures in bedrooms over winter through twenty-four hours were well below 16° C at 14.4° C. The highest average bedroom winter temperature is found between 5pm and 11pm at 15.2° C but bedrooms are coldest in the mornings, on average in winter, 13.2° C.

Table 18: Median, Mean and Minimum Average bedroom Winter Temperatures (n=163)

Period	Minimum	Mean	Median
Morning 7am-9am	7.98° C	13.18° C	13.42° C
Day 9am-5pm	8.13° C	14.57° C	14.64° C
Evening 5-11pm	8.45° C	15.18° C	15.38° C
Night 11pm-7am	8.26° C	14.00° C	14.10° C
24 hours	8.24° C	14.43° C	14.61° C

What is clear is that some dwellings are very cold. In living rooms, the lowest average winter morning temperature is 8.78° C. The lowest average winter day temperature is 9.85° C. The lowest average winter evening temperature is 11.86° C. In bedrooms during winter the lowest average winter morning temperature was 7.98° C with the lowest average during the day in a bedroom in winter being 8.13° C. Evening winter bedroom temperatures were as low as 8.45° C. As Table 19 shows, significant proportions of dwellings have low winter temperatures in both living rooms and bedrooms.

Table 19: Proportion of Monitored Dwellings by Room and Average Winter Temperatures (n=163)

Monitored Area and Time	<12° C	12-17.99° C	18-20.99° C	≥21° C
Living Room Winter 7am-9am	22.1%	72.4%	5.5%	0%
Living Room Winter 9am-5pm	4.3%	76.1%	17.8%	1.8%
Living Room Winter 5pm-11pm	0.6%	53.3%	35.5%	10.4%
Living Room Winter 11pm-7am	7.4%	82.8%	9.2%	0.6%
24 hours Winter Average	3.1%	77.3%	18.4%	1.2%
Bedroom Winter 7am-9am	25.2%	66.3%	1.2%	0%
Bedroom Winter 9am-5pm	12.9%	73.0%	6.7%	0%
Bedroom Winter 5pm-11pm	7.4%	73.0%	11.0%	1.2%
Bedroom Winter 11pm-7am	17.9%	77.5%	4.6%	0%
24 hours Winter Average	16.0%	71.8%	4.9%	0%

Table 20 shows that there are considerable numbers of dwellings that are simply too cold in both living rooms and bedrooms with only a minority of dwellings in which temperatures are acceptable by World Health Guidelines in both living and bed rooms. This tendency for low or marginal indoor winter temperatures is pervasive irrespective of location (Table 21). There is less evidence of overheating although average maximum living room temperatures from 5pm to 7 pm are 23.1° C with average maximum temperatures in bedrooms of 22.9° C. Even in summer, temperatures are relatively low with the most common average maximum living room temperature in summer being 17.2° C and 16.9° C in the monitored bedroom.

Table 20: Winter Temperature Performance in Dwellings Monitored for Temperature

Temperature Performance	Dwellings	% of Dwellings
Cold in both living and bedrooms	112	81.2
Acceptable living with cold bedroom	19	13.8
Acceptable bedroom with cold living	2	1.4
Acceptable in both living and bed rooms	5	3.6
Total	*138*	*100*

Table 21: Average Winter Room Temperatures by Location

Location	Average Winter Room Temperatures					
	Below 18°C		≥18°C		Total	
	n	%	n	%	n	%
Living Rooms						
Auckland	28	*87.5*	4	*12.5*	32	*100*
Bay of Plenty	19	*67.9*	9	*32.1*	28	*100*
Wellington	22	*88.0*	3	*12.0*	25	*100*
Nelson/Marlborough	15	*75.0*	5	*25.0*	20	*100*
Christchurch	21	*75.0*	7	*25.0*	28	*100*
Dunedin/Southland	26	*89.7*	3	*20.3*	29	*100*
Bedrooms	**Below 16°C**		**≥16°C**		**Total**	
Auckland	29	*90.6*	3	*9.4*	32	*100*
Bay of Plenty	26	*92.9*	2	*7.1*	28	*100*
Wellington	26	*100.0*	0	*0.0*	26	*100*
Nelson/Marlborough	16	*94.1*	1	*5.9*	17	*100*
Christchurch	24	*96.0*	1	*4.0*	25	*100*
Dunedin/Southland	21	*95.5*	1	*4.5*	22	*100*

5.4.3 Householder Comfort and Monitored Temperatures

An analysis of self-report data from householders and monitored data suggests that difficulties with heating are associated with low indoor temperatures. As Table 22 shows, those households that achieve more than 18° C are most likely to typify heating as easy.

Table 22: Average Winter Living Room Temperature 9am-5pm by Numbers of Dwellings

Average Temperature	Ease of Heating Reported in Preliminary Questionnaire			
	Very Hard	Quite Hard	Somewhat Hard	Very Easy
<12°C	2	3	1	0
12°C-17.99°C	20	34	36	7
18°C-20.99°C	1	5	15	2
21°C or more	0	1	0	0

5.4.4 Dwelling Temperatures and Beacon's HSS®

The HSS® includes temperature benchmarks of >16°C 11pm-7am in winter for bedrooms and >18°C 5pm-11pm in winter for living areas. The directly monitored temperatures in the Home*Smart* Renovation dwellings shows that these benchmarks are typically not met. The period of monitoring and the long period needed by householders to make and implement renovation decisions means that 'before' and 'after' affects of renovations on monitored temperatures could not be measured. What the data does show is that people are cold in their dwellings in winter not only in the Climate 3 Zone but in Climate Zones 1 and 2 as well. As Table 23 shows, in Climate Zone 3, 57.0 percent of dwellings are below HSS® temperatures in winter in the living room and 86.2 percent are below the HSS® temperature in the bedrooms.

Table 23: HSS® Temperature Benchmark Compliance by Climate Zone

HSS Compliance	Climate Zone 1		Climate Zone 2		Climate Zone 3	
	n	%	n	%	n	%
Bedrooms						
Above HSS	9	*28.1*	6	*11.1*	9	*13.8*
Below HSS	23	*71.9*	48	*88.9*	56	*86.2*
Total	32	*100*	54	*100*	65	*100*
Living Rooms						
Above HSS®	13	*40.6*	26	*50.0*	34	*43.0*
Below HSS®	19	*59.4*	26	*50.0*	45	*57.0*
Total	32	*100*	52	*100*	79	*100*

5.5 Humidity

Excessive humidity and damp in residential dwellings is associated with a wide variety of problems. It can compromise the health of residents where damp is associated with mould. Excessive humidity and damp can compromise the fabric of dwellings and impact negatively on dwelling durability. It is for those reasons, that Beacon's HSS High Standard of Sustainability® (HSS®) has parameters around humidity and damp. The pernicious affect of damp in homes and its apparent prevalence in New Zealand homes is also why measuring humidity and observing the extent of mould in dwellings has been part of the Home*Smart* Renovation Project.

The following discussion describes the evidence from the Home*Smart* Renovation Project on the prevalence of mould and damp in dwellings using data gathered by way of the Preliminary Questionnaire that householders wishing to join the Home*Smart* Renovation Project were asked to complete and the In-Home Assessment. The discussion then focuses on the data generated by the sub-set of 122 dwellings that were asked to monitor humidity.

5.5.1 Damp and Mould in Renovators' Dwellings

Of the 676 householders that initially signed-up with the Home*Smart* Renovation Project, 380 completed a preliminary questionnaire. The data from that questionnaire probably provide the clearest indication of mould and damp among householders seeking to renovate their homes.

Of the householders that completed a Preliminary Questionnaire when considering entry to the Home*Smart* Renovation Project, 31.5 percent used dehumidifiers. Nearly half of the households looking to retrofit or renovate their home (47.1 percent) had mould or damp related stains on more than an occasional basis. 13.7 percent reported that their home's interior walls or ceilings had black stains or mould on them 'always' or 'often' (Table 24).

In addition, 320 householders reported on the extent of musty or artificial smells in their dwellings. Those smells are frequently a sign of poor ventilation and/or damp. Only 43.4 percent reported that after a week of closing up the house, such smells were never evident. 13.4 percent reported smells throughout the house, while over a third reported them in some rooms (Table 25).

Table 24: Frequency of Mould or Black Stains in Dwellings

(Preliminary Questionnaire n=373)

Frequency of Mould/Black Stains	Householders	% of Householders
Always	22	*5.8*
Often	30	*7.9*
Sometimes	127	*33.4*
Seldom or never	195	*51.3*
Not stated	6	*1.6*
Total	***380***	***100***

Table 25: Musty Smells in the House After a Week of Being Closed

(Preliminary Questionnaire n=319)

Distribution of Smells	Householders	% of Householders
Throughout the house	43	*13.4*
In some rooms only	109	*34.1*
Only in wardrobes	29	*9.1*
No musty or artificial smells	139	*43.4*
Total	320	*100*

Data from the preliminary questionnaire suggests that these problems are likely to be associated with damp and moisture from with cooking, bathing, and laundries. With regards to cooking, 41.3 percent of 380 householders completing the preliminary questionnaire reported that steam and cooking smells filled the kitchen after cooking either 'always' or 'often'. A further 40 percent reported that this occurred sometimes. In bathrooms, when asked whether the mirror in the bathroom was clear after a bath or shower, 84.9 percent of the 371 householders who reported on this reported that the mirrors were only 'sometimes' or 'seldom or never' clear.

The impression of widespread moisture and damp in New Zealand homes that emerges from the Preliminary Questionnaire is reinforced by the data emerging from the In-Home Assessments undertaken by the independent providers working with the Home*Smart* Renovation Project. Data is available for 500 households from the In-Home Assessment process.

Those assessments found that 316 of the 500 dwellings subject to an In-Home Assessment (63.2 percent) had mould or mildew evident inside the house. Of those 316 dwellings: 57.9 percent had mould in the bathrooms and 55.7 percent had mould or mildew in bedrooms. Mould and mildew were also evident in kitchens, living rooms, laundries and wardrobes, but the incidence of each was less than 10 percent of dwellings.

In-Home assessors also reported that 55.4 percent of householders found that moisture formed on bedroom windows on winter mornings either 'always' or 'often'. Less than a quarter of householders found that condensation on bedroom windows was a rare event or entirely absent in winter (Table 26).

Table 26: Frequency of Condensation on Bedroom Windows on Winter Mornings

(In-Home Assessment Data n=497)

Condensation	Householders	% of Householders
Always condensation	191	*38.2*
Often condensation	86	*17.2*
Sometimes condensation	114	*22.8*
Seldom or never condensation	106	*21.2*
Not stated	3	*0.6*
Total	***500***	***100***

In 29.2 percent of the 500 dwellings for which there is In-Home Assessment data, dehumidifiers were used by householders to control damp and mould. In most of those dwellings (75.3 percent), dehumidifiers were only used in winter. However, in almost a quarter of those dwellings (24.6 percent) dehumidifiers were used in summer and winter.

5.5.2 Surface Humidity in Monitored Dwellings

Humidity at the surface was measured in 122 dwellings using Fugenex humidity gauges. Those gauges incorporate a single-use indicator strip. A blue dye is released into some, or all, of the indicator strip if moisture levels exceed a set threshold (moisture levels in excess of 75 percent relative humidity) for a period of at least 4 hours. Each gauge comes on an adhesive backing so householders are able to install these easily themselves.

Of the 209 households who were approached to be involved in the intensive monitoring for the Home*Smart* Renovation Project, a sub-set of 122 households were sent Fugenex humidity gauges to install in their homes. Each of the 122 households was sent two humidity gauges. Householders installed the humidity gauges themselves following the instructions provided. The first was to be installed in their main bedroom (the bedroom where they had a temperature logger already) and the other outside the bathroom door of the main bathroom in the house. Householders were asked to check the gauges regularly. If the indicator strip on the humidity gauge changed colour to blue, householders were asked to leave it in place for 2 days then remove it from the wall, note the date it was removed on the gauge and return to BRANZ, sealed in the plastic bags provided.

The gauges were sent out in two main batches as supply arrived from the United Kingdom. An initial batch was sent out in January 2009, with a second batch in February 2009. A final set of the remaining gauges were sent out in June 2009. The locational distribution of dwellings monitored with Fugenex gauges is set out in Table 27.

Table 27: Humidity Gauges and Monitored Households in HomeSmart Renovations

Research Area	Monitored Household Sample	Humidity Gauges Subset	*% of monitored houses with humidity gauge*
Auckland	39	29	*74.4*
Bay of Plenty	37	13	*35.1*
Wellington	32	26	*81.3*
Nelson/Marlborough	25	9	*36.0*
Canterbury	38	31	*81.5*
Dunedin/Southland	37	13	*35.1*
Outside of research areas	1	1	*100.0*
Total	*209*	*122*	*58.4*

Of the 122 households, 104 were still actively participating in the Home*Smart* Renovation Project in February 2010 and have completed a post renovation plan interview. Of the other 18, one was outside the research area, ten have withdrawn from the study and seven are non-contacts. Eight of those 18 households have returned a Fugenex gauge. We are unable to determine for the other 10 households whether gauges have not been returned because they were not activated or simply because the household had withdrawn from the research.

A small number of households returned gauges that had changed colour slightly but were not technically activated. These gauges have not been included in the count of activated gauges. The net result of both the withdrawn households and those that returned gauges pre-emptively on the analysis results can not be accurately predicted but is likely to mean that any estimates of numbers of dwellings effective by humidity are conservative and under-estimate rather than over-estimate the extent to which humidity at the surface is problematic in New Zealand dwellings.

In all a total of 133 strips in 73 households were triggered – indicating an instance of relative humidity levels in excess of 75 percent for a period of at least 4 to 8 hours in around two-thirds of the dwellings with humidity gauges. Sixty-seven households returned a bathroom humidity gauge and sixty-six returned a bedroom humidity gauge. Table 28 sets out the pattern of humidity gauge activation based on gauges returned from the 122 households.

Table 28: Pattern of Humidity Gauge Activations by HomeSmart Renovation Study Areas

Research Area	Humidity Gauges Activated			No Gauges
	Bathroom only	Bedroom only	Both	Activated
Auckland (n=29)	2	2	17	8
Bay of Plenty (n=13)	1	0	8	4
Wellington (n=26)	2	1	15	8
Nelson/Marlborough (n=9)	1	0	5	3
Canterbury (n=31)	1	1	10	19
Dunedin/Southland (n=13)	0	2	4	7
Outside of research areas (n=1)	0	0	1	0
Total (n=122)	*7*	*6*	*60*	*49*

In Auckland, the Bay of Plenty, Wellington and Nelson/Marlborough research areas upwards of two thirds of households with gauges installed returned one or more activated humidity gauge. Canterbury had the lowest proportion of households returning an activated gauge(s) with 38.7 percent of households with a humidity gauge installed returning an activated gauge (Table 29).

Table 29: Proportion of Households with Humidity Gauge Activations by HomeSmart Renovation Study Areas

Research Area	Humidity Gauges		
	Number of Households with Gauges Installed	Number of Households with Gauges Activated	Proportion of Households with Gauges Activated
Auckland	29	21	*72.4%*
Bay of Plenty	13	9	*69.2%*
Wellington	26	18	*69.2%*
Nelson/Marlborough	9	6	*66.7%*
Canterbury	31	12	*38.7%*
Dunedin/Southland	13	6	*46.2%*
Outside of research areas	1	1	*100.0%*

Householder recorded removal dates in combination with the date the gauge was dispatched to the homeowner enable an estimate of the elapsed time before a gauge was activated to be calculated.

On average, the elapsed time duration between the humidity gauges being dispatched for installation and an instance of relative humidity levels exceeding 75 percent for a period in excess of 4 hours was between one and two months. For bathroom gauges the mean duration between dispatch and return was 44 days and the median was 20 days. For bedroom gauges the mean duration between dispatch and return was 40 days and the median was 22 days.

The shortest elapsed time duration between dispatch and return of a humidity gauge was 3 days. This indicates the gauge was likely activated the first day it was installed, left for the 2 days and then returned. The longest elapsed time duration between dispatch and return of a humidity gauge for both bedroom gauges and bathroom gauges was 310 days.

Table 30 sets out the elapsed time durations between dispatch and return for the 67 households with an activated bathroom gauge and the 66 households with an activated bedroom gauge.

Table 30: Elapsed Time Duration between Dispatch and Return of Activated Humidity Gauges

Elapsed Time	Bathroom Humidity Gauges Activated		Bedroom Humidity Gauges Activated	
	n	%	n	%
One week or less	8	*11.9*	11	*16.7*
8-14 days	14	*20.9*	13	*19.7*
15-30 days	17	*25.4*	17	*25.6*
31-60 days	13	*19.4*	10	*15.2*
61-90 days	5	*7.5*	6	*9.1*
91-180 days	7	*10.4*	7	*10.6*
180 days or more	3	*4.5*	2	*3.0*
Total	*67*	*100*	*66*	*99.9*

Of the 73 households that returned a humidity gauge, 60 returned both their bedroom humidity gauge and their bathroom humidity gauge. This suggests that humidity issues affect whole dwellings rather than being simply restricted to single moisture generating sites such as bathrooms.

Typically, if both gauges were activated, activation tended to be during the same period. Forty-one households recorded the same removal date for their bathroom and their bedroom humidity gauges. There were 19 households, however, in which the humidity gauges were both activated but activated at separate times. The lapse times between activation are as follows:

- Within one week of each other – 9 households
- Between 8-14 days of each other – 4 households
- Between 15-30 days of each other – 2 households
- More than 30 days of each other – 4 households.

5.5.3 Humidity Monitored Dwellings & Experiences of Damp and Mould

The 122 households sent humidity gauges provide a unique opportunity to examine the relationship between humidity, damp and mould as experienced by householders and in-home assessors. What is notable is that a higher proportion of those households experienced persistent mould and mould associated staining than the dwellings than activated the humidity gauges. Similarly, the proportion of dwellings in which the humidity gauge was not triggered but had pervasive musty smells was higher than the dwellings in which those smells existed and in which a humidity gauge was triggered (Table 31).

Table 31: Frequency of Mould or Black Stains and Smells in Humidity Gauge Dwellings (Preliminary Questionnaire)

Frequency of Mould / Black Stains	One or more Humidity Gauges Activated		Humidity Gauges Not-Activated	
	n	%	n	%
Always	5	*7.9*	4	*14.3*
Often	3	*4.8*	3	*10.7*
Sometimes	22	*34.9*	9	*32.1*
Seldom or never	32	*50.8*	11	*39.3*
Not stated	1	*1.6*	1	*3.6*
Total	*63*	*100*	*28*	*100*

Distribution of Smells	One or more Humidity Gauges Activated		Humidity Gauges Not-Activated	
	n	%	n	%
Throughout the house	4	*11.8*	4	*20.0*
In some rooms only	12	*35.3*	7	*35.0*
Only in wardrobes	4	*11.8*	0	*0.0*
No musty or artificial smells	14	*41.2*	9	*45.0*
Total	*34*	*100.1*	*20*	*100*

This suggests that in many dwellings there are areas beyond the bedroom and bathroom in which the humidity gauges were placed that have damp problems resulting in mould. The apparent inability of some householders to note mustiness in their dwellings may be a manifestation of becoming accustomed to the smell of damp where it is prevalent.

The idea that householders become accustomed to damp is perhaps confirmed by data that suggests that substantial proportions of householders that do not connect humidity with house condition problems. As Table 32 shows, 56 of the 122 humidity gauge households provided information about their perception of the condition of their dwelling in the Preliminary Questionnaire. There is a tendency for dwellings that did not trigger the humidity gauge to be reported by householders as being in better condition than the dwellings that did trigger the humidity gauges. However, almost a third (32.5 percent) of the dwellings that triggered a humidity gauge were characterised as in good or better condition.

Table 32: Householder Perceived House Condition for Humidity Gauge Dwellings (Preliminary Questionnaire)

House Condition	One or more Humidity Gauges Activated		Humidity Gauges Not-Activated	
	n	%	n	%
Excellent	1	*2.9*	1	*4.8*
Pretty good really	10	*28.6*	10	*47.6*
Needs a bit of work	20	*57.1*	7	*33.3*
Poor – needs major maintenance	4	*11.4*	3	*14.3*
Total	*35*	*100*	*21*	*100*

There were 36 householders that are concerned enough about damp and humidity to use dehumidifiers although, as Table 33 shows, only just over a third of those that activated a humidity gauge reported using a dehumidifier in the Preliminary Questionnaire. It is also notable that of the 36 householders that reported using a dehumidifier almost two thirds (63.9 percent) still triggered a humidity gauge although there is not a statistically significant relationship between the two.

Table 33: Use of a Dehumidifier in Humidity Gauge Dwellings

(Preliminary Questionnaire)

Dehumidifier Used	One or more Humidity Gauges Activated		Humidity Gauges Not-Activated	
	n	%	n	%
Yes	23	36.5	12	44.4
No	40	63.5	15	55.6
Total	*63*	*100*	*27*	*100*

6 Household Resource Consumption

This section is concerned with the resource consumption both reported and measured by participants in the Home*Smart* Renovation Project. It explores the extent to which perceived household consumption is matched by measured household consumption.

6.1 Household Reported Resource Consumption

In the householder interviews, householders were asked a number of questions relevant to resource consumption including specific questions about: the dwelling's energy sources (reticulated electricity or gas); whether they are billed and/or charged for water consumption; desire for resource consumption reductions; and perceived level of resource consumption. Finally householders were asked whether the recommendations in their Home*Smart* Renovation Plan are likely to impact on the performance of their home in relation to the environment, exposure to power bills, and exposure to water bills.

6.1.1 Energy

All householders reported having reticulated electricity. Only 16.4 percent of householders have reticulated gas or bulk supply gas. Electricity-based hot water heating, space conditioning, heating and lighting are used in many but not all dwellings.

6.1.1.1 Heating

The In-Home Assessment found that in relation to heating:

- 49.5 percent of households use electric blankets. Of those households, 41.7 percent have more than one blanket.
- 29.4 percent of households use dehumidifiers.
- 29.9 percent use electrical sources for their primary heating.
- Enclosed wood-burners and pellet fires are the other primary heating source. This is used by 35.6 percent of dwellings.
- Only 11.1 percent of primary heating is by way of gas. Of those 48 dwellings, a third use unflued gas heaters for their primary source of heating.
- 313 households report using secondary heating. This is dominated by electrical heating which makes up 75.8 percent.

The preferences expressed by householders for living room heating showed a heightened interest in heat pumps. Where only 16.9 percent of dwellings used heat pumps as their primary heating source, 22.2 percent of householders reported to In-Home Assessors that their desired living area heater was a heat pump. BRANZ's 2007 Heat Pump survey found a

similar proportion of dwellings 19.4 percent (±3.2 percent at a 95 percent confidence interval) had at least one heat pump[15] (French, 2008).

Despite this, wood-burners and pellet fires remain popular with 34 percent of householders identifying those as their preferred living area heating source. Notably, no householders identified unflued gas heaters as desired living area heaters, although 3.5 percent of householders identified flued gas heaters as desirable. With regard to bedrooms, 32.6 percent of householders reported that they preferred not to heat bedrooms. This is the single largest preference. 12 percent wanted to transfer heat from elsewhere into the bedroom and 10.4 percent preferred heat pumps. One household identified unflued gas as their desired heating source for bedrooms.

6.1.1.2 Hot Water Systems

Hot water systems are predominantly electrical with 76.9 percent of the primary hot water cylinders being so. Only 57.5 percent of those cylinders have cylinder wraps. Only 40.5 percent of hot water systems generally have lagged pipes. Of the 181 primary hot water cylinders whose thermostats could be read, 32.6 percent were above 60°C. This was associated with high tap temperature with only 45.4 percent of dwellings having safe temperatures at the hot tap closest to the hot water cylinder.

6.1.1.3 Lighting

In terms of lighting, there is widespread use of incandescent bulbs and recessed down-lights. 45.6 percent of dwellings had at least one recessed down-light. Some dwellings had substantial numbers with the maximum number being 50 recessed down-lights in a dwelling (Table 34). In contrast, the use of energy efficient CFLs is not widespread. 16.4 percent of dwellings have no CFLs while the majority of dwellings have ten or less CFLs (Table 35). Only 16.7 percent of households had no opportunity to replace incandescent bulbs by CFLs as Table 36 shows.

[15] ***French, L., 2008, 'Active Cooling and Heat Pump Use in New Zealand – Survey Results' BRANZ Study Report SR186, BRANZ Ltd, Judgeford, New Zealand.***

Table 34: Recessed Downlights Reported in HomeSmart Renovation Dwellings

Number of Downlights in Dwellings	Dwellings	% of Dwellings
No recessed downlights	235	*54.4*
1-10	184	*42.7*
11-20	49	*11.3*
21-30	16	*3.7*
31-40	4	*0.9*
More than 40	3	*0.7*
Not stated	2	*0.5*
Total	*432*	*100*

Table 35: CFLs in HomeSmart Renovation Dwellings

Number of CFLs in Dwellings	Dwellings	%
None	71	*16.4*
1-10	263	*60.9*
More than 10	98	*22.7*
Total	*432*	*100*

Table 36: In-Home Assessment of Opportunities to Replace Incandescent Bulbs

Potential for CFLs	Dwellings	%
No CFL Potential	72	*16.7*
1-5 CFL Potential	122	*28.2*
6-10 CFL Potential	113	*26.2*
More than 10	125	*28.9*
Total	*432*	*100*

6.1.1.4 Alternative Energy

Beacon's High Standard of Sustainability, HSS®, identifies that demand for energy to heat space and water could be more effectively met through use of non-reticulated or "low-grade" energy. This would reduce the demand New Zealand's housing stock makes on the national grid. There is a substantial albeit minority proportion of households using wood burning space heating.

Use of solar energy is possible for most dwellings. 94.4 percent of dwellings have, for instance, washing lines although 25.5 percent of households need a washing line that will allow winter drying. It has already been noted that the majority of dwellings have solar hot water heating potential. In addition, 83.6 percent of dwellings have the opportunity to reduce energy related to space heating simply by increasing the insulation in their homes.

Those opportunities may not be taken-up where householders do not see themselves as high energy users. 18.5 percent of the Home*Smart* householders described their energy consumption as high or very high. As Table 37 shows over a third of the participants described their household energy use as low or very low.

Table 37: HomeSmart Renovation Household Perceptions of Energy Use

Householder Perceived House Condition	Home*Smart* Renovation Households	% Home*Smart* Renovation Households
Very High	8	*3.5*
High	35	*15.2*
About Average	100	*43.3*
Low	70	*30.3*
Very Low	18	*7.8*
Total	*231**	*100.1^*

* 1 missing case ^Due to rounding

Those perceptions compare to Beacon's Recent Movers Survey, which found that 21.9 percent defined their household energy use as "high" or "very high" and 22.2 defined their energy use as "low" or "very low". A smaller survey in 2007 commissioned by EECA found that 18.7 percent identified themselves as "high" or "very high" and 23.2 percent described their energy consumption as "low" or "very low" energy users.[16]

[16] ***That study also found that householders that self-identified as "high" or "very high" energy users did in fact, have higher than average energy use. See Saville-Smith, K. and Fraser. R., 2007, Analysis Report on Telephone and Physical Survey Data, Report prepared for East Harbour Management Services.***

Even at the time of entry into the Home*Smart* Renovation Project, these 432 householders who had a Wave 1 interview, saw their renovation goals as being around issues of comfort and health rather than energy efficiency or reduction of energy costs. Table 38 sets out the goals expressed by these households when they entered the programme.

Energy cost reduction has persistently been a comparatively lesser priority among these householders throughout the Home*Smart* Renovation Project. While 37.5 percent of households in Wave 1 interviews reported that saving on power bills had a 'lot' of importance for them, more households placed a 'lot' of importance on:

- improved comfort and warmth (67.6 percent)
- their home being healthier (57.2 percent)
- their home being better for the environment (44.9 percent).

Despite this, there is householder expectation in Wave 1 interviews that retrofit and renovations recommended in the Plan would reduce energy costs. 45.6 percent saw savings on their power bills as very likely while a further 32.4 percent report savings on power bills as very likely.

Table 38: HomeSmart Renovation Household Goals for Retrofit and Renovation at Sign-Up (n=432)

Householder Goal*	Households	% Households
Improved Comfort	292	*67.6*
Energy Efficiency	177	*41.0*
Reduced damp/mould	42	*9.7*
Improved durability	39	*9.0*
Water Efficiency	37	*8.6*
Improved light	14	*3.2*
Improved aesthetics	14	*3.2*
Healthier Home	8	*1.9*
Reduced Energy Bills	7	*1.6*
Adjust to Family Size	5	*1.2*
Capital Gain	1	*0.2*

*Multiple Response

6.1.2 Water

Of the 432 householders that undertook a Wave 1 interview, only 8.6 percent indicated a desire to reduce water consumption when they entered the Home*Smart* Renovation Project. Although 27.5 percent of householders reported that they received water bills of some kind, the preliminary questionnaire suggests that there was opportunity to make substantial water savings. Of the 292 households who undertook a Wave 1 interview as well as a preliminary questionnaire:

- 45.9 percent had single flush toilets and a further 22.6 percent had 5/11 dual flush toilets only;
- 37.7 percent reported using water for outdoor purposes such as gardens or boat washing more than once a week;
- 53.1 percent reported that their council rarely or never imposed water restrictions; and
- 70.9 percent believed that they were not high water users.

The In-Home Assessment found that:

- 65.1 percent of dwellings had a cold tap flow in excess of 6 litres per minute.
- Of the 544 showers in these dwellings, 29 percent had shower flow rates in excess of 9 litres per minute.
- Of the 583 cold hand basin taps, 68.3 percent had flow rates in excess of 6 litres per minute.
- 89.6 percent of dwellings had no facilities to capture rainwater although 85.5 percent of those dwellings without rainwater barrels or tanks had enough space for a tank up to 2000 litres in size.

Only a few dwellings had swimming pools (3.2 percent) or spa pools (5.1 percent). 64.3 percent of the swimming pools were filled with mains supply water.

6.2 Measured Energy and Water Consumption

This section examines levels of energy and water consumption measured in relation to:

- Reticulated electricity.
- Reticulated gas.
- Reticulated water.

The reticulated electricity and gas data have been collected by obtaining data directly from the electricity and gas retailers, with written permission from the Home*Smart* participants. Data was collected for the period between March 2008 and March 2010. Some 2010 April data were included, as well as some pre-March 2008 data for some companies.

The reticulated water data have been collected through two methods:

- The first was to obtain written permission from the Home*Smart* participants to access their water meter data if they lived in Auckland, Nelson or Christchurch.
- Further households in Wellington and Bay of Plenty were asked to allow the installation of a control water meter, which they would then read when prompted by BRANZ and send in the data (reading, time and date).

There have been considerable barriers to acquiring reticulated electricity, gas and actively metered water consumption data respectively. The first difficulty was the number of signed permission forms returned. Of the 382 households that indicated that they would give permission to access their billing records, only 182 returned complete and signed permission energy permission forms. Of the 185 households in Nelson, Auckland, and Christchurch, only 60 returned signed water permission forms.

16 households from the above mentioned regions agreed to installation of water meters at their properties. Readings were collected at approximately quarterly intervals wherever possible. At least two readings were acquired for each of the 16 properties, allowing representative derived annual averages to be formed from the data available. Of these 16 water meters, two meters developed leaks, and while one was repaired, the other one was pulled out by an external party early in the project. Another was pulled out by the householder's plumber near the end of the project, and has not been retrieved.

The number of initial agreements in the first surveys was higher than the number of signed permissions forms that actually came back from participants, even after multiple requests. There may be several reasons for the low number of returns despite initial agreements. Some of them are listed below.

- Change of mind after the survey, due to the lapse of time between the survey and when the consent forms were received;
- Permission form requests coming from a different company to that involved in the surveys;
- Forgetting to return;
- Lack of drive to return; and
- Change of mind due to a concern about misuse of data, despite strict privacy undertakings.

Additional challenge to the low number of returns was the low amount of data that was returned by the energy companies. Several reasons have been identified why this happened:

- The account did not exist during the period between March 2008 and March 2010 (most frequently found when applying for data from previous power companies);
- The account could not be located (potentially the wrong company nominated on the permission form);
- Previous customers' data was often not included, possibly due to the lack of account number available; or

- No electricity was used for that account between March 2008 and March 2010.

The majority of the water data requests resulted in returned data, however some Christchurch households had to be discounted due to either not having a water meter installed at all, or having Gallon Meters where it was impossible to determine whether the units were UK or US.

Due to the above mentioned difficulties of a low response rate and a lower than anticipated return rate from energy companies, the representativeness of statistical sample of the collected data was affected. Consequently, the data needed to be used with caution.

6.2.1 Energy

The quantification of energy consumption is based on reticulated electricity and gas. It should be noted, however, that households can consume non-reticulated energy. In particular, solar energy and energy for heating by using, in particular, non-reticulated gas and/or wood.

In relation to electricity consumption the reticulated usage per household has been calculated in three ways.

- The average electricity use per household was calculated by averaging all of the electricity data meter records that were obtained for that household.
- Average annual electricity usage was calculated by averaging monthly electricity use averages.
- The average monthly electricity usage was also calculated for the winter heating season, May to September (as used in HEEP – Isaacs, et.al., 2003 - and the Papakowhai Renovation Project – Burgess et. al., 2008).

The results of those methods generate some limited variation. The calculation of annual consumption based on the May to September period gives the highest average annual consumption at 9,079kWh of electricity. This was 9,079kWh of electricity usage and reflects the higher usage that can be expected over the winter period. Using available annualised data, the average annual household electricity use in the 200 Home*Smart* Renovation households shows a lower average annual consumption of between 7,721kWh and 7,786kWh.

There is data for 198 dwellings which consume both reticulated electricity and reticulated gas. The average annual kWh consumption for those households of gas and electricity combined is around 10,397kWh. It is clear, that there is a strong skew in consumption generated by some high users. The median average consumption of gas and electricity combined is considerably less at 8,230kWh.

One fifth of households had combined gas and electricity average annual consumption of 12,000 or more kWh. The minimum average annual consumption for gas and electricity was 924kWh with a maximum of 40,514kWh. The lowest consumption appears to have been in dwellings which were vacated for considerable periods to allow for renovations. Overall, 6.5 percent of the dwellings consumed 15.8 percent of the total aggregate consumption of these dwellings.

Beacon has developed and revised benchmarks for the HSS High Standard of Sustainability (HSS®). The second set of benchmarks (2008) was restricted to reticulated energy and was set substantially lower than the original benchmarks (see Table 39). Table 40 shows that while most dwellings for which there is reticulated energy data would have met the original benchmarks, only around half or less of dwellings reach the current HSS® benchmarks.

Table 39: Beacon's HSS High Standard of Sustainability® Benchmarks for Energy Use in Existing Houses

Original HSS® Benchmarks (2006)	Revised HSS® Benchmarks (2008)
Climate Zone 1: 9,050kWh	Climate Zone 1: 6,200kWh
Climate Zone 2: 11,000kWh	Climate Zone 2: 7,300kWh
Climate Zone 3: 12,000kWh	Climate Zone 3: 8,400kWh

Table 40: Dwellings' Energy Performance Against Previous and Current HSS High Standard of Sustainability® in Benchmarks for Existing Houses

HSS® Benchmarks	% Dwellings Meeting Benchmarks
2008 HSS® Benchmarks (current)	
Climate Zone 1: 6,200	*50.0*
Climate Zone 2: 7,300	*43.3*
Climate Zone 3: 8,400	*55.8*
2006 HSS® Benchmarks (original)	
Climate Zone 1: 9,050kWh	*76.3*
Climate Zone 2: 11,000kWh	*62.7*
Climate Zone 3: 12,000kWh	*81.1*

6.2.2

6.2.3 Water

Metered water data consumption has been collected for 71 dwellings. That data shows a considerable range of reticulated water consumption from a minimum daily consumption per person of 10.73 litres to a maximum daily per person consumption of 1,823 litres. Table 41 sets out the average, median and modal daily reticulated water consumption per person in the dwellings for whom measured water data are available.

Table 41: Median and Mean Reticulated Water Consumption (litres) in HomeSmart Renovation Dwellings

Water Consumption Measure	Mean (litres)	Median (litres)
Annual Average per Dwelling	22,5116	13,1301
Daily Average per Dwelling	666.8	359.7
Average Daily per person per Dwelling	239.1	147.1

The HSS® benchmark for water consumption is 125 litres/per person/ per day. Of the dwellings for which measured water data are available, 54.9 percent were above the HSS® water consumption benchmark and 45.1 percent were meeting the HSS® water consumption benchmark.

There is a distinct difference in the average and median water consumption patterns found among those dwellings above the HSS® benchmark and those below it. The average daily per person consumption in Home*Smart* Renovation dwellings below t he HSS® benchmark is 65 litres with the median being 62 litres daily per person. For those dwellings above the HSS® the median is three times greater and the average is almost six times higher (Table 42).

Table 42: Median and Mean Reticulated Water Consumption Among Dwellings Meeting the HSS® Water Benchmark and Those That are Not

HSS Status	Mean litres/Person/day/Dwelling	Median litres/Person/day/Dwelling
Above HSS® Water Benchmark	381.8	187.6
Below HSS® Water Benchmark	65.1	61.9

6.3 Energy and Water Consumption: Actual and Perceived

Previous research has suggested that householders have a relatively good sense of their electricity consumption[17]. The relative lack of exposure to water pricing, means that it could be expected that householders are less able to assess their water consumption. This section is concerned with the extent to which householders' perception of resource consumption is consistent with their independently measured resource consumption.

6.3.1 Energy

There is a statistically significant relationship between householders' assessments of their reticulated energy consumption and their measured consumption. Householders' who believe that their reticulated energy consumption is high do have energy high energy consumption (Table 43). 67.5 percent of those who believe they have high energy consumption have annual average household consumption in excess of 8,400kWh. Similarly, of those householders that believe their energy consumption is below average, 56.4 percent have average annual energy consumption of 6,200kWh or less.

Table 43: Actual and Perceived Reticulated Energy Consumption Among HomeSmart Renovation Households

Measured Reticulated Energy Average Annual kWh	Perceived Consumption					
	Above Average		Average		Below Average	
	n	%	n	%	n	%
6,200 kWh or less	7	*17.5*	21	*26.2*	44	*56.4*
6,201 - 7,300 kWh	4	*10.0*	10	*12.5*	8	*10.3*
7,301 - 8,400 kWh	2	*5.0*	11	*13.8*	10	*12.8*
8,401 kWh or more	27	*67.5*	38	*47.5*	16	*20.5*
Total	40	*100*	80	*100*	78	*100*

Similarly, of those households that consume 6200 kWh or less on average, 61.1 percent see themselves as below average users. However, only a third of those who consume on average more than 8,400 kWh annually only a third (33.3 percent) see themselves as above average users. That group is more likely to see themselves as average users.

[17] ***20 percent of energy used in the average New Zealand home comes form solid fuel, and two percent from LPG. This means that at least a fifth of New Zealand's domestic energy comes form non-reticulated resources. The total annual energy consumption for all fuels in New Zealand households is 11,410kWh per year, while the average electricity use only household is 7,240kWh per year. See Isaacs, N. et.al., 2006, 'Energy Use in New Zealand Households: Report on the Year 10 Analysis for the Household Energy End-use Project (HEEP)'. BRANZ Study Report 155, BRANZ Ltd Judgeford, New Zealand.***

6.3.2 Water

It has already been noted that previous research suggests that nationally people are less aware of their water consumption than their electricity consumption. This is particularly evident in Beacon's neighbourhood research where higher proportions of householders claim that their dwellings are water efficient than the proportions of householders that claim that their dwelling is energy efficient. Practitioners in water management have frequently argued that this lack of awareness of water consumption is exacerbated where consumers are protected from water price signals.[18]

The importance of price signals for reducing water consumption is confirmed by the Home*Smart* Renovation Project water data. There is a statistically significant association between climate zone and consumption above or below the levels set out in the HSS®. Dwellings in climate zone one are exposed to strong water price signalling compared to dwellings in other zones. Less than a third of dwellings in climate zone one have water consumption above the HSS® benchmark. This compares to climate zone 3 households where 68.2 percent are above the HSS® benchmark (Table 44).

Table 44: HSS® Water Benchmark Compliance by Climate Zone

HSS® Compliance	Climate Zone 1		Climate Zone 2		Climate Zone 3	
	n	%	n	%	n	%
Above HSS®	11	*32*	13	*87*	15	*68*
Below HSS®	23	*68*	2	*13*	7	*32*
Total	34	*100*	15	*100*	22	*100*

[18] ***Lawton, M., Birchfield, D., Kettle, D., and Trenouth, C., 2008, Best Practice Water Efficiency Policy and Regulations, WA7060/3, Water Report prepared for Beacon Pathways Ltd.***

6.4 Who Are the Big Consumers?

It has already been noted that 6.5 percent of households account for 15.8 percent of the aggregate consumption of the 200 dwellings for which there is measured reticulated energy data. This section provides a brief analysis of heavy user characteristics for both reticulated energy and water.

6.4.1 Energy

Key characteristics of the 6.5 percent of extremely heavy users of reticulated energy areas follow. They:

- Are more likely to live in houses built after 1970. 46.2 percent of the very heavy energy users live in late era houses compared to 26.7 percent of the rest.
- Have higher average household size of 3.8 people compared to 2.8 people in the rest.
- Are more likely to have larger dwellings with 53.9 percent in dwellings with four or more bedrooms compared to 24.6 percent of the rest.
- Are more likely to have more than 10 recessed down-lights with 33.3 percent very heavy users having this larger number of recessed down lights compared to 12.8 percent of the rest.
- Are more likely to be aged between 40 years and 60 years, with 76.9 percent of heavy users falling into that age group compared to 49.7 percent of the rest.
- Are more likely to have household incomes over $100,000 with 76.9 percent of heavy users in that category compared to 34.8 percent of the rest.

6.4.2 Water

Key characteristics of the 39 dwellings and households in which reticulated water consumption **exceeded** the HSS® benchmarks are:

- Dwellings that are reported as damp in the space below the house: two thirds of the dwellings with damp under house spaces were above the HSS®.
- Households that report themselves as high energy users.
- Older dwellings with two thirds of the above HSS® benchmark dwellings built prior to 1959 while less than half of the HSS® compliant dwellings built prior to 1959.
- More likely to have high flow rates in taps in the kitchen and bathrooms.
- Less likely to have dual flush toilets.
- More likely to use instant gas for hot water heating (Table 45).
- Less likely to be billed directly for water use. 27 of 38 dwellings billed for water were below HSS® water benchmarks. Of the 33 dwellings which householders were not directly billed for water, 28 were above the HSS® water benchmarks.

Table 45: Primary Hot Water by HSS® Water Benchmarks

Type of Hot Water	Above HSS®		Below HSS®	
	n	%	n	%
Electric Cylinder	23	*64*	25	*78*
Gas Storage	1	*3*	2	*6*
Instant Gas	9	*23*	3	*9*
Solar	1	*3*	1	*3*
Multiple	3	*8*	0	*0*
Other	0	*0*	1	*3*
Total	39	*101*	32	*99**

*Due to rounding

7 Renovation Activities

This section is concerned with the nature of the renovations that householders undertake and their investment into renovation. The discussion is divided into four sections. Firstly, data are presented around the renovation actions and intentions at the first wave of interviews. Second, data are presented around the actions and intentions for those householders interviewed in the second wave of interviews. Third, the discussion turns to the overall progression of the renovation activities over the period in which households have been involved in the Home*Smart* Renovation Project. Finally, the discussion considers the characteristics of those dwellings that have had renovations undertaken and those than have not.

7.1 Renovation Activities at Wave 1 Interviews

432 householders participated in the Wave 1 interviews. Of those, considerably more than half (62.5 percent) reported that they had invested in excess of $2,000 in renovation work in the year prior to interviewing. 82.2 percent report that they intend to invest in excess of $2,000 in renovations and retrofit in the coming year.

If this was a general population, it could be argued that the actual proportion of households likely to act as they have said they will act would be substantially lower than 82.2 percent. There is a considerable body of research that suggests that the probability of householders investing in future repairs, maintenance and renovations is higher if they have undertaken renovations in the past.[19]

This population of households is, however, a distinct subset of potential renovators. They have self-selected into Home*Smart* Renovations because they have a desire to undertake effective, performance based renovation. For that reason, it is reasonable to expect that the proportion of these households who actually renovate may be close to the proportions reporting an intention to renovate.

As Table 46 shows, among these households at the Wave 1 interviews there was a strong orientation towards insulation for their intended renovations, especially for their future renovations.

[19] ***Saville-Smith, K., 2005, National Home Maintenance Survey 2004: The Telephone Interview Data, Report prepared for BRANZ, CRESA, Wellington; Saville-Smith, K., and Amey, B., 1999 National Home Maintenance Survey 1998: The Telephone Interview Data, Technical Report prepared for BRANZ.***

Table 46: HomeSmart Renovation Household Past and Intended Renovations Wave 1 Interviews (n=432)

Renovation Activity*	Renovations Undertaken in Previous Year % of Households[20]	Intended Renovations % of Households
Install ceiling insulation	15.5	31.0
Install underfloor insulation	13.9	32.4
Install heat pump	9.5	8.8
Install wall insulation	9.3	15.0
Install double glazing	6.9	15.0
Full exterior repaint	5.1	3.0
Replumbing	4.9	4.4
Roof replacement	4.2	4.9
Replace bathroom whiteware	3.9	3.7
Rewiring	3.7	1.9
Replace bathroom cabinetry	3.5	3.9
Install dual flush toilet	3.5	3.0
Install ventilation system (HRV/DVS)	3.2	2.5
Carpeting	3.2	2.1
Adding rooms	3.2	2.1
Install woodburner	3.0	3.7
Install low flow shower head	2.8	3.0
Interior repainting/wallpapering	2.8	1.9
Install new hot water cylinder	2.8	2.8
Install solar hot water	2.8	10.2
Interior recladding	2.5	3.5
Install extractor fan in bathroom	2.3	4.9
Replace kitchen cabinetry	1.9	4.6
Install rangehood or kitchen extractor fan	1.6	3.5
Replace kitchen appliances	1.4	3.7
Polishing floors	1.0	0.5
Replace significant areas of exterior cladding	0.9	0.5
Install gas hot water	0.9	0.2
Install rainwater tank	0.7	4.6
Installing wetback	0.7	0.0
Replace laundry whiteware	0.5	0.0
Install heat pump hot water	0.5	2.3
Install pellet burner	0.0	1.2
Install passive vents in the windows	0.0	0.2
Venting Drier to outside	0.0	0.3

* Multiple response

[20] ***Where that renovation resulted in excess of $2,000 expended.***

7.2 Renovation Activities at Wave 2 Interviews

Of the 432 householders who completed a Wave 1 interview, 400 went on to complete a Wave 2 interview. On average, the time between a Wave 1 interview and participating in a Wave 2 interview was 6.8 months. However, the attenuated nature of recruitment, In-Home Assessment and provision of renovation plans combined with the programme meant that some householders had a relatively short time between Wave 1 and Wave 2 interviews. The lapse time is set out in Table 47. Of those 400 householders, 66 percent reported that they had taken some sort of renovation action between the Wave 1 and Wave 2 interviews. The pattern of renovation action between Wave 1 and Wave 2 interviews is set out in Table 48.

Table 47: Lapsed Time Between Wave 1 and Wave 2 Householder interviews

	Households	% Households
4 months or less	15	*3.8*
Over 4 months-8 months	299	*74.7*
More than 8 months	86	*21.5*
Total	400	*100*

Table 48: Renovation Activities between Wave 1 and Wave 2 Interviews

(n=400)

Renovation Activity	Number	% Householders
Install ceiling insulation	99	*24.8*
Install underfloor insulation	73	*18.3*
Install wall insulation	49	*12.3*
Install double glazing	37	*9.3*
Install heat pump	32	*8.0*
Replaced bathroom cabinetry	17	*4.3*
Replaced kitchen cabinetry	16	*4.0*
Full exterior repaint	15	*3.8*
Interior repainting/wallpapering	15	*3.8*
Replaced bathroom whiteware	15	*3.8*
Install dual flush toilet	14	*3.5*
Interior recladding	13	*3.3*
Replaced kitchen appliances	13	*3.3*

Renovation Activity	Number	% Householders
Install solar hot water	13	*3.3*
Install low flow shower head	12	*3.0*
Roof replacement	11	*2.8*
Install ventilation systems (e.g. HRV/DVS)	11	*2.8*
Install new hot water cylinder	11	*2.8*
Added rooms	9	*2.3*
Install wood-burner	9	*2.3*
Replaced significant areas of exterior cladding	8	*2.0*
Carpeting	8	*2.0*
Re-plumbing	8	*2.0*
Install range-hood/extractor fan in kitchen	8	*2.0*
Install extractor fan in bathroom	8	*2.0*
Instant gas	8	*2.0*
Rewiring	7	*1.8*
Install rainwater tank	4	*1.0*
Install heat pump hot water	2	*0.5*
Install wetback hot water	2	*0.5*

74 percent of the 400 householders interviewed in Wave 2 interviews reported that they intended further renovations. The most common reason among the 77 householders not intending to undertake renovations in the year following the Wave 2 interview was that they were satisfied that they had completed all that they wanted to do. However, there were a number of other reasons for not pursuing renovations in the coming year: 4.2 percent of householders saw future renovations as too expensive and 2.1 percent of householders decided to move. Among the 320 householders reporting that they intend to pursue renovations in the coming year, the focus on insulation still prevails as Table 49 shows.

Table 49: Intended Renovations for the Year After Wave 2 Interviews

(n=320)

Renovation Activity	Number	%
Install under-floor insulation	76	*23.8*
Install ceiling insulation	76	*23.8*
Install double glazing	52	*16.3*
Install wall insulation	45	*14.1*
Replace bathroom whiteware	39	*12.2*
Replace bathroom cabinetry	36	*11.3*
Full exterior repaint	30	*9.4*
Replace kitchen cabinetry	29	*9.1*
Replace kitchen appliances	28	*8.8*
Roof replacement	24	*7.5*
Install heat pump	24	*7.5*
Interior repainting/wallpapering	18	*5.6*
Add rooms	18	*5.6*
Install solar hot water	14	*4.4*
Replace significant areas of exterior cladding	12	*3.8*
Install wood-burner	11	*3.4*
Install dual flush toilet	11	*3.4*
Carpeting	10	*3.1*
Install new hot water cylinder	10	*3.1*
Interior recladding	9	*2.8*
Rewiring	9	*2.8*
Replumbing	9	*2.8*
Install extractor fan in bathroom	9	*2.8*
Install rainwater tank	8	*2.5*
Install low flow shower head	6	*1.9*
Install ventilation systems (e.g. HRV/DVS)	5	*1.6*
Polishing floors	4	*1.3*

Renovation Activity	Number	%
Install rangehood/extractor fan in kitchen	4	*1.3*
Install wetback hot water	3	*0.9*
Install heat pump hot water	2	*0.6*
Install pellet burner	1	*0.3*
Instant gas	1	*0.3*
Replace laundry whiteware	1	*0.3*

7.3 Renovation and Water

Water users consuming above the HSS® water benchmark do not show a particular interest in renovations that might save water. Only one of the 71 meter read dwellings installed a rainwater tank in the 12 months prior to the Wave 1 interviews. That dwelling was using above the HSS® water benchmark. Similarly, only one of the meter read dwellings installed a low flow showerhead in that period. That dwelling already had HSS® compliant water consumption.

A similar pattern was found with installing dual flush toilets. Only one dwelling did so prior to the Wave 1 interview and that dwelling was below the HSS® water consumption benchmark.

There was a higher level of reported intent to increase water efficiency in the Wave 1 interviews. For instance, five households reported that they would install a rainwater tank and 3 of those five were high water users. In addition, four households reported that they would install a low flow shower head with three of those households consuming water at levels above the HSS® benchmark.

Those reported intentions did not always come to fruition by the Wave 2 interviews. Only one dwelling had had a rainwater tank installed. The households living in that dwelling were high water users. However, four households have installed a low flow showerhead and two households had installed dual flushes for their toilets. Both the latter households were high water users.

The idea of installing rainwater tanks lingered. At the Wave 2 interview, three of the households consuming water above the HSS® benchmark reported that they intended to install a rainwater tank. No household expressed an intention to install a low flow showerhead. However, two intended to install a dual flush toilet. One of the latter was a high water user, while the other consumed water at below the HSS® benchmark.

7.4 Renovation Investment

When householders indicated an interest in entering the Home*Smart* Renovation Project they were asked to estimate the cost of their intended renovations or retrofit. Many householders (38.2 percent) did not disclose the amount. But just over a third (35.9 percent) intended to expend less than $20,000 and over about 44.9 percent indicated that they would spend in excess of $10,000. At the Wave 1 interview, 62.5 percent of households reported that they had expended in excess of $2,000 on renovations in the year prior to the interview. At the Wave 2 interviews, 63.3 percent of the 400 householders involved in the Wave 2 interviews had spent something on renovations in the previous year. That expenditure ranged from $2 to over $200,000. As Table 50 shows, around half those householders committed funds of up to $4,500 to renovations.

Table 50: Investment in Renovations and Retrofit Between Wave 1 and Wave 2 Interview

Investment Amount	Number	%
$4,500 or less	128	*50.6*
$4,501-9,000	55	*21.7*
$9,001-13,500	18	*7.1*
$13,501-18,000	11	*4.3*
$18,001-22,500	10	*3.9*
$22,501-27,000	4	*1.6*
$27,001-31,500	6	*2.4*
$31,501-36,000	0	*0*
$36,001-40,500	4	*1.6*
$40,501-45,000	2	*0.8*
$45,001-49,500	0	*0*
$49,501-54,000	5	*1.9*
$54,001-75,000	5	*1.9*
$75,001-100,000	3	*1.2*
More than $100,000	2	*0.8*
Total	253	*100*

7.5 Who Renovates?

A comparative analysis of the dwelling characteristics of the 432 Wave 1 householders indicates few differences between those who undertook renovations and those that did not. Those that **did not act** on the plan tend to be:

- less likely to live in a dwelling older than 1957
- more likely to be living in a dwelling in the mass housing/state housing typology
- either more likely to see their existing house as in average or worse condition or more likely to typify their dwelling as in 'excellent' condition
- more likely to self-identify as a high energy user
- more likely to be in a one or two-person household
- more likely to be residing in Climate Zone 2.

The households who **have acted** both before Wave 1 interviews and again in Wave 2 interviews are:

- slightly more likely to live in dwellings older than 1957
- likely to be aged between 31 and 50 years
- have household incomes in excess of $50,000
- have two or more household members, with 82.2 percent reporting a household size of 2-4 people
- live in Climate Zone 3.

8 The Impact of the Plan: Shaping Action

One of the fundamental questions for the Home*Smart* Renovation Project is whether independent dwelling assessment and advice will assist home owners to reshape their renovation intentions and actions. This analysis focuses on four indicators to assess whether interventions prompt a change in renovation actions. They are the extent to which the:

- Renovation pattern of participants in the Home*Smart* Renovation Project is different from other householders' renovation actions.
- Home*Smart* Renovation assessments and plans are perceived by participants as credible and leading to changes in a household's Renovation Plan.
- Home*Smart* Renovation Plans are being acted on.

8.1 Home*Smart* Renovators: Different Renovation Patterns

It is clear from the pattern of renovations undertaken by Home*Smart* Renovation Project participants that they have a distinctly different profile of renovation activity from the renovation activities reported by participants in other research exploring renovation behaviours and investments.

As the previous section has shown, both previous and intended renovations reported by the Home*Smart* Renovation Project were strongly directed to improving the thermal performance of their dwellings. This contrasts with the activities of the serial renovators that emerged among the households participating in Beacon's High Energy User Survey and Beacon's Recent Movers Survey summarised in Table 51.[21]

Table 51 shows the tendency for those general populations to be directed to more cosmetic renovation activities despite there being considerable evidence that many of their dwellings were performing inadequately. Interior repainting and/or wallpapering attracted the highest proportion of Recent Movers (45.7 percent) and High Energy Users (19.7 percent). That activity occupied only 2.8 percent of Home*Smart* Renovation Project participants in the year prior to their Wave 1 interview and 3.5 percent of householders in the period between their Wave 1 and Wave 2 interviews. Similarly, among the households in the Recent Movers and High Energy Users Surveys only 13.6 percent and 5.6 percent respectively installed ceiling insulation. By comparison, 15.5 percent of Home*Smart* Renovation Project households had in the year prior to their Wave 1 interview and 22.9 percent between Wave 1 and Wave 2 interviews.

The focus by Home*Smart* Renovation Project households on performance improvements is evident in Table 52 which ranks the ten highest retrofit and renovation activities for Recent

[21] ***Saville-Smith, K., 2008, House Owners and Energy – Retrofit, Renovation and Getting House Performance, EN-6570, Energy Report prepared for Beacon Pathways Ltd.***

Movers, High Energy Users and Home*Smart* Renovation Project households at Wave 1 and Wave 2 interviews.

The focus on renovations that deal with thermal performance is also consistent with the Home*Smart* Renovation Project participants' motivations. The householders, who stayed with the Home*Smart* Renovation Project until the Wave 1 interviews, started the programme with a clear emphasis on improving the comfort and warmth of their dwellings. 67.6 percent sought improved comfort with the next largest proportion of households (41 percent) seeking energy efficiency gains.

Table 51: Renovation and Retrofitting Activities among Owner Occupiers by Recent Movers and High Energy Users

Renovation or Retrofit (multiple response)	**Recent Movers (n=724)**		**High Energy Users (n=700)**	
	n	**%**	**n**	**%**
Interior repainting and/or wallpapering	155	*45.7*	46	*19.7*
Replacement of kitchen appliances	117	*34.5*	22	*9.4*
Carpeting	104	*30.7*	31	*13.3*
Replacement of kitchen cabinetry	90	*26.5*	19	*8.2*
Installing a heat pump	81	*23.8*	23	*9.9*
Replacement of bathroom whiteware	77	*22.7*	37	*15.9*
Re-plumbing	66	*19.5*	8	*3.4*
Installing an extractor fan in the bathroom	64	*18.9*	3	*1.3*
Installing a rangehood/extractor fan in the kitchen	64	*18.9*	1	*0.4*
Full exterior re-paint	63	*18.6*	28	*12.0*
Replacement of bathroom cabinetry	62	*18.3*	15	*6.4*
Rewiring full or significant part of the dwelling	54	*15.9*	5	*2.1*
Installing ceiling insulation	46	*13.6*	13	*5.6*
Installing wall insulation	46	*13.6*	7	*3.0*
Installing a new hot water cylinder	44	*13.0*	7	*3.0*
Replacement of interior cladding	41	*12.1*	15	*6.4*
Installing a ventilation system e.g. HRV, DVS	40	*11.8*	17	*7.3*
Installing under-floor insulation	35	*10.3*	8	*3.4*
Adding rooms	31	*9.1*	16	*6.9*
Installing a wood burner	26	*7.7*	6	*2.6*
Roof replacement	25	*7.4*	15	*6.4*

Renovation or Retrofit (multiple response)	Recent Movers (n=724)		High Energy Users (n=700)	
	n	%	n	%
Polishing floors	24	*7.1*	3	*1.3*
Upgrading hot water systems to instant gas	24	*7.1*	1	*0.4*
Venting drier to the outside	23	*6.8*	1	*0.4*
Installing a low flow showerhead	21	*6.2*	1	*0.4*
Replacement of significant amounts of exterior cladding	20	*5.9*	7	*3.0*
Installing double glazing	17	*5.0*	4	*1.7*
Installing a rainwater tank	11	*3.2*	1	*0.4*
Installing a pellet burner	7	*2.1*	1	*0.4*
Installing a solar hot water system	6	*1.8*	4	*1.7*
Installing a wet back hot water system	3	*0.9*	1	*0.4*
Installing a heat pump hot water system	2	*0.6*	4	*1.7*
Installing passive vents in windows	1	*0.3*	0	*0.0*

Table 52: The Ten Most Prevalent Retrofit Actions – Comparing Participants in the Recent Movers Survey, the High Energy Users Survey and the HomeSmart Renovation Project

Recent Movers Survey	**High Energy Users Survey**	**Home*Smart* Wave 1**	**Home*Smart* Wave 2**
Interior repainting and/or wallpapering	Interior repainting and/or wallpapering	Install ceiling insulation	Install ceiling insulation
Replacement of kitchen appliances	Replacement of bathroom whiteware	Install underfloor insulation	Install underfloor insulation
Carpeting	Carpeting	Install heat pump	Install wall insulation
Replacement of kitchen cabinetry	Full exterior re-paint	Install wall insulation	Install double glazing
Installing a heat pump	Installing a heat pump	Install double glazing	Install heat pump
Replacement of bathroom whiteware	Replacement of kitchen appliances	Full exterior re-paint	Replace bathroom cabinetry
Re-plumbing	Replacement of kitchen cabinetry	Re-plumb	Replace kitchen cabinetry
Installing an extractor fan in the bathroom	Installing ventilation system (e.g. DVS, HRV)	Roof replacement	Full exterior re-paint
Installing a rangehood/extractor fan in the kitchen	Add rooms	Replace bathroom whiteware	Replace bathroom whiteware
Full exterior re-paint	Replace bathroom cabinetry	Rewiring	Interior re-painting or wallpapering

By the Wave 1 interviews the expectation of improved comfort and warmth from following recommendations in the Renovation had consolidated with:

- the largest proportion of households (90.9 percent) expecting improved comfort or warmth.
- 86.8 percent of householders reporting that the Home*Smart* Renovation Plan recommendations would make their home healthier.
- 84.0 percent of householders believing that implementing the Home*Smart* Renovation Plan would lead to their home being better for the environment.
- 78 percent of households expecting reduced power bills.
- 73.8 percent of households considering that retrofit improvements will increase the value of their dwelling.
- 75.2 percent of these householders believing that their home would be easier to sell after undertaking sustainability related renovations or retrofits.

Those expectations of the outcomes from implementing the Renovation Plan fit well with the priorities that householders have in relation to their having:

- 97.5 percent of households reported having a warmer house was important
- 95.4 percent of households saw a more comfortable house as important
- 94.2 percent of households described an energy efficient house as important.
- 92.8 percent of households saw having a healthier house as important.
- 81.9 percent of households reported that a less damp house was important.
- 71.3 percent of households wanted to have less mould in their house.
- 65.5 percent of households saw greater resale value as important.

While householders had multiple reasons for renovating, the main reasons were for warmer houses and more comfortable houses (Table 53). The Renovation Plan was seen as a useful pathway to achieving these goals. [22]

[22] ***Saville-Smith, K., 2008, House Owners and Energy: Retrofit, Renovation and Getting House Performance Report EN-6570 for Beacon Pathway Limited.***

Table 53: Main Reason for Renovating at Wave 1 Interview

Renovation goals	Number	%
A warmer house	143	*39.6*
A more energy efficient house	82	*22.7*
A more comfortable house	66	*18.3*
A healthier house	28	*7.8*
A bigger house	17	*4.7*
Greater resale value	12	*3.3*
Less damp house	8	*2.2*
A more attractive house	4	*1.1*
Less mould	1	*0.3*
Total	361	*100*

8.2 Perceptions of the Home*Smart* Renovation Assessment and Plans

Among the 432 participants in the Wave 1 interviews, 46.1 percent of the householders reported that they have amended their renovation focus because of the Home*Smart* Renovation Plan. In addition, 61.8 percent of those in this phase of the interviewing reported that they had acted on the recommendations of the Home*Smart* Renovation Plan.

That is consistent with the relative high satisfaction levels expressed by householders with the assessment process and the Home*Smart* Renovation Plan itself in the Wave 1 interviews, although there was a persistent desire for greater specification around the plan recommendations. At the Wave 1 interviews, 87.5 percent of householders reported that they saw the assessor as having *Good* or *Excellent* competency. With regard to the Home*Smart* Renovation Plan:

- 86.8 percent of householders reported that the plan was comprehensive.
- 81.7 percent of householders reported that the plan was good or excellent at identifying key priorities.
- 76.4 percent of householders reported that the plan provided new and useful information.
- 74.6 percent of householders reported that the plan provided detailed recommendations.
- 69.7 percent of householders reported that the plan helped with decision-making.

Of course many householders had had a relatively short period of time participating actively in the Home*Smart* Renovation Project when they undertook a Wave 1 interview. Those householders remaining in the project showed consistently high levels of satisfaction with the various elements of the Home*Smart* Renovation Project. Of the 400 householders interviewed in Wave 2 interviews:

- 87.5 percent reported that the In-Home Assessment had been useful.
- 70.8 percent found the newsletters useful.
- 70.5 percent reported that the Homeowner Manual was useful, but 4 percent had not read it.
- 68.5 percent found the Project Management Guide was useful, although 2.8 percent had not read that document.

It should be noted, however, that of the 500 households that received an In-Home Assessment and plan, only 432 went on to a Wave 1 interview and only 400 went on to a Wave 2 interview. While some of these might simply be non-contacts, 37 householders actively withdrew before Wave 1 and another 8 householders actively withdrew by Wave 2. There may be a number of drivers for withdrawal, but some expressed dissatisfaction with the outcomes to date or perceived future benefits of continued participation.

8.3 Acting on Home*Smart* Renovation Plans

At the Wave 1 interviews, 23.8 percent of householders reported that they had already paid a tradesperson to act on at least one of the recommendations in the Home*Smart* Renovation Plan. In addition, 18.5 percent of householders reported that they had acted on at least one recommendation in the Home*Smart* Renovation Plan. 5.3 percent of householders were talking with suppliers at the time of interviewing and 14.4 percent of householders were obtaining one or more quotes at the time of interviewing.

The apparently rapid response to at least some of the Home*Smart* Renovation Plan recommendations might be explained in terms of the affordability of the packages. A proportion of the householders (27.8 percent) found that the costs set out in the Home*Smart* Renovation Plan were higher than expected. But for most (59.3 percent) the costs were about what they expected or somewhat less than expected. 40.7 percent of householders noted that at least one package would be unaffordable, but most were unable to identify at the interview which packages specifically out of those presented would be unaffordable. It should be noted, of course, that most participants had not yet commissioned or received quotes in relation to their chosen package or retrofit options at the Wave 1 interviews.

Of the 400 householders interviewed in the Wave 2 interviews, 65.3 percent had undertaken some action in relation to their Renovation Plan since the Wave 1 interviews. 3.5 percent had talked to suppliers and 11.4 percent were awaiting quotes.

There was evidence of active uptake of recommendations both by householders doing the work themselves (23.3 percent) or getting a paid tradesperson to undertake the work (30.5 percent). Householders were also actively seeking subsidies. 18 percent of householders at the Wave 2 interview reported that they had made enquiries about EECA or other subsidies with 13.3 reporting actually accessing subsidies. Overall, of the 400 participating in the Wave 2 interviews, 61.8 percent of households had acted on the Plan by the time of the Wave 1 interviews and 86.6 had acted on the plan by the Wave 2 interviews. As Table 54 shows, some householders acted on their Renovation Plan over a period of time.

Table 54: Acting on the Renovation Plan

Activity in relation to plan	Households	*% Households*
Acted on Plan by Wave 1 but not after Wave 1	61	*12.2*
Acted on Plan by Wave 1 subsequently unknown	23	*4.6*
Acted on Plan by Wave 2 but not before Wave 1	99	*19.8*
Acted on Plan by Wave 1 and again by Wave 2	186	*37.2*
Did not act on Plan	63	*12.6*
Unclear – Non contact for, or withdrawal by, Wave 1 interview	68	*13.6*
Total	500	*100*

8.4 Recommended Actions and Household Action

Establishing the extent to which the plans have generated and shaped householders actions is complex. This is in part because many dwellings required or could have usefully undertaken a myriad of repairs, maintenance, renovations and maintenance. The data also suggests that there are lapse times between householders' planning activities and acting on those plans.

The Home*Smart* Renovation Project has been limited in duration and it could be expected that some households at least will act on recommendations after the research period. Consequently, analysis of responses to Renovation Plan recommendations should be treated with care and levels of activity can be considered as conservative. Table 55 sets out the proportion of households acting on some of the key requirements identified in the In-Home Assessment at both Wave 1 and Wave 2 interviews.

Table 55: Proportion of Households Acting on Dwelling Issues Identified as Requiring Action in the In-Home Assessment % of Households Acting

Required Action	Households	% Households Acting on Requirement
Ceiling insulation (n=191)	125	*65.4*
Underfloor insulation (n=176)	99	*56.3*
Heating (n=226)	107	*47.3*
Wall insulation (n=214)	71	*33.2*
Double or secondary glazing (n=255)	62	*24.3*
Thermal curtains (n=156)	12	*7.7*
Bathroom extractor fan (n=111)	8	*7.2*
Rangehood kitchen extractor (n=104)	7	*6.7*
Pelmets (n=241)	2	*0.8*

8.5 Packages and Costs

It is difficult to conclude whether the Renovation Plans are adequate despite the overall high levels of satisfaction with them by those active within the Home*Smart* Renovation Project. Partly because of delays in implementing the assessment and plan phases, and partly because householders take time to undertake retrofit and renovations there is no robust monitored data for before and after. In addition while the plans have clearly stimulated action, it is also clear that in some areas of activity the plans are too generalised to address specific issues for householders. Recommendations around heating and the lack of specification around particular brands, performance requirements and features were noted by many participants as problematic. While Beacon purposefully limited independent advice to performance and not brands: heating systems performance is identified an area requiring more research.

What is also clear is that there is considerable under-costing[23] of packages presented to householders. Only half of householders that received Package 1 recommendations, had all those recommendations costed. The proportions of households receiving costed packages fell as the packages increased in complexity. For Package 2, only 29.6 percent of packages were costed for all recommendations. For package 3, less than 0.9 percent of dwellers received fully costed packages. This generates the anomaly of Package 1 costs being apparently about the same as Package 2 (Table 56). Superficially, at least, this would appear to compromise the utility of the packages to stimulating and guiding household investment choices.

Table 56: Costs by HomeSmart Renovation Package Type

Wave 1 Interview Plans	Average $	Median $	Max $	Min $
Package 1	4,035	3,900	13,120	10
Package 2	4,636	4,313	15,540	10
Package 3	11,077	10,905	114,909	70

[23] ***Undercosting was a result of incomplete data incorporated in the Plan Nuilder and gaps in supplemental information provided by plan providers (community energy trusts).***

9 Whither New Zealand's Dwelling Stock?

The Home*Smart* Renovation Project participants have dwellings somewhat older than the national stock, but even dwellings less than twenty years are being renovated by this group of householders. But they are not, by New Zealand experience, the coldest dwellings. These dwellings are, indeed, somewhat warmer than those recruited into the HEEP study and monitored between 1997 and 2005.

In the HEEP study, 98 percent of dwellings had average living room temperatures over 24 hours of less than 18°C. By contrast a lower proportion, 80.4 percent, of the Home*Smart* dwellings did so. Similarly in the Home*Smart* Renovation houses, 87.8 percent had average winter bedroom temperatures over 24 hours less than 18°C while 98 percent of HEEP dwellings did so.

The participants in the Home*Smart* Renovation Project are distinct in two ways. Firstly, they have a significantly higher income profile than most New Zealand households. Almost two-thirds of Home*Smart* Renovation households have household income in excess of $70,000 per annum compared to less than half of New Zealand households nationally. This reflects the life stage of these households. The majority of households are in that part of their life stage that they can optimise household earnings. Only 10 percent of the Home*Smart* participants who undertook a Wave 1 interview had a household member aged 65 years or more and less than a quarter of households had a child 5 years or less in the household.

The second way in which these households are distinct appears to be in relation to their expectations of house performance and their priorities in relation to renovation. These renovators still have the tendency to de-couple house condition and house performance. Over half (52.3 percent) of the Home*Smart* Renovation participants reported that their dwelling was in 'Excellent' or 'Good' condition, although 79.7 percent of householders initially entering the project reported that their dwelling was cold after an hour of heating on a cold winter morning and measured average winter temperatures in bedrooms and living rooms, shows that their dwellings were significantly colder than that seen to be healthy by the World Health Organisation.

Other indicators of poor performance and inadequate condition include:

- Almost half of the dwellings having mould or damp stains
- Excessive humidity measured at surface
- Almost a third of dwellings with ceiling insulation that is lacking
- Almost a quarter of dwellings having underfloor damp
- Over a third of dwellings requiring draughts to be remedied
- Over a half of dwellings requiring external maintenance

Despite this, these Home*Smart* Renovation participants do have a pronounced desire to improve their dwelling performance, particularly in relation to comfort and warmth. Moreover, they act on that goal. There is a strong predilection toward addressing insulation issues. There is less evidence in this group of householders of a focus on superficial "prettifying" activities compared to participants in Beacon's earlier Recent Movers and High Energy User Surveys.

They are, despite their high income profile, still likely to spend relatively modest amounts on renovations. At the Wave 1 interview 37.5 percent of householders reported expending less than $2,000 on renovations in the year prior to interviewing. Half of those who had expended on renovations between the Wave 1 and Wave 2 interviews had spent less than $4,500 dollars. Over two thirds (72.3 percent) reported spending $9,000 or less.

Notwithstanding the focus of these householders on improved performance, the idea of what constituted improved performance was relatively narrow. The proportions acting on plan recommendations and assessments of required action varied from 65.4 percent of those from whose ceiling insulation was recommended to 6.7 percent of households recommended to install a range-hood or kitchen extractor. It would appear that the insulation message is increasingly grasped, but the issue of dealing with humidity is less clearly understood among householders. Similarly, opportunities for water and electricity saving are also less likely to be taken advantage of. Relatively small proportions either took up or reported that they intend to take up solar water heating despite the majority of dwellings having a suitably orientated roof. Take-up of water saving options was also relatively limited. The lack of focus on those issues by renovators, combined with their water use patterns, confirms the importance of charging users directly for their reticulated water use if household water demand is to be minimised.

It can be concluded then, that although support through In-Home Assessment and subsequent Renovation Plans both stimulated and shaped renovation action, the opportunities for further resource efficiency and dwelling performance gains are still considerable. It must be asked why only 18 percent of householders had enquired about retrofit subsidies with only 13.3 percent taking up subsidies.

It is clear that householders still feel anxious about purchasing products and services. While many found both the In-Home Assessment and Renovation Plan helpful, participants in the course of interviewing and in other communications with the programme frequently sought advice on selection between products and service providers. It appears that, in the interaction with the market, householders feel particularly vulnerable.

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11 Appendix A: Recruited Households and the Home*Smart* Renovation project

Between June 2008 and September 2009 a total of 676 households were assigned a unique identifier[24]. Twenty-seven of these households were subsequently found to be ineligible due to being outside the research area (17 households), being double-ups (6 households), or because they had been assigned to the wrong area and needed a new ID issued (4 households). In all a total of 649 eligible households signed up to participate in the research.

The research process had five distinct stages where information was collected about participant households. Those five stages and the data set associated with each stage are as follows:

- Stage 1 – self-complete on-line registration form
- Stage 2 – self-complete preliminary questionnaire
- Stage 3 – Dwelling In-Home Assessment by partner assessor
- Stage 4 – Renovation Plan delivered to household by partner assessor
- Stage 5 – Telephone interview - Householder Surveys (each household will have 2-3 telephone interviews as part of Stage 5)

Progression through the stages was broadly linear and some stages were prerequisites for advancing to the next stage. For instance, Stage 4 was reliant on Stage 3 being completed and Stage 5 was reliant on Stage 4 being complete. Not all households completed all stages. For example, a small number of households were recruited directly by research partners, and although most of these were referred to the on-line registration form some did not complete Stage 1. A larger number of households did not complete a Stage 2 preliminary questionnaire. Households could also withdraw from the research process at any stage. Households that withdraw from the research are kept in the administrative and research databases but labelled as *inactive households*.

[24] ***A single unique identifier is assigned to each eligible household. That same unique identifier is attached to any data set generated in the course of the research related to that household or their dwelling.***

Table 57 sets out the progression of the 649 eligible households through the research stages up to the point in time immediately after the completion of the first telephone interview at Stage 5.

Table 57: Progression of households through stages of the project

Research Process	Active households	Inactive households	Total
Stage 1	0	107	107
Stage 2	0	42	42
Stage 4	51	17	68
Stage 5	429	3	432
Total	480	169	649

A subset of around 200 of the 649 eligible houses, were approached to take part in a monitoring project which involved temperature loggers being installed in the household for the duration of the research, along with humidity sensors. Over the course of the research 212 houses were approached to be monitored, 209 of these were eligible for monitoring. Table 58 sets out the progression of the monitored sub-set of households through the research stages up to the point in time immediately after the completion of the first telephone interview at Stage 5. Note this table is a subset of the table above.

Table 58: Progression of monitored households through the project

Research Process	Monitored households only		Total
	Active	Inactive	
Stage 1	0	9	9
Stage 2	0	10	10
Stage 4	13	1	14
Stage 5	175	1	176
Total	188	21	209

It should be noted that out of the 209 monitored households – temperature data was able to be calculated for only 183 households. A number of houses failed to return loggers, and in some cases loggers failed.

Each stage of the process generated a set of data for analysis. As mentioned above, the number of data sets for each household varies for two reasons. Firstly, not all stages of the research were prerequisites for progressing to the next stage and second, a household could withdraw at any stage of the process.

Table 59, below, sets out the total number of data sets available for analysis at each stage of the research. The cells in this table are not mutually exclusive, so for instance a single household can be counted up to five times.

Table 59: Total number of data sets at each stage of the project

Data collection instruments	Number completed		Total
	Monitored	Non-monitored	
On-line registration survey	202	430	632
Self-complete preliminary questionnaire	154	226	380
Dwelling In-Home Assessment	190	310	500
Renovation plan	190	310	500
First post-plan telephone interview	176	256	432
Second post-plan telephone interview	171	229	400
Total	1083	1761	2844

For the final report the datasets from each stage have been matched using the unique household identifier and combined into a meta-database for analysis purposes. Where a household has completed a dataset at each stage the meta database means we can compare planned renovations against actual renovation activities on a household by household basis or calculate elapsed time between each research stage. Table 60 below sets out some examples of analysis groups that can be constructed from the meta database and the numbers of households in each. For instance, there are 301 households who have completed datasets at each stage of the process (analysis group A) meaning we can calculate detailed elapsed time profiles from Stage 1 to Stage 5 for 301 households however if we only want to calculate elapsed time from in home assessment (Stage 3) to delivery of renovation plan (Stage 4) we can calculate this for 500 households (analysis group F).

Table 60: Examples of analysis groups

Data collection instruments	Analysis Groups											
	A	B	C	D	E	F	G	H	I	J	K	L
On-line registration survey	X			X	X			X	X			X
Self-complete preliminary questionnaire	X	X			X	X					X	X
Dwelling In-Home Assessment	X	X	X	X	X	X	X	X	X	X	X	X
Renovation plan	X	X	X	X	X	X	X	X	X	X	X	X
First post-plan telephone interview	X	X	X	X	X	X	X	X				
Second post-plan telephone interview	X	X	X	X								
Total	282	282	400	282	301	301	432	426	484	500	338	330

*the 149 households who progressed no further than stage 1 or stage 2 are not included in this table

For the subset of monitored households there are 135 households in analysis groups A and B and 171 households in analysis group C.

11.1.2 Time Lapse Analysis

This section details some limitations of the variables available for use in the time lapse analysis and the implications of those limitations, it then describes the variables used in the time lapse analysis and presents preliminary findings from the first run of time lapse analysis.

11.1.2.1 Time lapse analysis – data limitations

The data obtained from the time lapse analysis must be treated with some caution. The source of the data for some of the variables used in the analysis means that time lapse estimates are likely to be conservative and therefore underestimate elapsed time.

Dates used in the time lapse analysis are obtained from two sources: dates generated as part of the data collection process (for example the date of the in-home dwelling assessment and the date of the first post-plan telephone interview); and dates generated from administrative data sets (for instance the Stage 1 date for the on-line registration survey and the Stage 4 date for when the renovation plan was sent to the household). The dates obtained from the administrative datasets are estimates only. While these administrative dates can be used as a

marker for a research stage they do not represent the actual date an event occurred (unlike dates from the research datasets such as the date of the in-home dwelling assessment). Dates generated as part of the data collection process are kept with their respective data set in each research database so were automatically included when the meta database was created. Dates generated from administrative data have been reformatted and constructed into new variables which have been added to the meta database.

The administrative dates are likely to generate conservative time lapse estimates, although in most cases the underestimate should be a few days to a week. In Stage 1 the date a household registered to take part in the research project was not captured. The date being used as a substitute is taken from an administrative dataset and represents the date the household's registration was acknowledged. In a small number of cases the date a registration was made and the date it was acknowledged will be one and the same but in most cases the acknowledgements were done in batches. For example all the registrations for the past week might be processed and acknowledged on a Friday. This means the constructed date variable for Stage 1 is likely to be a conservative estimate of the date the registration took place. Likewise the date being used to represent 'Stage 4 – delivery of renovation plan' is also an estimate. This estimate is obtained from monthly reports from community partners of completed assessments and plans. The date represents the date the plan was completed and dispatched to the household not necessarily the date the plan was received by the household. The majority of renovation plans was posted in hard copy so depending on the day of the week a plan was sent and the location of the recipient household a plan might not be received until 1-6 days after the date the plan was sent.

Another complicating factor arising from the use of administrative dates is that, unlike the dates generated in the course of data collection, administrative dates can sometimes change. This was an issue particularly with the Stage 4 date the renovation plan was delivered. In a number of cases renovation plans were sent but not received by householders. The non-receipt of renovation plans was generally not discovered until households were contacted for their first Stage 5 telephone interview approximately 4-8 weeks after the date the plan was dispatched. Where this happened the renovation plan was resent to the householder and the Stage 4 date over-written with the new date. The interview was rescheduled for 4-6 weeks after the receipt of the re-sent renovation plan. In these instances, the date included in the meta database will be the date the plan was resent. While this accurately reflects the householders' experience of elapsed time between research events, as they had not received the plan at the earlier date, it will have the consequence of increasing the average elapsed time between Stage 3 and Stage 4 across the dataset as a whole.

11.1.2.2 Time lapse analysis- the variables

The time lapse analysis is based on a set of four date variables, as follows:

- Date acknowledgement notification sent (Stage 1 date)
- Date of in-home dwelling assessment (Stage 3 date)
- Date renovation plan sent to household (Stage 4 date)
- Date of first post renovation plan telephone interview (Stage 5 date)

Taking these four variables a new set of variables were constructed based on the elapsed time between dates. For each elapsed time period analysed a pair of variables was constructed one which calculated the elapsed time in days and one which calculated the elapsed time in weeks. The new sets of variables created are as follows:

- Elapsed time from registration to in-home dwelling assessment (Difference between Stage 3 date and Stage 1 date)
- Elapsed time from registration to delivery of renovation plan (Difference between Stage 4 date and Stage 1 date)
- Elapsed time between in-home dwelling assessment and delivery of renovation plan (Difference between Stage 4 date and Stage 3 date)
- Elapsed time between delivery of renovation plan and first telephone interview (Difference between Stage 5 date and Stage 4 date).

A total of 12 variables were associated with the time lapse analysis and can be used within the meta database for a variety of univariate and cross tabulation analysis.

11.1.2.3 Time lapse analysis – the preliminary findings

The preliminary findings in this section include elapsed time for both active and inactive households where the inactive household reached the relevant stage. The findings are presented in relation to the four created analysis variables outlined above. Broadly these four variable represent the elapsed time between:

- Stage 1 and Stage 3
- Stage 1 and Stage 4
- Stage 3 and Stage 4
- Stage 4 and Stage 5

Note the elapsed time in days and/or weeks has been rounded to the nearest whole day or week for presentation in tables.

Stage 1 to Stage 3: Elapsed time from registration to delivery of in-home dwelling assessment

The average number of weeks from Stage 1 to Stage 3 for all households was 14.1 weeks (the median was 12.1 weeks). The shortest duration experienced by a householder was less than a week. The much shorter than average duration is due to a number of households which were recruited directly by community partners – where this occurred the assessment was often done simultaneously with completion of the registration form. The longest duration experienced was 59.7 weeks – this was a household that signed up early on and was then either mistakenly identified as not interested in continuing, or withdrew but later changed their mind – some months later they contacted Lois to ask whether they could still have a home assessment.

As Table 61 shows, around half the participating households (52.7 percent) had received an in-home dwelling assessment within 3 months of registration and the majority (89.2 percent) had received an in-home dwelling assessment within 6 months of registration.

Table 61: Elapsed time from registration to In-Home Assessment

Duration in weeks	Number of households	Proportion of households
Less than 1 week	6	1.3
1-2 weeks	11	2.3
3-4 weeks	30	6.3
5-12 weeks	205	42.8
13-24 weeks	175	36.5
25-36 weeks	36	7.5
37 or more weeks	16	3.3
Total	*479*	*100*

* there are 21 households where one date was missing so the elapsed time analysis was unable to be calculated for this table.

Stage 1 to Stage 4: Elapsed time from registration to delivery of Home*Smart* Renovation Plan

The average number of weeks from Stage 1 to Stage 4 for all households was 16.6 weeks (the median was 14.8 weeks). The shortest duration experienced by a householder was less than a week. The much shorter than average duration is due again to a number of households which were recruited directly by community partners – where this occurred the in-home dwelling assessment was often done simultaneously with completion of the registration form and for some the Renovation Plan was also provided the next day. The longest duration experienced was 59.7 weeks – this is the same household that signed up early on and was then either mistakenly identified as not interested in continuing, or withdrew but later changed their mind – some months later they contacted Lois to ask whether they could still have a home assessment.

As Table 62 shows over a third (37.3 percent) of the participating households had received an in-home dwelling assessment within 3 months of registration and the majority (82.6 percent) had received an in-home dwelling assessment within 6 months of registration.

Table 62: Elapsed time from registration to delivery of HomeSmart Renovation Plan

Duration in weeks	Number of households	Proportion of households
Less than 1 week	3	0.6
1-2 weeks	5	1.0
3-4 weeks	19	4.0
5-12 weeks	152	31.7
13-24 weeks	217	45.3
25-36 weeks	56	11.7
37 or more weeks	27	5.6
Total	*479*	*99.9*

* there are 21 households where one date was missing so the elapsed time analysis was unable to be calculated for this table.

Stage 3 to Stage 4: Elapsed time from in-home dwelling assessment to delivery of Home*Smart* Renovation Plan

The average number of weeks from Stage 3 to Stage 4 for all households was 2.7 weeks (the median was 1.4 weeks). The shortest duration experienced by a householder was delivery the same day as the assessment. The longest duration experienced was 38.1 weeks – this was a household where the first Home*Smart* Renovation Plan sent out was not received and it was not until an interviewer made contact some months after the in-home dwelling assessment that this was apparent and a replacement sent.

As Table 63 shows over a third (37.3 percent) of the participating households had received their Home*Smart* Renovation Plan within one week of their in-home dwelling assessment and the majority (84.2 percent) had received their Home*Smart* Renovation Plan with a month of their in-home dwelling assessment.

Table 63: Elapsed time from In-Home Assessment to HomeSmart Renovation Plan

Duration in Weeks	Number of households	Proportion of households
Less than 1 week	175	35.0
1-2 weeks	146	29.2
3-4 weeks	100	20.0
5-12 weeks	62	12.4
13-24 weeks	13	2.6
25-36 weeks	3	0.6
37 or more weeks	1	0.2
Total	*500*	*100*

Stage 4 to Stage 5: Elapsed time from delivery of Home*Smart* Renovation Plan to first post-plan interview

The average number of weeks from Stage 4 to Stage 5 for all households was 13.6 weeks (the median was 11.1 weeks). The shortest duration experienced by a householder was one week. The longest duration experienced was 51.6 weeks. Those that completed an interview within less than 4 weeks of their plan being sent included some who wanted to book in their interview even though a plan needed to be resent as they had already started renovations and a small number of the very early houses who acted as a pilot for the first interviews.

As Table 64 shows over half of the participating households (56.8 percent) had completed their first post-plan interview within 3 months of receiving their Home*Smart* Renovation Plan and the majority (89.4 percent) had completed an interview within 6 months of receiving their plan.

Table 64: Elapsed time from HomeSmart Renovation Plan to first post-plan interview

Duration in weeks	Number of households	Proportion of households
Less than 1 week	-	0.0
1-2 weeks	5	1.2
3-4 weeks	8	1.9
5-12 weeks	232	53.7
13-24 weeks	141	32.6
25-36 weeks	39	9.0
37 or more weeks	7	1.6
Total	*432*	*100*

* there are 68 households where one date was missing so the elapsed time analysis was unable to be calculated for this table.

12 Appendix B: Phone survey instrument

ID Number: _____

Home*Smart* Renovation
Post Assessment and Plan Questionnaire

Good evening my name is _____

I am ringing on behalf of Beacon. You have been participating in the Home*Smart* Renovation Project and should have had an In-Home Assessment and received a Home*Smart R*enovation Plan.

Can I check whether you have:

- Had an In-Home Assessment

  ❑$_1$ Yes ❑$_2$ No → If NO do not proceed with interview

- Received the Home*Smart* Renovation Plan?

  ❑$_1$ Yes ❑$_2$ No → If NO do not proceed with interview

As part of the research into what helps people to improve their home's performance, we would like to ask you some questions about how you found the In-Home Assessment, the Home*Smart* Renovation Plan, and the extent it is helping you to make decisions about home renovation. If you have your plan handy somewhere then you might like to grab it so you can refer to it if needed while we're talking.

All data collected in this survey will be aggregated and used for research purposes only. Your responses are confidential. No individual details will be used in reports or research summaries.

You can withdraw from this or any other part of the research at any time. Remember you don't have to go ahead with renovations to stay part of the project. We are interested in the decisions you make and why you make them.

Are you happy to proceed with the interview?

❑$_1$ No, not at all – *Whether they intend to withdraw and why?*

❑$_2$ Yes but not now – *Make another time*

❑$_3$ Yes – *Proceed* ➔ Note date of interview _____

First we need to ask you some questions about the In-Home Assessment

Q.1 Can you remember the name of the group that came to do the In-Home Assessment?

Do not prompt – Tick nearest name

- ❑$_1$ Community Energy Action
- ❑$_2$ Energysmart
- ❑$_3$ Ecomatters
- ❑$_4$ Energy Options
- ❑$_5$ Other
- ❑$_6$ Can't remember

Q.2 How would you rate the in-home assessors on each of the following things?

READ: The responses are excellent, very good, neither good nor bad, poor, very poor. *Tick <u>one</u> response only for each*

Read each	Excellent	Good	Neither good nor poor	Poor	Very poor
(a) Turning up on time	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(b) Competency of assessors	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(c) Attitude and helpfulness	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(d) Promptness of plan delivery	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$

Q.3 How would you rate the Home*Smart* Renovation Plan you received for each of the following things?

READ: The responses are the same as the previous question *Tick <u>one</u> response only for each*

Read each statement	Excellent	Good	Neither good nor poor	Poor	Very poor
(a) Being comprehensive	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(b) Providing new and useful information	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(c) Helping with decision making	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(d) Providing detailed recommendations	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(e) Identifying key priorities	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$

Q.4 Is the cost of getting your house to a high standard of sustainability as set out in the plan**: READ 1-3**

❑$_1$ More than expected ❑$_2$ About expected ❑$_3$ Less than expected

[**Don't read 4** - but tick if required ❑$_4$ Don't know/no expectations]

Q.5 Did the plan show you that you were eligible for grants or subsidies to help you improve the sustainability of your home?

❑$_1$ Yes → Go to Q5a
❑$_2$ No
❑$_3$ Don't know

Q5a Were you aware that those grants, subsidies or assistance was available to you before the In-Home Assessment or the renovation plan?

❑$_1$ Yes ❑$_2$ No

READ: I want to talk to you about the affordability of each package in the plan. Just look at the final page of your plan.

Q.6 Would you find any of those packages unaffordable?

❑$_1$ Yes → Go to Q6a ❑$_2$ No → Go to Q7

Q6a If yes, which of the packages are unaffordable?

DON"T PROMPT – tick any that apply

❑$_1$ Package 1
❑$_2$ Package 2
❑$_3$ Package 3
❑$_4$ Package 4

comments if required_____
_____

Q.7 Have you taken any action in relation to the recommendations in the plan already?

❑$_1$ Yes→ Go to Q8 ❑$_2$ No → Go to 9

Q.8 What have you done? *Please tick (✓) <u>any</u> that apply.* ***DON'T PROMPT***

❑$_1$ Talked to suppliers
❑$_2$ Obtained one or more quotes – **also answer 8a**
❑$_3$ Undertaken to do one or more of the recommendations ourselves

❑4 Had unpaid assistance to do one or more of the recommendations
❑5 Paid tradespeople/community partners to undertake one or more of the recommendations
❑6 Incorporated one or more recommendations into our building/renovations plans with architect etc
❑7 Other (please specify) _____

Q.8a **If ticked 8.2 ONLY otherwise go on to Q9 -** What renovations have you had quoted and who did you get a quote from?

What	Who

Q.9 What recommendations in the plan, if any, would you expect to undertake in:

Year 1

Year 2

Year 3

Year 4

Year 5

Q.10 What recommendations in the plan, if any, would you never undertake?

List	Reason

Q.10a. Why won't you undertake those recommendations? (Put reasons in the reasons column for Q10).

Q.11 If you happened to follow ALL the plan recommendations how likely do you think the performance of your home would improve? *Tick (✓) one for each*

	Very likely	Likely	Unlikely	Not at all likely	Don't know	N/A
a. Improved comfort or warmth	❑1	❑2	❑3	❑4	❑5	
b. Savings on my power bills	❑1	❑2	❑3	❑4	❑5	
c. Savings on my water bills	❑1	❑2	❑3	❑4	❑5	❑6
d. Adding to the value of my home	❑1	❑2	❑3	❑4	❑5	
e. Making my home better for the environment	❑1	❑2	❑3	❑4	❑5	
f. Making my home healthier	❑1	❑2	❑3	❑4	❑5	
g. Making my home easier to sell	❑1	❑2	❑3	❑4	❑5	

Q.12 If you followed just the recommendations you are **likely** to take up, do you think the performance of your home would improve a lot, a little bit or not at all? *Tick (✓) one for each*

	A Lot	A Little Bit	Not at All	Don't know
a. Improved comfort or warmth	❑1	❑2	❑3	❑5
b. Savings on my power bills	❑1	❑2	❑3	❑5
c. Adding to the value of my home	❑1	❑2	❑3	❑5
d. Making my home better for the environment	❑1	❑2	❑3	❑5
e. Making my home healthier	❑1	❑2	❑3	❑5
f. Making my home easier to sell	❑1	❑2	❑3	❑5

Q.13 In the last year, have you undertaken any renovations or major maintenance on your dwelling costing in excess of $2,000? *Please tick (✓) <u>one</u> box only*

❑1 Yes ❑2 No → If NO, go to Question 15

Q.14 What did those renovations or major maintenance involve? *Please tick (✓) <u>any</u> that apply.*

- ❑$_{1}$ Roof replacement
- ❑$_{2}$ Full exterior re-paint
- ❑$_{3}$ Replacement of significant amounts of exterior cladding
- ❑$_{4}$ Replacement of interior cladding
- ❑$_{5}$ Interior repainting and/or wallpapering
- ❑$_{6}$ Carpeting
- ❑$_{7}$ Polishing floors
- ❑$_{8}$ Adding rooms (*Please specify and indicate number)* _____
- ❑$_{9}$ Replace bathroom whiteware
- ❑$_{10}$ Replace kitchen appliances
- ❑$_{11}$ Replace bathroom cabinetry of
- ❑$_{12}$ Replace kitchen cabinetry
- ❑$_{13}$ Rewiring full or significant part of the dwelling
- ❑$_{14}$ Replumbing
- ❑$_{15}$ Install underfloor insulation
- ❑$_{16}$ Install ceiling insulation
- ❑$_{17}$ Install wall insulation
- ❑$_{18}$ Install double glazing
- ❑$_{19}$ Install wood burner
- ❑$_{20}$ Install pellet burner
- ❑$_{21}$ Install heat pump
- ❑$_{22}$ Install solar hot water system
- ❑$_{23}$ Install heat pump hot water system
- ❑$_{24}$ Install wet back hot water system
- ❑$_{25}$ Install ventilation systems, such as HRV/DVS
- ❑$_{26}$ Install rainwater tank
- ❑$_{27}$ Install new hot water cylinder
- ❑$_{28}$ Installing a rangehood/ extractor fan in the bathroom
- ❑$_{29}$ Installing an extractor fan in the bathroom
- ❑$_{30}$ Venting the drier to the outside
- ❑$_{31}$ Installing passive vents in the windows
- ❑$_{32}$ Upgrading hot water system to instant gas
- ❑$_{33}$ Upgrading hot water system to solar hot water
- ❑$_{34}$ Putting in a wetback hot water system
- ❑$_{35}$ Installing a low flow shower head
- ❑$_{36}$ Polishing floors
- ❑$_{37}$ Replace laundry whiteware
- ❑$_{38}$ Installing a dual flush toilet
- ❑$_{39}$ Other

*If 'other', please specify:*_____

_____

Q.15 In the next year, do you intend to you undertake any renovations or major maintenance on your dwelling costing in excess of $2,000? *Please tick (✓) <u>one</u> box only*

❑$_1$ Yes ❑$_2$ No → If NO, go to Question 17

Q.16 What will those involve? *Please tick (✓) <u>any</u> that apply.*

❑$_1$ Roof replacement
❑$_2$ Full exterior re-paint
❑$_3$ Replacement of significant amounts of exterior cladding
❑$_4$ Replacement of interior cladding
❑$_5$ Interior repainting and/or wallpapering
❑$_6$ Carpeting
❑$_7$ Polishing floors
❑$_8$ Adding rooms (*Please specify and indicate number)* _____
❑$_9$ Replace bathroom whiteware
❑$_{10}$ Replace kitchen appliances
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❑$_{12}$ Replace kitchen cabinetry
❑$_{13}$ Rewiring full or significant part of the dwelling
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❑$_{35}$ Installing a low flow shower head
❑$_{36}$ Polishing floors
❑$_{37}$ Replace laundry whiteware
❑$_{38}$ Installing a dual flush toilet
❑$_{39}$ Other

*If 'other', please specify:*_____

_____

Q.17 Have your renovation intentions for the coming year changed because you have seen the plan?

❑$_1$ Yes ❑$_2$ No

If yes, how?

_____

_____

Q.18 Are you likely to install solar water heating or a heat pump hot water heater in the next year?

❑$_1$ Yes – solar hot water heating
❑$_2$ Yes – a heat pump hot water heater
❑$_3$ No - Neither

Any comments

_____

_____

Q.19 How useful have you found the Project Management Guide? *Please tick (✓) <u>one</u> box only*

❑$_1$ Useful
❑$_2$ Not useful
❑$_3$ Haven't read it
❑$_4$ Too early to say
❑$_5$ Don't know

Q.20 How useful have you found the Homeowner Manual? *Please tick (✓) <u>one</u> box only*

- ❑1 Useful
- ❑2 Not useful
- ❑3 Haven't read it
- ❑4 Too early to say
- ❑5 Don't know

Now some questions about energy and water

Q.21 Compared with other households, would you say your household energy consumption is…? *Please tick (✓) <u>one</u> box only*

- ❑1 Very High
- ❑2 High
- ❑3 About Average
- ❑4 Low
- ❑5 Very Low

Q.22 What was your last month's energy bill? *Please ask for dollar amount and kWh as on last power bill with an actual reading. If no bill available ask for estimate. Also check who their supplier is. If they are billed separately for gas you will need to record two different amounts.*

$_____ kWh_____

Supplier: _____

- ❑1 Estimate
- ❑2 Actual

Q.23 Are you billed for water usage?

❑1 Yes - If YES, go to Question 23a
❑2 No - If NO, go to Question 24

Q23a If yes, What was your last water bill? *Please ask for dollar amount and measure and period. If billed – also need to check that the bill does NOT include wastewater as some people are also billed for this.*

$_____

billed per: ❑$_1$ Cubic metre ❑$_2$ Other (specify) _____

frequency: ❑$_1$ Monthly ❑$_2$ Quarterly ❑$_3$ Other (specify) _____

Q.24 We would like to get this energy and water information regularly. How would you like us to do this?

❑$_1$ Give permission to access energy and water data from supplier

READ: We will send you a form so the person named on the water or energy bill can sign this request to the supplier.

❑$_2$ Save up energy and water bills and report quarterly for each month by telephone.

❑$_3$ Respond to an email prompt from us.

❑$_4$ Do not wish to supply.

Now some questions about your desire to do renovations

Q.25 How would you describe the condition of your house?

READ: The responses are excellent, good, average, poor, very poor.

Please tick (✓) <u>one</u> box only

❑$_1$ Excellent – No immediate repair and maintenance needed
❑$_2$ Good – Minor maintenance needed
❑$_3$ Average – Some repair and maintenance needed
❑$_4$ Poor – Immediate repairs and maintenance needed
❑$_5$ Very poor – Extensive and immediate repair and maintenance needed

Q.26 If you undertake renovations how important is achieving the following?

READ: The responses are important or not important for each one.

	Important	Not Important	Not Applicable
a. A warmer house	❑1	❑2	❑3
b. A more energy efficient house	❑1	❑2	❑3
c. A less damp house	❑1	❑2	❑3
d. Less mould in the house	❑1	❑2	❑3
e. A healthier home	❑1	❑2	❑3
f. A more comfortable home	❑1	❑2	❑3
g. Greater resale value	❑1	❑2	❑3
h. A bigger home	❑1	❑2	❑3

Q.27 What is your main reason for renovating your house?

READ *Please tick (✓) One*

❑1 A warmer house
❑2 A more energy efficient house
❑3 A less damp house
❑4 Less mould in the house
❑5 A healthier home
❑6 A more comfortable home
❑7 Greater resale value
❑8 A bigger home
❑9 A more attractive home
❑10 Other – *Specify*

The final questions ask for some details that describe yourself and your household.

Q.28 Which age group do you fall into?

READ *Please tick (✓) <u>one</u> box only*

❑1 24 years or under
❑2 25 to 30 years
❑3 31 to 40 years
❑4 41 to 50 years
❑5 51 to 60 years
❑6 61 to 64 years
❑7 65 years or over

Q.29 What is your household's <u>total</u> annual income before tax?

READ *Please tick (✓) <u>one</u> box only*

❑$_1$ $10,000 or less
❑$_2$ $10,001 to $20,000
❑$_3$ $20,001 to $30,000
❑$_4$ $30,001 to $40,000
❑$_5$ $40,001 to $50,000
❑$_6$ $50,001 to $70,000
❑$_7$ $70,001 to $100,000
❑$_8$ Over $100,000

Q30 Do you have or are you eligible for a Community Services Card?
❑$_1$ Yes
❑$_2$ No
❑$_3$ Don't know

Q.31 Including yourself, how many people live in your household? _____

Q.32 Are there people aged 65 years and over in your house? How many? _____

Q.33 Are there children aged 5 and under live in the household? How many? ____

13 Appendix C: Wave 1 Interview Form

ID Number: _____

Home*Smart* Renovations
Post Assessment and Plan Questionnaire

Good evening my name is _____

I am ringing on behalf of Beacon. You have been participating in the Home*Smart* Renovation Project and should have had an In-Home Assessment and received a Home*Smart* Renovation Plan.

Can I check whether you have:

- Had an In-Home Assessment

  ❑$_1$ Yes ❑$_2$ No → If NO do not proceed with interview

- Received the Home*Smart* Renovation Plan?

  ❑$_1$ Yes ❑$_2$ No → If NO do not proceed with interview

As part of the research into what helps people to improve their home's performance, we would like to ask you some questions about how you found the In-Home Assessment, the Home*Smart* Renovation Plan, and the extent it is helping you to make decisions about home renovation. If you have your plan handy somewhere then you might like to grab it so you can refer to it if needed while we're talking.

All data collected in this survey will be aggregated and used for research purposes only. Your responses are confidential. No individual details will be used in reports or research summaries.

You can withdraw from this or any other part of the research at any time. Remember you don't have to go ahead with renovations to stay part of the programme. We are interested in the decisions you make and why you make them.

Are you happy to proceed with the interview?

❑$_1$ No, not at all – *Whether they intend to withdraw and why?*

❑$_2$ Yes but not now – *Make another time*

❑$_3$ Yes – *Proceed* ➔ Note date of interview _____

First we need to ask you some questions about the In-Home Assessment

Q.1 Can you remember the name of the group that came to do the In-Home Assessment?
Do not prompt – Tick nearest name

❑$_1$ Community Energy Action
❑$_2$ Energysmart
❑$_3$ Ecomatters
❑$_4$ Energy Options
❑$_5$ Other
❑$_6$ Can't remember

Q.2 How would you rate the in-home assessors on each of the following things?

READ: The responses are excellent, very good, neither good nor bad, poor, very poor. *Tick <u>one</u> response only for each*

Read each	Excellent	Good	Neither good nor poor	Poor	Very poor
(a) Turning up on time	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(b) Competency of assessors	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(c) Attitude and helpfulness	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(d) Promptness of plan delivery	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$

Q.3 How would you rate the Home*Smart* Renovation Plan you received for each of the following things?

READ: The responses are the same as the previous question *Tick <u>one</u> response only for each*

Read each statement	Excellent	Good	Neither good nor poor	Poor	Very poor
(a) Being comprehensive	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(b) Providing new and useful information	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(c) Helping with decision making	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(d) Providing detailed recommendations	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
(e) Identifying key priorities	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$

Q.4 Is the cost of getting your house to a high standard of sustainability as set out in the plan**: READ 1-3**

❑$_1$ More than expected ❑$_2$ About expected ❑$_3$ Less than expected

[**Don't read 4** - but tick if required ❑$_4$ Don't know/no expectations]

Q.5 Did the plan show you that you were eligible for grants or subsidies to help you improve the sustainability of your home?

❑$_1$ Yes → Go to Q5a
❑$_2$ No
❑$_3$ Don't know

Q5a Were you aware that those grants, subsidies or assistance was available to you before the In-Home Assessment or the renovation plan?

❑$_1$ Yes ❑$_2$ No

READ: I want to talk to you about the affordability of each package in the plan. Just look at the final page of your plan.

Q.6 Would you find any of those packages unaffordable?

❑$_1$ Yes → Go to Q6a ❑$_2$ No → Go to Q7

Q6a If yes, which of the packages are unaffordable?

DON"T PROMPT – tick any that apply

❑$_1$ Package 1
❑$_2$ Package 2
❑$_3$ Package 3
❑$_4$ Package 4

comments if required_____
_____

Q.7 Have you taken any action in relation to the recommendations in the plan already?

❑$_1$ Yes→ Go to Q8 ❑$_2$ No → Go to 9

Q.8 What have you done? *Please tick (✓) <u>any</u> that apply.* ***DON'T PROMPT***

- ❑$_1$ Talked to suppliers
- ❑$_2$ Obtained one or more quotes – **also answer 8a**
- ❑$_3$ Undertaken to do one or more of the recommendations ourselves
- ❑$_4$ Had unpaid assistance to do one or more of the recommendations
- ❑$_5$ Paid tradespeople/community partners to undertake one or more of the recommendations
- ❑$_6$ Incorporated one or more recommendations into our building/renovations plans with architect etc
- ❑$_7$ Other (please specify) _____

Q.8a **If ticked 8.2 ONLY otherwise go on to Q9 -** What renovations have you had quoted and who did you get a quote from?

What	Who

Q.9 What recommendations in the plan, if any, would you expect to undertake in:

Year 1

Year 2

Year 3

Year 4

Year 5

Q.10 What recommendations in the plan, if any, would you never undertake?

List	Reason

Q.10a. Why won't you undertake those recommendations? (Put reasons in the reasons column for Q10).

Q.11 If you happened to follow ALL the plan recommendations how likely do you think the performance of your home would improve? *Tick (✓) one for each*

	Very likely	Likely	Unlikely	Not at all likely	Don't know	N/A
a. Improved comfort or warmth	❑1	❑2	❑3	❑4	❑5	
b. Savings on my power bills	❑1	❑2	❑3	❑4	❑5	
c. Savings on my water bills	❑1	❑2	❑3	❑4	❑5	❑6
d. Adding to the value of my home	❑1	❑2	❑3	❑4	❑5	
e. Making my home better for the environment	❑1	❑2	❑3	❑4	❑5	
f. Making my home healthier	❑1	❑2	❑3	❑4	❑5	
g. Making my home easier to sell	❑1	❑2	❑3	❑4	❑5	

Q.12 If you followed just the recommendations you are **likely** to take up, do you think the performance of your home would improve a lot, a little bit or not at all? *Tick (✓) one for each*

	A Lot	A Little Bit	Not at All	Don't know
a. Improved comfort or warmth	❑1	❑2	❑3	❑5
b. Savings on my power bills	❑1	❑2	❑3	❑5
c. Adding to the value of my home	❑1	❑2	❑3	❑5
d. Making my home better for the environment	❑1	❑2	❑3	❑5
e. Making my home healthier	❑1	❑2	❑3	❑5
f. Making my home easier to sell	❑1	❑2	❑3	❑5

Q.13 In the last year, have you undertaken any renovations or major maintenance on your dwelling costing in excess of $2,000? *Please tick (✓) <u>one</u> box only*

❑$_1$ Yes ❑$_2$ No → If NO, go to Question 15

Q.14 What did those renovations or major maintenance involve? *Please tick (✓) <u>any</u> that apply.*

❑$_1$ Roof replacement
❑$_2$ Full exterior re-paint
❑$_3$ Replacement of significant amounts of exterior cladding
❑$_4$ Replacement of interior cladding
❑$_5$ Interior repainting and/or wallpapering
❑$_6$ Carpeting
❑$_7$ Polishing floors
❑$_8$ Adding rooms (*Please specify and indicate number)* _____
❑$_9$ Replace bathroom whiteware
❑$_{10}$ Replace kitchen appliances
❑$_{11}$ Replace bathroom cabinetry of
❑$_{12}$ Replace kitchen cabinetry
❑$_{13}$ Rewiring full or significant part of the dwelling
❑$_{14}$ Replumbing
❑$_{15}$ Install underfloor insulation
❑$_{16}$ Install ceiling insulation
❑$_{17}$ Install wall insulation
❑$_{18}$ Install double glazing
❑$_{19}$ Install wood burner
❑$_{20}$ Install pellet burner
❑$_{21}$ Install heat pump
❑$_{22}$ Install solar hot water system
❑$_{23}$ Install heat pump hot water system
❑$_{24}$ Install wet back hot water system
❑$_{25}$ Install ventilation systems, such as HRV/DVS
❑$_{26}$ Install rainwater tank
❑$_{27}$ Install new hot water cylinder
❑$_{28}$ Installing a rangehood/ extractor fan in the bathroom
❑$_{29}$ Installing an extractor fan in the bathroom
❑$_{30}$ Venting the drier to the outside
❑$_{31}$ Installing passive vents in the windows
❑$_{32}$ Upgrading hot water system to instant gas
❑$_{33}$ Upgrading hot water system to solar hot water
❑$_{34}$ Putting in a wetback hot water system
❑$_{35}$ Installing a low flow shower head
❑$_{36}$ Polishing floors
❑$_{37}$ Replace laundry whiteware
❑$_{38}$ Installing a dual flush toilet
❑$_{39}$ Other

*If 'other', please specify:*_____

Q.15 In the next year, do you intend to you undertake any renovations or major maintenance on your dwelling costing in excess of $2,000? *Please tick (✓) <u>one</u> box only*

❑$_1$ Yes ❑$_2$ No → If NO, go to Question 17

Q.16 What will those involve? *Please tick (✓) <u>any</u> that apply.*

❑$_1$ Roof replacement
❑$_2$ Full exterior re-paint
❑$_3$ Replacement of significant amounts of exterior cladding
❑$_4$ Replacement of interior cladding
❑$_5$ Interior repainting and/or wallpapering
❑$_6$ Carpeting
❑$_7$ Polishing floors
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❑$_9$ Replace bathroom whiteware
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❑$_{37}$ Replace laundry whiteware
❑$_{38}$ Installing a dual flush toilet
❑$_{39}$ Other

*If 'other', please specify:*_____

_____

Q.17 Have your renovation intentions for the coming year changed because you have seen the plan?

❑$_1$ Yes ❑$_2$ No

If yes, how?

_____

_____

Q.18 Are you likely to install solar water heating or a heat pump hot water heater in the next year?

❑$_1$ Yes – solar hot water heating
❑$_2$ Yes – a heat pump hot water heater
❑$_3$ No - Neither

Any comments

_____

_____

Q.19 How useful have you found the Project Management Guide? *Please tick (✓) <u>one</u> box only*

❑$_1$ Useful
❑$_2$ Not useful
❑$_3$ Haven't read it
❑$_4$ Too early to say
❑$_5$ Don't know

Q.20 How useful have you found the Homeowner Manual? *Please tick (✓) <u>one</u> box only*

❑$_1$ Useful
❑$_2$ Not useful
❑$_3$ Haven't read it
❑$_4$ Too early to say
❑$_5$ Don't know

Now some questions about energy and water

Q.21 Compared with other households, would you say your household energy consumption is…? *Please tick (✓) <u>one</u> box only*

❑$_1$ Very High
❑$_2$ High
❑$_3$ About Average
❑$_4$ Low
❑$_5$ Very Low

Q.22 What was your last month's energy bill? *Please ask for dollar amount and kWh as on last power bill with an actual reading. If no bill available ask for estimate. Also check who their supplier is. If they are billed separately for gas you will need to record two different amounts.*

$_____ kWh_____

Supplier: _____

❑$_1$ Estimate
❑$_2$ Actual

Q.23 Are you billed for water usage?

❑$_1$ Yes - If YES, go to Question 23a
❑$_2$ No - If NO, go to Question 24

Q23a If yes, What was your last water bill? *Please ask for dollar amount and measure and period. If billed – also need to check that the bill does NOT include wastewater as some people are also billed for this.*

$_____

billed per: ❑$_1$ Cubic metre ❑$_2$ Other (specify) _____

frequency: ❑$_1$ Monthly ❑$_2$ Quarterly ❑$_3$ Other (specify) _____

Q.24 We would like to get this energy and water information regularly. How would you like us to do this?

❑$_1$ Give permission to access energy and water data from supplier
READ: We will send you a form so the person named on the water or energy bill can sign this request to the supplier.
❑$_2$ Save up energy and water bills and report quarterly for each month by telephone.
❑$_3$ Respond to an email prompt from us.
❑$_4$ Do not wish to supply.

Now some questions about your desire to do renovations

Q.25 How would you describe the condition of your house?

READ: The responses are excellent, good, average, poor, very poor.
Please tick (✓) <u>one</u> box only

- ❑$_1$ Excellent – No immediate repair and maintenance needed
- ❑$_2$ Good – Minor maintenance needed
- ❑$_3$ Average – Some repair and maintenance needed
- ❑$_4$ Poor – Immediate repairs and maintenance needed
- ❑$_5$ Very poor – Extensive and immediate repair and maintenance needed

Q.26 If you undertake renovations how important is achieving the following?

READ: The responses are important or not important for each one.

	Important	Not Important	Not Applicable
a. A warmer house	❑$_1$	❑$_2$	❑$_3$
b. A more energy efficient house	❑$_1$	❑$_2$	❑$_3$
c. A less damp house	❑$_1$	❑$_2$	❑$_3$
d. Less mould in the house	❑$_1$	❑$_2$	❑$_3$
e. A healthier home	❑$_1$	❑$_2$	❑$_3$
f. A more comfortable home	❑$_1$	❑$_2$	❑$_3$
g. Greater resale value	❑$_1$	❑$_2$	❑$_3$
h. A bigger home	❑$_1$	❑$_2$	❑$_3$

Q.27 What is your main reason for renovating your house?

READ *Please tick (✓) One*

- ❑$_1$ A warmer house
- ❑$_2$ A more energy efficient house
- ❑$_3$ A less damp house
- ❑$_4$ Less mould in the house
- ❑$_5$ A healthier home
- ❑$_6$ A more comfortable home
- ❑$_7$ Greater resale value
- ❑$_8$ A bigger home
- ❑$_9$ A more attractive home
- ❑$_{10}$ Other – *Specify*

The final questions ask for some details that describe yourself and your household.

Q.28 Which age group do you fall into?

READ *Please tick (✓) <u>one</u> box only*

- ❑1 24 years or under
- ❑2 25 to 30 years
- ❑3 31 to 40 years
- ❑4 41 to 50 years
- ❑5 51 to 60 years
- ❑6 61 to 64 years
- ❑7 65 years or over

Q.29 What is your household's <u>total</u> annual income before tax?

READ *Please tick (✓) <u>one</u> box only*

- ❑1 $10,000 or less
- ❑2 $10,001 to $20,000
- ❑3 $20,001 to $30,000
- ❑4 $30,001 to $40,000
- ❑5 $40,001 to $50,000
- ❑6 $50,001 to $70,000
- ❑7 $70,001 to $100,000
- ❑8 Over $100,000

Q30 Do you have or are you eligible for a Community Services Card?

- ❑1 Yes
- ❑2 No
- ❑3 Don't know

Q.31 Including yourself, how many people live in your household? _____

Q.32 Are there people aged 65 years and over in your house? How many? _____

Q.33 Are there children aged 5 and under live in the household? How many? ____

14 Appendix D: Wave 2 Interview Form

ID Number: _____

Home*Smart* Renovations
Post Assessment and Plan Questionnaire – Wave 2

Good evening my name is _____

I am ringing on behalf of Beacon. You have been participating in the Home*Smart* Renovation Project and you will have spoken with one of our researchers sometime ago a few weeks after you received your home smarts renovation plan.

We are doing a second, much shorter interview talking to everyone in the project about any other renovation or maintenance activities, if any, you might have done since we last spoke. Many of the questions are similar to last interview so we can capture any change in your experience of, or your opinions about, your home.

If you still have your plan handy somewhere then you might like to grab it so you can refer to it if needed while we're talking. If not don't worry.

All data collected in this survey will be aggregated and used for research purposes only. Your responses are confidential. No individual details will be used in reports or research summaries.

You can withdraw from this or any other part of the research at any time. Remember you don't have to have gone ahead with renovations to stay part of the programme. We are interested in the decisions you make and why you make them.

Are you happy to proceed with the interview?

❑$_1$ No, not at all – *Whether they intend to withdraw and why?*
❑$_2$ Yes but not now – *Make another time*
❑$_3$ Yes – *Proceed* ➔ Note date of interview _____

Months since last interview _____

(just approx so if last interviewed in June – now interviewed in Dec that's 6 months)

First some questions about your home and any renovation or maintenance activities

Q.1 Have you taken any action in relation to the recommendations in the plan since we last talked? **[give month of last interview as prompt if needed]**

❑$_1$ Yes → Go to Q2 ❑$_2$ No → Go to 3

Q.2 What have you done? *Please tick (✓) <u>any</u> that apply.*

❑$_1$ Talked to suppliers
❑$_2$ Obtained one or more quotes – **also answer 2a**
❑$_3$ Undertaken to do one or more of the recommendations ourselves
❑$_4$ Had unpaid assistance to do one or more of the recommendations
❑$_5$ Paid trades people/community partners to undertake one or more of the recommendations
❑$_6$ Incorporated one or more recommendations into our building/renovations plans with architect etc
❑$_7$ Made enquiries about an EECA subsidy (or other subsidy/assistance)
❑$_8$ Access an EECA subsidy (or other assistance)
❑$_9$ Other (please specify) _____

Any comment re subsidy _____

_____

Q.2a **If ticked 2.2 ONLY otherwise go on to Q3 -** What renovations have you had quoted and who did you get a quote from?

What	Who

Q.3 Since your last interview, have you undertaken any renovations or major maintenance on your dwelling? *Please tick (✓) <u>one</u> box only*

❑$_1$ Yes ❑$_2$ No → If NO, go to Question 5

Q.4 What did those renovations or major maintenance involve? *Please tick (✓) <u>any</u> that apply.*

		Estimate of Cost (only if item ticked)
❑$_1$	Roof replacement	
❑$_2$	Full exterior re-paint	
❑$_3$	Replacement of significant amounts of exterior cladding	
❑$_4$	Replacement of interior cladding	
❑$_5$	Interior repainting and/or wallpapering	
❑$_6$	Carpeting	
❑$_7$	Polishing floors	
❑$_8$	Adding rooms (*Please specify/number)* _____	
❑$_9$	Replace bathroom whiteware	
❑$_{10}$	Replace kitchen appliances	
❑$_{11}$	Replace bathroom cabinetry of	
❑$_{12}$	Replace kitchen cabinetry	
❑$_{13}$	Rewiring full or significant part of the dwelling	
❑$_{14}$	Replumbing	
❑$_{15}$	Install underfloor insulation	
❑$_{16}$	Install ceiling insulation	
❑$_{17}$	Install wall insulation	
❑$_{18}$	Install double glazing	
❑$_{19}$	Install wood burner	
❑$_{20}$	Install pellet burner	
❑$_{21}$	Install heat pump	
❑$_{22}$	Install solar hot water system	
❑$_{23}$	Install heat pump hot water system	
❑$_{24}$	Install wet back hot water system	
❑$_{25}$	Install ventilation systems, such as HRV/DVS	
❑$_{26}$	Install rainwater tank	
❑$_{27}$	Install new hot water cylinder	
❑$_{28}$	Installing a rangehood/ extractor fan in the kitchen	
❑$_{29}$	Installing an extractor fan in the bathroom	
❑$_{30}$	Venting the drier to the outside	
❑$_{31}$	Installing passive vents in the windows	
❑$_{32}$	Upgrading hot water system to instant gas	
❑$_{33}$	Upgrading hot water system to solar hot water	
❑$_{34}$	Putting in a wetback hot water system	
❑$_{35}$	Installing a low flow shower head	
❑$_{36}$	Polishing floors	
❑$_{37}$	Replace laundry whiteware	
❑$_{38}$	Installing a dual flush toilet	
❑$_{39}$	Other	

*If 'other', please specify:*_____

Q.5 How would you describe the current condition of your house?

READ: The responses are excellent, good, average, poor, very poor.
Please tick (✓) <u>one</u> box only

- ❑1 Excellent – No immediate repair and maintenance needed
- ❑2 Good – Minor maintenance needed
- ❑3 Average – Some repair and maintenance needed
- ❑4 Poor – Immediate repairs and maintenance needed
- ❑5 Very poor – Extensive and immediate repair and maintenance needed

Q.6 In the next year, do you intend to you undertake any renovations or major maintenance on your dwelling? *Please tick (✓) <u>one</u> box only*

❑1 Yes ❑2 No → If NO, go to Question 6a

Q.6a Can I ask why are you not doing anything/why you haven't done anything?
Please tick (✓) <u>any</u> that apply

- ❑1 Have already completed everything we wanted to do
- ❑2 Too expensive
- ❑3 Do not agree with some of the recommendations in the Home*Smart* Renovation Plan
- ❑4 Decided to move house
- ❑5 My circumstances have changed
  - ❑6 Family change – relationship breakdown/change in size larger or smaller
  - ❑7 Household income has fallen
  - ❑8 Other (please specify) _____
- ❑9 Still waiting for quotes/subsidy
- ❑10 Difficult to get a builder/tradesperson
- ❑11 Other (please specify) _____

Any additional comments:

_____

_____

_____

NOW GO TO QUESTION 8

Q.7 What will those involve? *Please tick (✓) <u>any</u> that apply.*

		Estimate of Cost (only if item ticked)
❑1	Roof replacement	
❑2	Full exterior re-paint	
❑3	Replacement of significant amounts of exterior cladding	
❑4	Replacement of interior cladding	
❑5	Interior repainting and/or wallpapering	
❑6	Carpeting	
❑7	Polishing floors	
❑8	Adding rooms (*Please specify and indicate number)* _____	
❑9	Replace bathroom whiteware	
❑10	Replace kitchen appliances	
❑11	Replace bathroom cabinetry of	
❑12	Replace kitchen cabinetry	
❑13	Rewiring full or significant part of the dwelling	
❑14	Replumbing	
❑15	Install underfloor insulation	
❑16	Install ceiling insulation	
❑17	Install wall insulation	
❑18	Install double glazing	
❑19	Install wood burner	
❑20	Install pellet burner	
❑21	Install heat pump	
❑22	Install solar hot water system	
❑23	Install heat pump hot water system	
❑24	Install wet back hot water system	
❑25	Install ventilation systems, such as HRV/DVS	
❑26	Install rainwater tank	
❑27	Install new hot water cylinder	
❑28	Installing a rangehood/ extractor fan in the kitchen	
❑29	Installing an extractor fan in the bathroom	
❑30	Venting the drier to the outside	
❑31	Installing passive vents in the windows	
❑32	Upgrading hot water system to instant gas	
❑33	Upgrading hot water system to solar hot water	
❑34	Putting in a wetback hot water system	
❑35	Installing a low flow shower head	
❑36	Polishing floors	
❑37	Replace laundry whiteware	
❑38	Installing a dual flush toilet	
❑39	Other	

*If 'other', please specify:*_____

Now back to the information you have received in the course of the Home*Smart* Renovation Project. You will have had an assessor come to your home, followed up by a written plan. Along with that plan there should have been a small folder with a Homeowner Manual and a Project Management Guide inside. You may also have received homeowner newsletters

Q.8 Reflecting back on those things did you find them … useful/not useful? *Please tick (✓) <u>one</u> box only for each*

	Useful	Not useful	Haven't read it	Too early to say	Don't know	Doesn't think they received it
a) The Assessment	❑1	❑2	❑3	❑4	❑5	❑6
b) The Plan	❑1	❑2	❑3	❑4	❑5	❑6
c) The Homeowner Manual	❑1	❑2	❑3	❑4	❑5	❑6
d) The Project Management Guide	❑1	❑2	❑3	❑4	❑5	❑6
e) The homeowner newsletters	❑1	❑2	❑3	❑4	❑5	❑6

Record any comments

_____

_____

_____

Now some questions about energy and water

Q.9 Since the last interview, would you say your household energy consumption has…? *Please tick (✓) <u>one</u> box only*

❑1 Increased
❑2 Stayed the same
❑3 Decreased

Note why/record comments

_____

_____

_____

Q.10 Since the last interview, would you say your household water consumption has…? *Please tick (✓) <u>one</u> box only*

❑1 Increased
❑2 Stayed the same
❑3 Decreased

Note why/record comments

_____

_____

Finally a few questions that ask for some details that describe yourself and your household.

Q.11 Since the last interview, would you say your household's total income before tax has…? *Please tick (✓) <u>one</u> box only*

- ❑1 Increased
- ❑2 Stayed the same – GO TO QUESTION 13
- ❑3 Decreased

Q.12 If changed, what is your household's <u>total</u> annual income before tax now?

READ *Please tick (✓) <u>one</u> box only*

- ❑1 $10,000 or less
- ❑2 $10,001 to $20,000
- ❑3 $20,001 to $30,000
- ❑4 $30,001 to $40,000
- ❑5 $40,001 to $50,000
- ❑6 $50,001 to $70,000
- ❑7 $70,001 to $100,000
- ❑8 Over $100,000

Q13 Do you have or are you eligible for a Community Services Card?

- ❑1 Yes
- ❑2 No
- ❑3 Don't know

Q.14 Including yourself, how many people live in your household? _____

Q.15 Are there people aged 65 years and over in your house? How many? _____

Q.16 Are there children aged 5 and under live in the household? How many? ____

Further contacts:

For queries to do with temperature loggers/monitoring … if you can't help them then ask them to contact Nikki at BRANZ 0800 925 347 or
NikkiBuckett@branz.co.nz

For any other queries about the project contact Lois
loise@beaconpathway.co.nz or phone (06) 867 4458

For queries to do with the research – it's contact us so if you can't help them – refer to Kay or Ruth