



Beacon Pathway Limited  
PO Box 11 338 Auckland  
FreePhone 0508 beacon  
[www.beaconpathway.co.nz](http://www.beaconpathway.co.nz)  
[www.nowhome.co.nz](http://www.nowhome.co.nz)

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# **House Owners and Energy – Retrofit, Renovation and Getting House Performance**

**Final**

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## About This Report

### **Title**

House Owners and Energy – Retrofit, Renovation and Getting House Performance

### **Authors**

Saville-Smith, Kay, CRESA

### **Abstract**

Abstract here

### **Reference**

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## 1 Background

Beacon Pathway is committed to improving New Zealand's sustainability in the residential built environment through the provision of relevant and robust research. Beacon Pathway places considerable emphasis on technology, knowledge transfer and market transformation. It recognises that stimulating change is necessary across the value chain. It also recognises that the supply-side of the building industry is frequently hesitant to change practices or deliver services and products unless there is demonstrated demand. As a consequence, understanding the practices, expectations, dwelling conditions of house owners in relation to energy and house performance is critical to developing practical retrofit packages that will encourage the whole value chain to deliver on sustainable houses.

Improving the energy performance of New Zealand's housing stock is primarily a matter of changing the performance of the existing stock. The challenge is to develop energy retrofit packages that most effectively improve dwelling performance and fall within the constraints of house owners' affordability and willingness to pay. Beacon is addressing the problem of developing effective retrofit packages by a three pronged research stream into energy use that is directed to:

- establishing the relationship between retrofit and building typology,
- identifying how to stimulate take-up among key consumers in the housing market, and
- identifying a set of evidence-based, robust promotional approaches, packages and tools to retrofit existing houses.

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## 2 Scope of the report

This report presents the findings emerging from the second research stream of the energy programme. That research has been concerned with four key questions. They are:

- What user/consumer segments are best targeted to achieve maximum take-up of energy efficiency retrofits of New Zealand homes?
- What are the motivations of these user segments and how should they be targeted?
- Are there common features of building typology of the priority user segments?
- What benefits do other end-users in the supply chain gain through retrofit?

Those questions have been explored through three surveys. One survey has focused on households that are high energy users. The second survey has involved owner occupiers that have recently moved from one house to another. The third survey has involved landlords.

This report:

- sets out the rationale for surveying those three sets of consumers,
- provides the survey method and comment on the focus and rationale of the questionnaires,
- presents key findings from the surveys, and
- comments on the implications of the findings for the development of effective retrofit packages and the potential for market transformation and stock sustainability.

The report is structured as follows:

- Section 3 presents an overview of the method for each survey
- Section 4 presents data related to the socio-demographic characteristics of the owner occupiers and the characteristics of the owner occupied dwellings.
- Section 5 summarises data on the energy efficiency of the owner-occupied dwellings and the rental stock delivered by the landlords.
- Section 6 presents data on the renovation activities of the owner-occupiers and the landlords.
- Section 7 summarises data on the retrofit awareness and attitudes of owner-occupiers and landlords, including a commentary on willingness to pay.
- Section 8 comments on learnings in relation to Beacon's desire for market transformation and developing retrofit packages.

The report summarises more detailed analysis provided in working papers as an input into Beacon's Energy Programme and Beacon's Renovate 1000 Programme. Those working papers are appended as Appendices A-C.

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## 3 Method

This section:

- Provides the rationale for surveying three different groups of house owners in New Zealand.
- Sets out the sampling, instrumentation, data collection and data management for each survey.

### 3.1 Who was surveyed and why?

The focus of the surveys is to establish the perceptions, awareness and motivations of house owners in relation to the energy-related performance of their houses:

- 1) The High Energy Users Survey is important because this group constitutes the primary portion of residential energy use. They may make up between 15 and 25 percent of households. That is, between 200,000 and 350,000 households in New Zealand.<sup>1</sup> HEEP data<sup>2</sup> as well as recent research undertaken by Saville-Smith and Fraser (2007) suggests that High Energy Users tend to be also middle and higher income households. Government subsidies for retrofit have traditionally been directed to low income households. The introduction of Energy Wise loans has extended subsidies to higher income households. They also embrace a wider range of interventions including heating. The survey of High Energy Users provides an evidence-base critical to taking up the opportunities for improved house performance presented by those changes in policy settings.
- 2) The Recent Mover Survey is important because this group has immediate selection choices regarding the energy efficiency of their new home and is often in situations in which they finance their new home to allow for both purchase and renovation. The tendency for home buyers to renovate provides Beacon with a potential intervention point, not only with consumers but also with lenders and insurers.
- 3) The Landlord Survey is important because homeownership in New Zealand is falling. The 2006 Census shows that 66.9 percent of dwellings are owned by a member of the occupant household compared to 67.8 percent in 2001. Landlord decisions are likely to become increasingly important in determining the thermal performance of the housing stock and the conditions under which many households live. The vast majority of rental stock in New Zealand is in the private rental market. The public rental stock delivered by Housing New

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*1 Saville-Smith, K. and R. Fraser (2007) Analysis Report on Telephone and Physical Survey Data, Report prepared for East Harbour, CRESA Ltd, Wellington.*

*2 Isaacs, N.P., Camilleri, M., French, L., Pollard, A., Saville-Smith, K., Fraser, R., Rossouw, P., Jowett, J. 2006. Energy Use in New Zealand Households: Report on the Year 10 Analysis for the Household Energy End-use Project (HEEP). BRANZ: Judgeford, Porirua (Study Report SR155)*

Zealand Corporation (HNZC) is already subject to modernisation investment. Private landlords have access, under certain conditions, to Government subsidies. There have been low levels of take-up, however.

## 3.2 Instrumentation, samples and data

All three groups were surveyed using structured questionnaires of predominantly close-ended questions. Copies of the questionnaires are found as annexes in each of the relevant working papers. The High Users Survey and the Landlords Survey were both undertaken using a specialist telephone survey company to do telephone interviewing and supply the raw data to CRESA for analysis. The Recent Movers Survey was undertaken using a self-complete postal questionnaire.

Participants for the High User Survey were selected randomly from throughout New Zealand using telephone numbers extracted from white pages listings. Interviewing was undertaken over a two week period from 12 October 2007 to 26 October 2007. An initial screening question asked respondents to estimate their energy consumption compared to other households – only those respondents who estimated their household energy consumption as high or very high were eligible to complete an interview. In all, 700 interviews were completed.

Participants for the Recent Movers Survey were selected randomly from a data extract of owner occupiers who had changed address between 1 April 2006 and 31 March 2007. Surveying took place over a four week period beginning late September 2007. In all 724 completed surveys were received. The sample was drawn for a national set of data and, consequently, participants from all climate zones are involved

The data from each of the surveys have been entered and analysed in the Statistical Package for the Social Sciences (SPSS). Data have been subject to univariate and bivariate analysis. Statistical testing – usually chi-square tests – was also undertaken to establish whether there was systematic and statistically significant relationships between selected key variables.

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## 4 Socio-demographic and dwelling characteristics

In this section, the socio-demographic characteristics of the High Energy Users and Recent Movers are presented. This is followed by a summary of the stock characteristics of the owner-occupied and rental stocks.

### 4.1 High Users and Recent Movers

Table 1 sets out the age profile of the participants in each survey, and shows a somewhat higher proportion of Recent Movers in the 31-40 year age group. In both groups there is under-representation of low income groups and over-representation of higher income groups (Table 2 and Table 3). This is consistent with their High Energy User status and with Recent Movers operating on a high price housing market

**Table 1: Age Profile of Recent Mover Householders**

Ages	Recent Movers		High Users	
	n	%	n	%
24 years and under	6	0.8	22	3.2
25-30 years	48	6.7	46	6.6
31-40 years	189	26.3	166	23.8
41-50 years	178	24.7	203	29.1
51-60 years	136	18.9	111	15.9
61-65 years	50	6.9	46	6.6
66 years or over	113	15.7	103	14.8
<i>Total</i>	<i>720</i>	<i>100</i>	<i>697</i>	<i>100</i>

**Table 2: Annual Household Income Profile of Recent Mover Respondents Compared to the 2006 Census**

Annual Household Income	Respondent Households		2006 Census	
	n	%	n	%
\$20,000 or Less	60	8.3	200,790	13.8
\$20,001 - \$30,000	78	10.8	155,661	10.7
\$30,001 - \$50,000	126	17.4	238,431	16.4
\$50,001 - \$70,000	116	16.0	197,868	13.6
\$70,001 - \$100,000	160	22.1	189,720	13.0
\$100,001 or More	159	22.0	235,644	16.2
Not Stated	25	3.5	235,992	16.2
<i>Total</i>	<i>724</i>	<i>100.1.1</i>	<i>1,454,106</i>	<i>99.9</i>

**Table 3: Annual Household Income Profile of High Energy User Respondents Compared to the 2006 Census**

Annual Household Income	Respondent Households		2006 Census	
	n	%	n	%
\$20,000 or Less	85	12.1	200,790	13.8
\$20,001 - \$30,000	62	8.9	155,661	10.7
\$30,001 - \$50,000	114	16.3	238,431	16.4
\$50,001 - \$70,000	107	15.3	197,868	13.6
\$70,001 - \$100,000	123	17.6	189,720	13.0
\$100,001 or More	155	22.1	235,644	16.2
Not Stated	54	7.7	235,992	16.2
<i>Total</i>	<i>700</i>	<i>100</i>	<i>1,454,106</i>	<i>100</i>

The average household size of the Recent Mover households was 2.8 people. This is smaller than the households in the High Energy Users Survey. The average household size in the latter was 3.4 people.

## 4.2 Dwelling characteristics

New Zealand has a fairly homogenous dwelling stock in terms of dwelling size and type although there is some variation in terms of style of construction, materials and components. This is evident in the dwellings occupied by the High Users and the dwellings occupied by Recent Movers. The majority of dwellings are three bedroom dwellings and there is a strong preponderance of detached single-storey dwellings (Table 4).

**Table 4: Dwelling Size and Type of Owner Occupiers**

Dwelling Characteristics	% Recent Movers		% High Energy Users	
	n	%	n	%
1 bedroom	10	1.4	16	2.3
2 bedrooms	104	14.4	75	10.7
3 bedrooms	354	49.0	300	42.9
4 bedrooms	212	29.4	210	30.0

5+ bedrooms	42	5.7	99	14.1
<i>Total</i>	722	99.9	700	100
A detached single-storey house	443	61.7	450	64.4
A detached multi-storey house	190	26.5	185	26.5
A semi-detached single-storey house	18	2.5	20	2.9
A purpose built flat or a flat in a converted building	19	2.6	18	2.6
A semi-detached multi-storey house	16	2.2	8	1.1
Other	19	2.6	8	1.1
An apartment (in a block two or more storeys high)	7	1.0	6	0.9
A terrace house	6	0.8	4	0.6
<i>Total</i>	718	99.9	2099	300.1

It is also evident in the stock typology of the landlords. The Landlords Survey provided information on 2,389 rental stock units. Table 5 shows the type of those stock units.

Compared to the owner occupiers, the rental stock delivered by the landlords has a higher proportion of flats, conversions and multi-units. Nevertheless, the rental stock is still dominated by detached houses. Similarly, the dwelling stock all three groups is dominated by dwellings built prior to 1978 (Table 6).

**Table 5: Stock Units by Type Delivered in the Rental Market by Landlords**

Stock Type	Rental Stock Units	
	n	%
Detached single storey house	963	40.3
Purpose built flat	446	18.7
Detached house multi-storey house	262	11.0
Semi-detached single storey house	226	9.4
Apartment in multi-floor apartment block	119	5.0
Flat in converted building	100	4.2
Other	96	4.0
Semi-detached multi-storey house	94	3.9
Terrace house	55	2.3
Type not specified	28	1.2
<i>Total</i>	2389	100

**Table 6: Proportion of Stock Units by Age by House Owners**

Stock Age	High Users	Recent Movers	Landlords
	%	%	%
Built before 1978	64.9	51.1	75.4
Built 1978-2000	23.7	29.1	17.6
Built after 2000	11.5	19.9	7.0
<i>Total</i>	<i>100.1</i>	<i>100.1</i>	<i>100</i>

## 5 Energy efficiency of dwellings

The information about insulation characteristics of dwellings is not entirely comparable across the three groups. The data is much more limited in relation to the rental stock. As far as the owner-occupiers are concerned, Recent Movers are less likely to report dwellings with no insulation. They are more likely to report that their dwellings are fully or substantially insulated (Table 7). Only 6.4 percent of Recent Movers report no insulation compared to 13.3 percent of High Users.

Among the rental stock, it is clear that there are likely to be lower levels of insulation overall. Table 8 shows that only 58.8 percent of the rental stock has roof insulation. However, among Recent Movers, 81.6 percent have roof insulation and among High Energy Users 77.2 percent do so.

**Table 7: Reported Insulation Profile of Recent Movers' and High Energy Users' Dwellings**

Insulation	% Recent Movers (n=724)	% High Energy Users (n=700)
No insulation	6.4	13.3
Roof space only	25.8	25.9
Floors only	1.2	1.1
External walls only	3.5	2.7
Roof space and floor	6.9	8.3
Roof space and exterior walls	32.6	27.1
Floor and exterior walls	0.4	1.4
Fully insulated	16.3	15.9
Not sure	6.9	4.3
<i>Total</i>	<i>100</i>	<i>100</i>

**Table 8: Rental Stock Reported by Landlords as Insulated**

Insulation	Rental Stock (n=2389)	
	n	%
Roof space	1405	58.8
External walls	880	33.5
Under floor	460	19.3

\* Multiple response

**Table 9: Main Space Heating Used by Owner Occupiers**

Heater Type	% Recent Movers (n=724)		% High Energy Users (n=700)	
	n	%	n	%
Enclosed woodburner	168	25.9	158	22.6
Heat pump	144	22.2	109	15.6
Electric heater e.g. fan, bar, convection heater	68	10.5	105	15.0
Fixed electric radiator or oil column heater	65	10.0	80	11.4
Fixed and flued gas heater	58	8.9	66	9.4
Portable gas heater e.g. LPG	50	7.7	64	9.1
Open fire	26	5.7	40	5.7
Underfloor heating	15	4.0	21	3.0
Fixed unflued gas heater	17	3.3	23	3.3
Other	35	2.6	25	3.6
No heating used	3	1.3	9	1.3
<i>Total</i>	<i>649</i>	<i>100.0</i>	<i>700</i>	<i>100</i>

The owner occupiers have a profile of heating sources that tends to be more efficient and effective than the profile of heating appliances than in the rental stock (Table 9 and Table 10). 18.3 percent of landlords provide no heating appliances in their stock. As Table 10 shows, enclosed woodburners are in only 11.3 percent of the rental stock. In the owner occupied stock they are used as the primary heating method by a considerably high proportion of households. Woodburners are known to deliver higher temperatures in dwellings.

**Table 10: Space Heating Supplied to Rental Dwellings**

Heater Type	Rental Stock Units (n=2389)	
	n	%
Heat pump	358	15.0
Enclosed woodburner	270	11.3
Open fire	239	10.0
Fixed electric radiator or oil column heater	211	8.8
Fixed and flued gas heater	144	6.0
Unflued and fixed gas heaters	88	3.7
Underfloor heating	47	2.0
Pellet burners	3	0.1

\* Multiple response

There is considerable similarity between the three sets of house owners regarding very basic aspects of energy efficiency. The landlords' dwellings, the dwellings of the High Users and the Recent Movers are characterised by a tendency to having either unwrapped or poorly wrapped hot water cylinders (Table 11).

**Table 11: Hot Water Cylinder Wrapping in Rental and Owner Occupied Stock**

Type of Wrapping	Recent Movers	High Energy Users	Rental Stock
	%	%	%
No wrapping	61.3	61.2	48.8
Hard foam	6.4	4.6	20.3
Unsure	8.9	11.4	13.9
New well-fitted jacket	18.6	15.1	12.7
Older poorly-fitted jacket	4.9	7.6	4.4
<i>Total</i>	<i>100.1</i>	<i>99.9</i>	<i>100.1</i>

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## 6 Renovation and retrofit activities

### *Repairs, renovation and retrofit*

Internationally, investment into existing housing has traditionally been differentiated into three, albeit, frequently overlapping categories: house maintenance, repairs, and renovation. More recently, the term retrofit has been added to the range of investments made into existing dwelling stock. It is useful to differentiate these for analytic purposes. However, because the energy surveys were designed to test how consumers perceive those terms and associate them with particular activities, consumers were not asked to categorise their investments but rather to simply describe activities they undertook.

The traditional schema is that house maintenance constitutes those activities necessary to preserve the functionality of the dwelling. House maintenance may involve minor repairs of a dwelling's fabric or components but those are generally not substantial. House maintenance is primarily directed to the prevention of damage. House repair, however, involves 'making good' damage whether through wear and tear or catastrophic events. Like house maintenance, however, house repair is largely directed at retaining the original standard, performance and amenity of a dwelling.

By way of contrast, renovation, refurbishment and rehabilitation is directed to enhancing the current performance and amenity of a dwelling, usually past its original specifications to the equivalent performance within more modern expectations of and capacity to deliver on improved dwelling performance and amenity. Dwellings that require renovation can frequently be in good repair and have had adequate on-going maintenance

Figure 1: Maintenance, Repairs and Renovation – Sustainable Housing Outcomes<sup>3</sup>

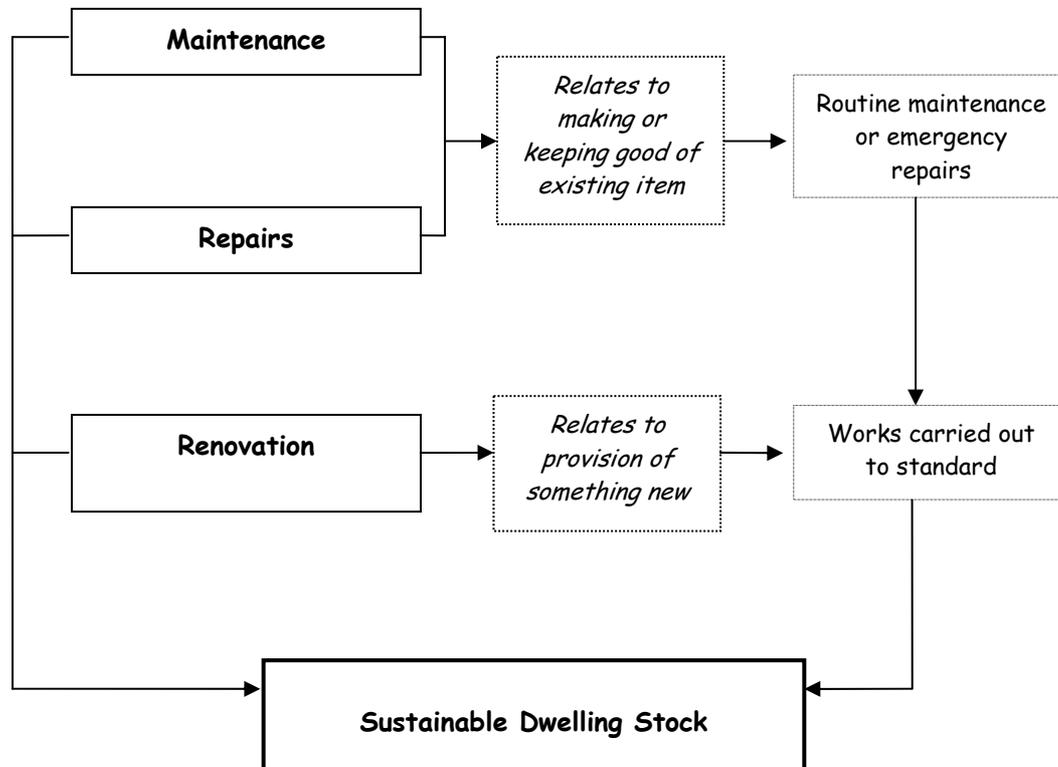


Figure 1 sets out Stewart’s (2003) schema that relates those activities and their relationship to a sustainable dwelling stock. What Stewart’s schema does is illustrate the way that maintenance, repair, or some form of renovation are all directed to sustaining the useful life and performance of the housing stock. In particular, maintenance, repair and rehabilitation are directed to ensuring the on-going functionality of the stock over the long-term, and the dwelling’s on-going social, health, environmental and economic performance.

Under Stewart’s schema, retrofit clearly falls within the category of renovation. However, retrofit is a distinct subset of renovation. It is not simply the provision of something new. It is the provision of new components or systems in an existing dwelling directed to increasing the dwelling’s resource performance and indoor environmental quality.

### **Renovation and retrofit activity**

The energy and thermal performance of the dwellings of landlords, the dwellings of High Energy Users and the dwellings of Recent Movers could be significantly improved through quite simple retrofitting interventions. Where significant investments in renovation were made

<sup>3</sup> Stewart, J. (2003) *Encouraging home-owners to maintain their homes: Initiatives in the Bellenden Renewal Area, Peckham. Journal of Environmental Health Research, 2(No.1), pp.10-21.*

in the year prior to surveying, few of those renovations have actually involved retrofitting for higher levels of energy efficiency.

Among the Recent Movers, 46.3 percent have undertaken renovation or retrofit work in excess of \$2,000. The average reported expenditure on renovations/retrofit is \$22,477 and the median is \$7,000. Among the High Energy Users, a third (33.3 percent) report renovation or retrofit work in excess of \$2,000. The average reported expenditure by High Energy Users on renovations/retrofit is \$25,284 and the median is \$9,500. Among landlords 60.9 percent had undertaken renovations on their stock in excess of \$2,000. 640 dwellings, 26.8 percent of the rental stock, were subject to some form of renovation or repair. The average reported expenditure by landlords on renovations/retrofit is \$22,251.05 and the median is \$8,000.

Table 12 sets out the types of activities undertaken by owner occupiers and Table 13 the activities undertaken by landlords. What is notable is the preponderance in all three populations of painting and wallpapering. In all three groups, carpeting also tends to rate highly. Landlords are less likely to be involved in replacing cabinetry and bathroom whiteware. They are more likely to be involved in exterior painting. But the patterns are, overall, similar.

What these three groups also have in common is a concern about cold, damp and mould. 43.6 percent of High Energy Users reported that their dwelling had problems of mould or damp and over a third (36 percent) of High Energy Users and 31.9 percent of Recent Movers reported on ways they have tried to address mould, cold and damp problems in their houses through repairs or renovation or acquisition of appliances. 84.1 percent of landlords reported that they had had problems with cold damp or mould in their rental dwellings. The primary response to cold, damp and mould is to install appliances such as Heat Recovery Ventilation (HRV), Distributed Ventilation System (DVS), or similar systems with installation of heat pumps and dehumidifiers not far behind.

**Table 12: Renovation & Retrofitting Activities among Owner Occupiers**

Renovation or Retrofit	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
Replumbing	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 underfloor 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
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

\* Multiple response

**Table 13: Renovations, Repairs in Excess of \$2,000 by Landlords in Year Prior to Surveying \***

Activity	n	% Landlord Renovators	% All Landlords
Interior repainting and/or wallpapering	128	42.8	26.1
Carpeting	91	30.4	18.5
Full exterior re-paint	68	22.7	13.8
Replace kitchen or laundry appliances	62	20.7	12.6
Replace bathroom whiteware	53	17.7	10.8
Replace bathroom cabinetry	48	16.1	9.8
Replace kitchen cabinetry	39	13.0	7.9
Install heat pump	38	12.7	7.7
Replumbing/gas work	32	10.7	6.5
Roof Replacement	27	9.0	5.5
Replacement of interior cladding	26	8.7	5.3
Landscaping/gardening/decking/fencing	20	6.7	4.1
Rewiring full or significant part of the dwelling	17	5.7	3.5
Install ceiling insulation	14	4.7	2.9
Replacement significant portion exterior cladding	13	4.3	2.6
Replacing lino/vinyl/tiles	13	4.3	2.6
Adding rooms	12	4.0	2.4
Install new hot water cylinder	12	4.0	2.4

Polishing floors	10	3.3	2
Install wall insulation	10	3.3	2
Install underfloor insulation	8	2.7	1.6
Repairs to doors/windows	8	2.7	1.6
New curtains/blinds	8	2.7	1.6
Driveway/garaging/parking	8	2.7	1.6
Renovations to bathroom	5	1.7	1
Installing a rangehood/extractor fan in the kitchen	4	1.3	0.8
Installing an extractor fan in the bathroom	4	1.3	0.8
Installing a low flow shower head	4	1.3	0.8
Installing low dual flush toilets (6/3 litres or less)	4	1.3	0.8
General maintenance	4	1.3	0.8
Install ventilation systems, such as HRV/DVS	3	1.0	0.6
Upgrading hot water system to instant gas	3	1.0	0.6
Renovations to kitchen	3	1.0	0.6
Install double glazing	2	0.7	0.4
Install woodburner	2	0.7	0.4
Install heat pump hot water system	2	0.7	0.4
Installing rainwater barrel for watering the garden	2	0.7	0.4
Replacing door locks, knobs, handles	2	0.7	0.4
Repiling	2	0.7	0.4
Installing gas heating	2	0.7	0.4
Installing a wastewater recycling system	1	0.3	0.2
Developing a low water use garden	1	0.3	0.2

\*Multiple Response

Forty-six percent of the High Energy Users that reported attempting to address mould and damp in their houses put in HRV/DVS systems, but less than 4 percent installed insulation. Similarly, 28.6 percent of Recent Movers used dehumidifiers while 19.5 percent installed HRV/DVS systems and 17.7 percent installed heat pumps to deal with mould, damp and cold. Less than 8 percent installed some form of insulation despite 83.7 percent of the Recent Movers dwellings having only partial or no insulation.

Table 14 sets out the activities that landlords report they undertake to reduce damp, cold and mould. The average reported expenditure by landlords to address damp, cold or mould is \$9,151.52. The median expenditure is \$3,000. Notable is the low levels of landlords installing insulation. Considerable proportions of owner occupiers found that they continued to have mould, damp and cold problems. Among the High Energy Users, for instance, of the 313 householders reporting they have a mould in their dwelling, 45.4 percent have previously attempted to address the problem through renovation, retrofit or appliance use. Similarly, of the 252 High Energy Users who have taken measures to rectify problems with mould, 56.3 percent report still having mould problems.

**Table 14: Activities undertaken by landlords to reduce cold, damp or mould**

Activity	n	% Landlords (n=413)
Putting in an HRV/DVS or similar ventilation system	81	19.6
Installing heat pump	72	17.4
Installing insulation/batts in the ceiling	54	13.1
Installing an extractor fan in the bathroom	43	10.4
Installing underfloor insulation	30	7.3
Putting up heavy thermal curtains with pelmets	20	4.8
Other heating type installed	17	4.1
Installing insulation in the walls	16	3.9
Draught stopping the doors and windows	15	3.6
Installing efficient woodburner	10	2.4
Installing a rangehood/extractor fan in the kitchen	7	1.7
Installing double glazing	5	1.2
Other ventilation solution (e.g. security latches so windows can be left ajar)	4	1.0
Venting the drier to the outside	2	0.5
Installing passive vents on the windows	2	0.5
Upgrading hot water system to instant gas	2	0.5
Hot water cylinder insulation	2	0.5
Installing a low flow shower head	1	0.2
Upgrading hot water system to solar hot water	0	0.0

## 7 Retrofit awareness, attitudes and willingness to pay

Almost half (49.3 percent) the landlords had heard of the term retrofit. This is higher than among the owner occupiers. Only 28 percent of High Energy Users and 41 percent of the Recent Movers reported that they had heard of the term. High Energy Users are strongly oriented towards associating comfort and health benefits with reduced energy costs. Among the Recent Movers, however, over a quarter see comfort and health benefits as being attractive in themselves irrespective of energy cost savings (Table 15).

The largest single category of landlords (46.4 percent) reported that they would retrofit their property if Government provided assistance. However, almost a quarter of landlords were categorical that they did not want to retrofit their properties at all (Table 16).

**Table 15: Attitudes to Retrofitting Current Houses among Recent Movers & High Energy Users**

Attitude Statement	Recent Movers (n=724)	High Energy Users (n=700)
Retrofit for comfort, warmth and health if power bill savings	38.3	46.0
Retrofit for comfort, warmth and health even if no power bill savings	26.9	17.6
Will not retrofit current house	22.0	21.9
Already retrofitted	7.9	8.0
Don't know	5.0	6.6
<i>Total</i>	<i>100.1</i>	<i>100.0</i>

**Table 16: Landlord Attitude to Retrofit\***

Attitude to Retrofit	Landlords	
	n	%
I would retrofit my houses if the government provided some financial assistance	228	46.4
I do not want to retrofit any of my rental houses	114	23.2
Some of my rentals are already retrofitted and I would retrofit more if it meant my tenants would stay longer	53	10.8
Some of my rentals are already retrofitted and I would retrofit more if I could then charge higher rent	40	8.1
All of my rentals are already retrofitted	25	5.1
Unsure/Not stated	19	3.9
Other	12	2.4
<i>Total</i>	<i>491</i>	<i>99.9</i>

Among all house owners, whether landlords or owner occupiers, expense is the most commonly cited barrier to retrofit (Table 17). 43.3 percent of landlords cited the expense of retrofitting as the primary reason for not investing. But there patterns are real dissimilarities between different groups. For Recent Movers, the inability to assess value for money is a strong barrier to retrofit take-up. This anxiety is not so evident among either High Users or landlords.

Only a small proportion of landlords were concerned with whether retrofit would ‘pay-back’. Inability to pass costs to tenants in increased rents was cited as barrier by 8.1 percent of landlords. Only 7.1 percent reported that capital gains would be too low to undertake retrofit. Only 1.8 percent of landlords were hesitant because they felt they did not know their particular stock needs or how to get value for money.

**Table 17: Barriers to Undertaking Retrofit Among High Energy Users and Recent Movers**

Attitude Statement	Recent Movers (n=724)	High Energy Users (n=700)
Too expensive	41.2	50.8
I don't know what my particular house needs and/or how to get the best value for money from a retrofit	27.9	2.6
I don't know how to do it myself	9.4	0.5
I can't get access to credible information	5.7	2.5
It would be inconvenient	4.9	13.5
I can't get trades people	2.5	1.1
I have other priorities	0	4.8

\* Multiple response

Financial preoccupations are also evident in willingness to pay for retrofit activities. In Table 18, Recent Movers appear less likely to be prepared to take-up retrofit recommendations than both Landlords and High Energy Users. This may indicate that Recent Movers have selected dwellings to a level of performance and comfort that suits them. All are characterised by low levels of willing investment.

**Table 18: Amount Willing to Spend on Recommended Measures for Improved Energy Efficiency**

Willing Investment	% Landlords (n=491)	% Recent Movers (n=724)	% High Users (n=700)
Less than \$100	8.6	7.3	15.0
\$101-\$500	19.6	8.4	11.4
\$501-\$1,000	23.2	16.0	11.7
\$1,001 to \$3,000	16.5	19.9	18.1
\$3,001 to \$5,000	4.9	12.3	10.9
\$5,001 to \$8,000	0.4	4.0	3.9
\$8,001 to \$10,000	0.6	2.9	3.4
\$10,001 to \$15,000	0.2	1.7	1.0
\$15,001 to \$20,000	0.4	0.8	0.4
More than \$20,000	0.4	1.4	2.4

I am unlikely to act on recommended measures	14.5	17.4	11.7
Unsure	10.8	7.9	10.0
<i>Total</i>	<i>100.1</i>	<i>100</i>	<i>100</i>

Over a quarter of High Energy Users reported that they might act on retrofit recommendations that cost less than \$500. Over half of High Users reported that they would take up measures costing between one and five thousand dollars. Among the Recent Movers, almost two-thirds (63.9 percent) would spend less than \$5,000 on recommended measures. Among landlords, almost three-quarters (72.8 percent) of landlords would spend \$5,000 or less and over a quarter reported willingness to expand up to \$500 only.

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## 8 House owners and market transformation

It is clear that all these three sets of house owners are resistant to investment in retrofitting. High Energy Users show little interest or ability to select dwellings that are likely to be resource efficient. Recent Movers are more likely to seek dwellings that are warm and comfortable, but even their newly acquired dwellings still have very basic sustainability features missing. Despite this, and the reported willingness to expend only small amounts on retrofit, High Energy Users and Recent Movers have histories of expending significant amounts on renovations the year prior to surveying. The key to improving house performance appears to be in redirecting that expenditure.

Some owner occupiers want to reduce exposure to energy costs and others want improved comfort. Landlords appear largely intractable except where there is financial assistance. Only 16.3 percent of landlords reported that they would undertake retrofit if advised to do so by an industry association. Around twice that proportion, 34.8 percent of landlords, reported that they would undertake retrofits if requested by tenants. A slightly higher proportion (42.2 percent) reported they would do so if there was regulation. Almost two thirds (63.3 percent) reported they would do so in response to Government financial assistance.

Again, like High Energy Users and Recent Movers, landlords invest in their properties. For the landlords too, the key to improving house performance appears to be in redirecting expenditure on items that are largely 'cosmetic' to items that improve house performance. The reality is that while house owners are prepared to pay for renovation, they do not 'do retrofit' despite many of their dwellings having basic energy deficiencies easily retrofitted at low cost. Basic deficiencies include draughty doors and windows; poor insulation of hot water cylinders and pipes; partial roof and underfloor insulation, and inefficient heating and lighting. Indeed, it appears that, where householders do undertake work that might be considered 'retrofit,' they undertake to put in complex systems rather than address basic issues of thermal performance.

However, while the willingness to pay for retrofit is low, among all house owner groups there is a pattern of renovation expenditure. The pathway to improved energy, and probably other resource efficiency lies in:

- Connecting retrofitting to the renovation decisions and investments that owners make in relation to their dwellings.
- Developing a range of low cost retrofit packages.
- Aligning renovation solutions that improve the thermal envelope to addressing concerns about cold, dampness and mould.
- Providing advice on the relative impacts and appropriate sequencing of retrofit products and packages.

In addition, the Landlord Survey suggests that the informational pathway to them is via the internet and through builders and suppliers rather than through industry associations. 38.3 percent reported they would seek information there. Around half that number would seek advice from trades people (15.7 percent of landlords) or building suppliers (17.6 percent of landlords). Small proportions would seek information or advice from:

- Department for Building or Housing – 6.6 percent
- Books and magazines – 5.4 percent
- EECA – 5.1 percent
- Property organisations – 4.5 percent
- Local Energy Trust – 3.7 percent
- Family – 2.3 percent
- Friends – 2.3 percent
- Other landlords – 2.3 percent
- BRANZ – 0.8 percent.

The Landlord Survey also suggests that regulation has limited impact and can not be considered the only pathway for promoting improved rental house performance. 57.8 percent of landlords appear to be unresponsive to regulatory prompts to undertake retrofit. Almost two thirds (63.3 percent) reported they would do so in response to Government financial assistance, but very small proportions of landlords are aware of sources for financial assistance. The responsiveness to tenants is also relatively muted. Generating take-up among landlords presents a significant challenge.