



Creating home and neighbourhoods
that work well into the future
and don't cost the earth

Beacon's NOW Homes ® – Building and Renovating Homes for Sustainability

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Beacon's Objectives



- To bring the vast majority (90%) of NZ homes to a high standard of sustainability by 2012
- Every new subdivision and any redeveloped subdivision or neighbourhood from 2008 onwards to be developed with reference to a nationally recognised sustainability framework

New Zealand's Third World Housing Stock



- New Zealand's housing stock has a reputation for being cold and damp – and often mouldy!
- New Zealand has one of the highest levels of asthma and bronchial diseases in the world (1 in 6 people have asthma) and a high rate of gastroenteritis
- Over a million of our houses were built before 1979 - the first full year when insulation was mandatory in new houses
- 30% of houses have an average living room evening temperature below 16°C The average winter bedroom temperature in pre-1979 houses is 13.2°C and in post-1979 houses 14.5°C. [BRANZ HEEP data]

Beacon's Now Homes® Projects



- Now Homes® Hypothesis
 - Using current technology and knowledge it is possible to build a home significantly more sustainable than current new housing for a price that is affordable to most New Zealanders
 - Two NOW Homes ® have been built in Waitakere and Rotorua
 - Homes are occupied by “normal” families with no special training
 - Homes are monitored against a Beacon's High Standard of Sustainability benchmarks

Beacon's High Standard of Sustainability Benchmarks



- Setting benchmarks at the house level for new and retrofitted homes:
 - Energy
 - Water
 - Indoor Environment Quality (IEQ)
 - Waste
 - Materials
- Benchmarks based on theoretical calculations verified by real life research data (eg BRANZ HEEP Project, NOW Homes[®]) where this exists
- Benchmarks have been set within a context of *affordability* and *future flexibility*

High Standard of Sustainability Benchmarks



The benchmarks set represent:

- a 35% reduction in energy use in new homes;
- a 15% reduction in energy use in existing homes;
- a 40% reduction in water use in both new and existing homes;
- average indoor environment temperatures which meet the World Health Organisation minimum standards;
- adequate ventilation without excessive draughts;
- provision for waste minimisation during construction, renovation and operation of homes;
- consideration of sustainability issues in the choice of materials used for construction or renovation of homes.

Waitakere NOW Home[®]

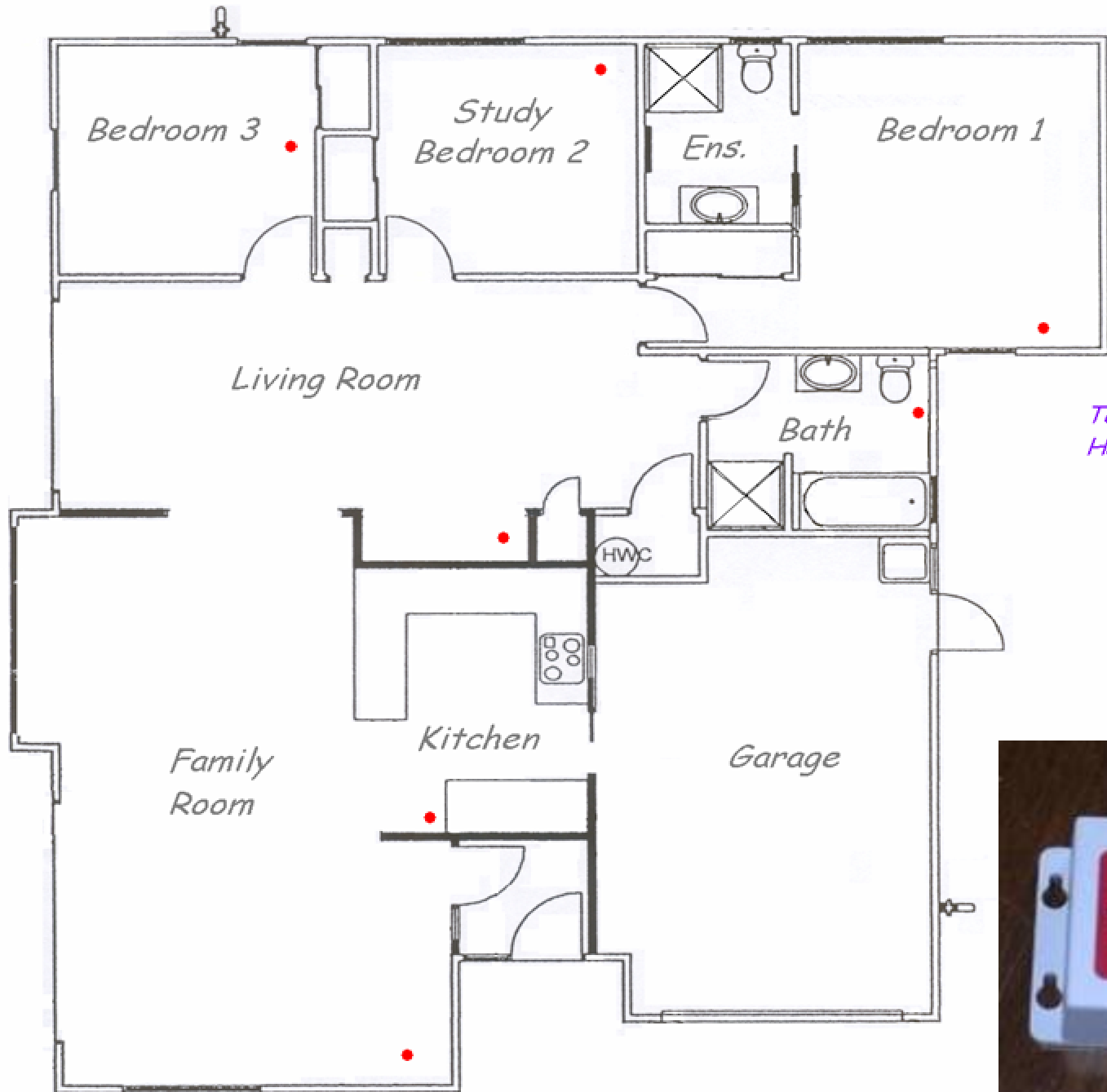
- 3 bedroom home
- House size 146m²
- House built for \$240,000
- Built with consideration of sustainability in design, materials & operation
- 4 person household (2 adults, 2 children)
- Average income
- No special training
- Building Code Climate Zone 1
- Metered water supply



Monitoring the Waitakere NOW Home ®



- BRANZ has monitored the Waitakere NOW Home ® for two years.
- This included:
 - Internal temperatures and humidity
 - Measured energy consumption
 - Power bills
 - Water (litres consumed per person per dwelling)
 - Construction waste to landfill
 - Post Occupancy Evaluation (comparison with previous home)



Temperature
Humidity Sensors



Construction Waste

- Material and products chosen/ design carefully undertaken to minimise construction waste
- 189 kg of waste materials – 8% of the total waste on site - were diverted from the local landfill using sorting process.
- Easy, practical landfill diversion solutions for many waste products still unavailable.
- Total construction waste was 2448 kg. (16.8 kg/m²)
- Domestic construction is believed to typically generate between 14.7 and 25.4 kg of waste per square metre.



Year 1 Waitakere NOW Home[®] Monitoring



- Home performing very well – monitoring¹ supports hypothesis that is much more sustainable than a standard new home:
 - 33% less energy used than comparable home (37% less than an “average” home in the climate zone)
 - 45% less energy used by the household than their previous home
 - 40% less reticulated water use than surrounding households
 - Home is warm, dry, comfortable and healthy – and much loved by the family who live there

Monitoring Results - Hot Water

- The solar hot water system provided for 55% of the hot water needs to the home.
- That's a saving of around 2500kWh/yr - approximately \$425 per year.
- Electricity savings give 10 year payback period (direct \$ for \$)
- For the average NZ household, 34% of the energy use is used for heating water, Waitakere NOW Home ® this is 21%



Monitoring Results - Water

- Reticulated water use is an average of 100 litres per person per day
- Reticulated water use per capita is 40% less than Waitakere City average
- Actual per capita water use is slightly more than WCC average (189 lpd vs 167 lpd) – therefore no reduction in wastewater discharge
- Dual flush toilet a key feature for water efficiency
- Rainwater tank is providing 46% of the total water used in the home





Occupants' Views

- Love the home – its warmth, spaciousness, healthiness and efficiency, and the ease of keeping the concrete floor clean
- Haven't needed to use – dehumidifier and electric blankets and have used heater only twice
- Health of kids (asthma) also greatly improved
- House is very quiet (insulation + double glazing)

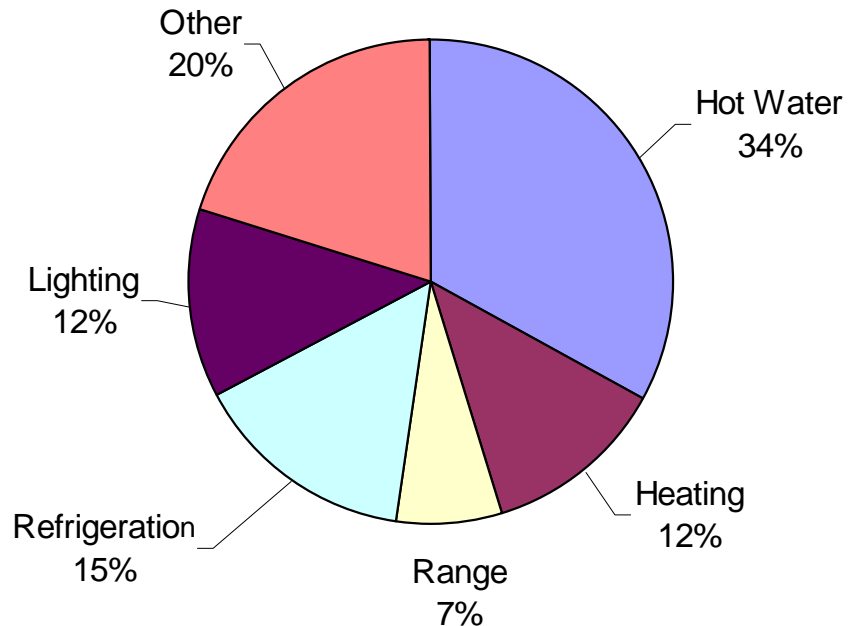


Comparison with an Average New Zealand Home*

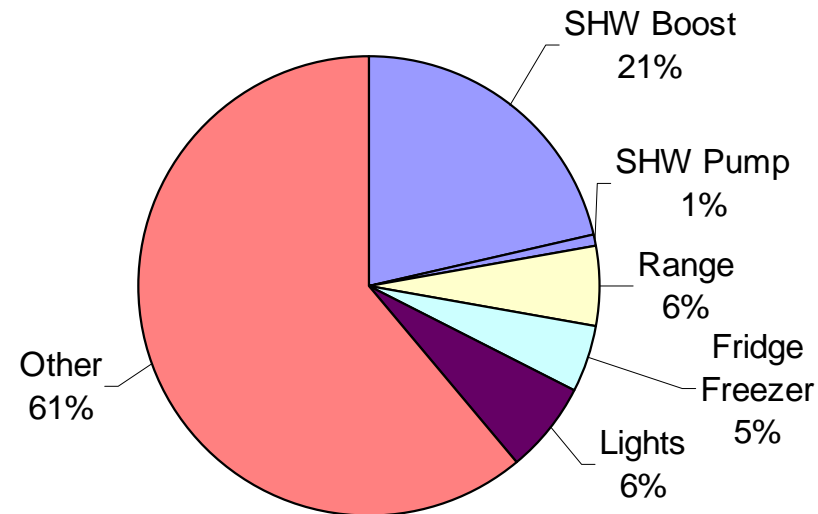


*Analysis undertaken by BRANZ Limited

HEEP - Electricity Only



NOW Home - Electricity



Research vs Demonstration Home

- Increasing awareness of the home – and frequent requests for viewing of it and its features
 - 350 people through on 4 March Ecoday
 - Strong interest and desire for more information from across community and the government sector
 - Strong interest in Now Home® website (and from people wanting to buy/build Now Homes ®)



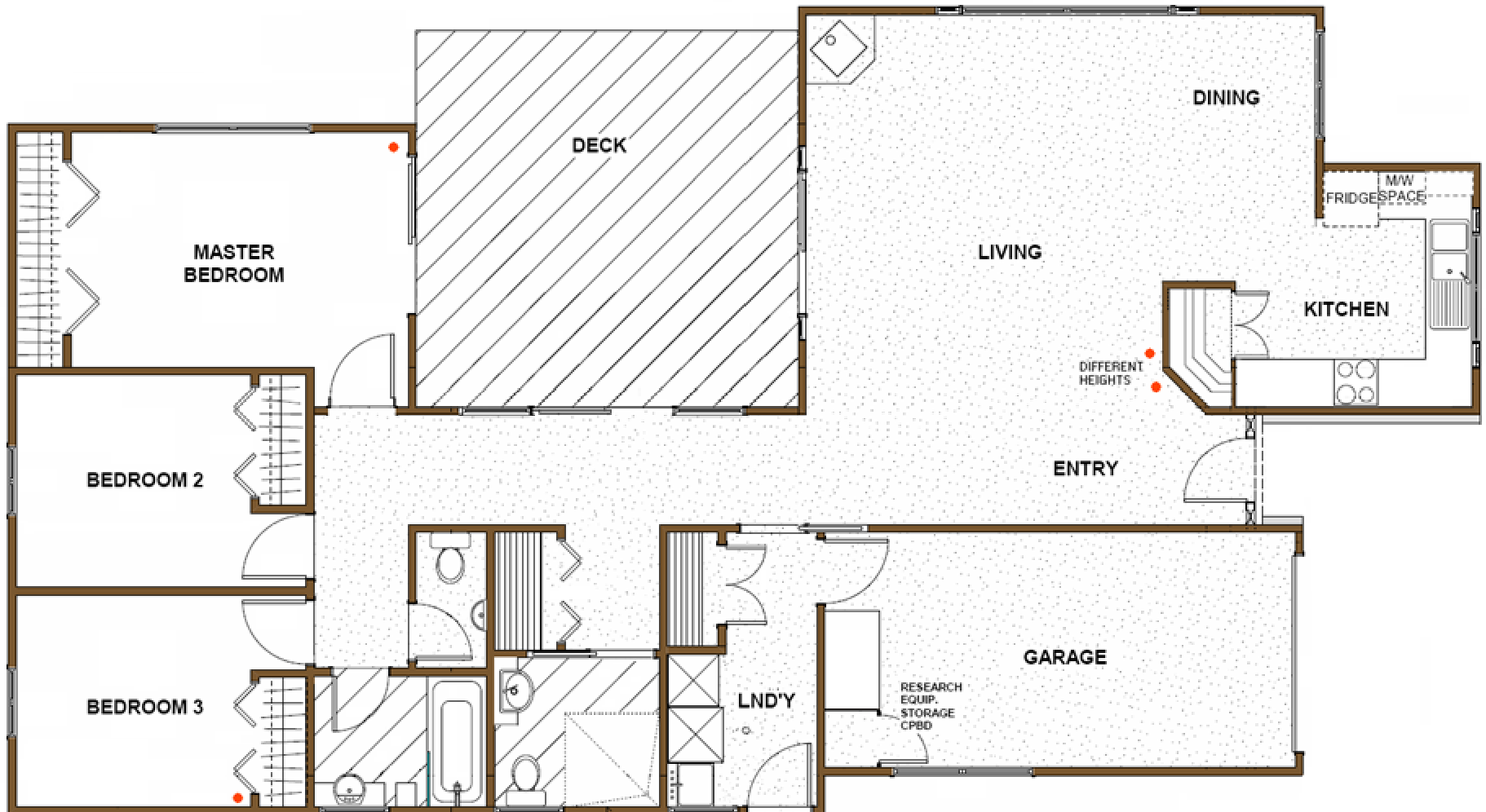
Rotorua NOW Home[®]

- Is a collaboration with Housing New Zealand Corporation so affordability was a key consideration
- Accessible design and functional requirements introduced specifications additional to the Waitakere home
- 3 bedroom home
- 141 m² (plus 24.8 m² concrete deck)
- Building Code Climate Zone 2
- No household user charges for water use
- Built for less than Waitakere home (budget \$180,000)
- Was tenanted in October 2006 (5 people)





Plan of Rotorua NOW Home®



Additional Features of the Rotorua Now Home®

- Materials – chosen using BRANZ LCA Tool
- Colder climate means includes a pellet burner for heating
- House designed specifically for barrier free access



Other differences in the Rotorua Now Home®

- More extensive use of passive ventilation
- Perimeter insulation of concrete slab
- Butterfly roof with central gutter
- Underground concrete 5000 litre rainwater tank



NOW Homes® - Opportunities

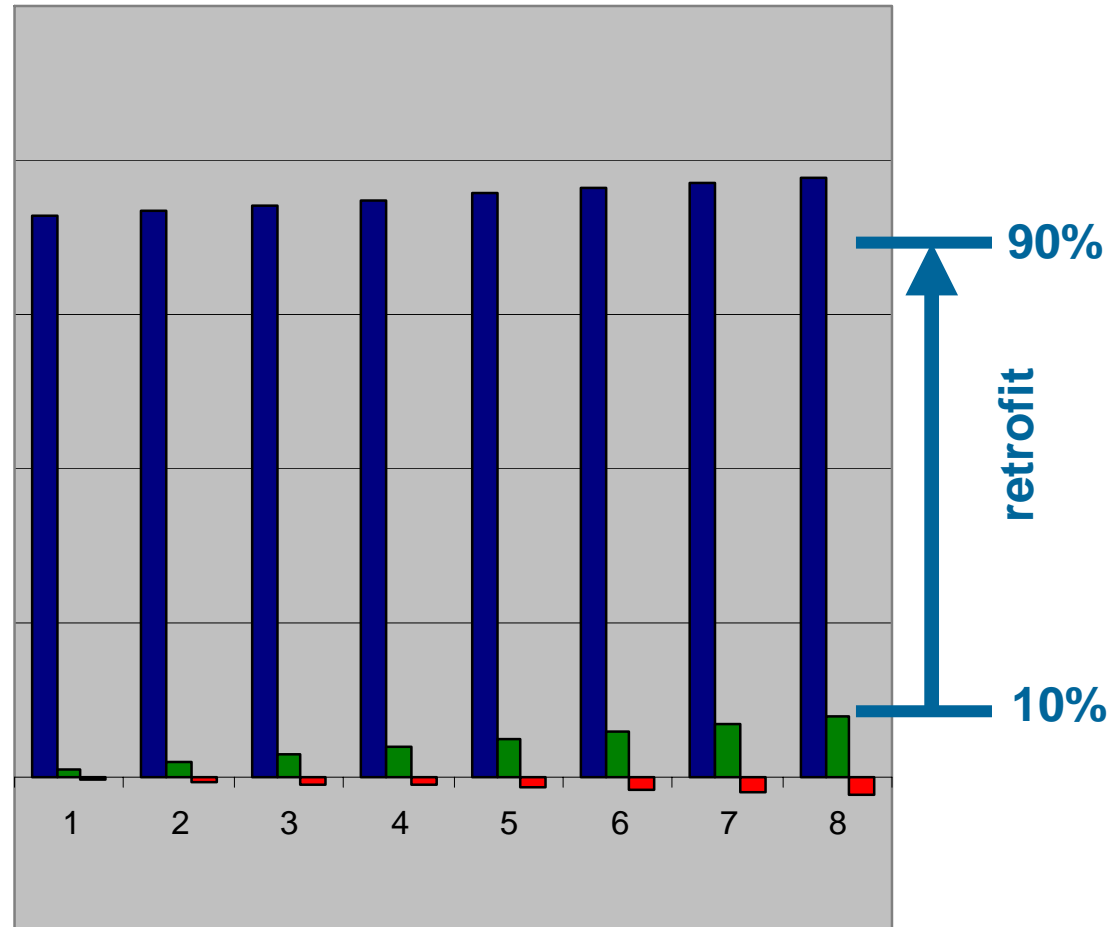


- Moving from a Research Home (with small Demonstration component) to mass production and wide uptake
- With detailed research understanding of existing NOW Homes®, performance we are developing protocols for piloting at large scale
- Regional differences (climate, local environmental issues, urban typologies) means there is a need to verify performance across NZ – we will do this as part of piloting process
- Opportunity to partner with commercial builders/developers to test broad scale implementation in a range of locations

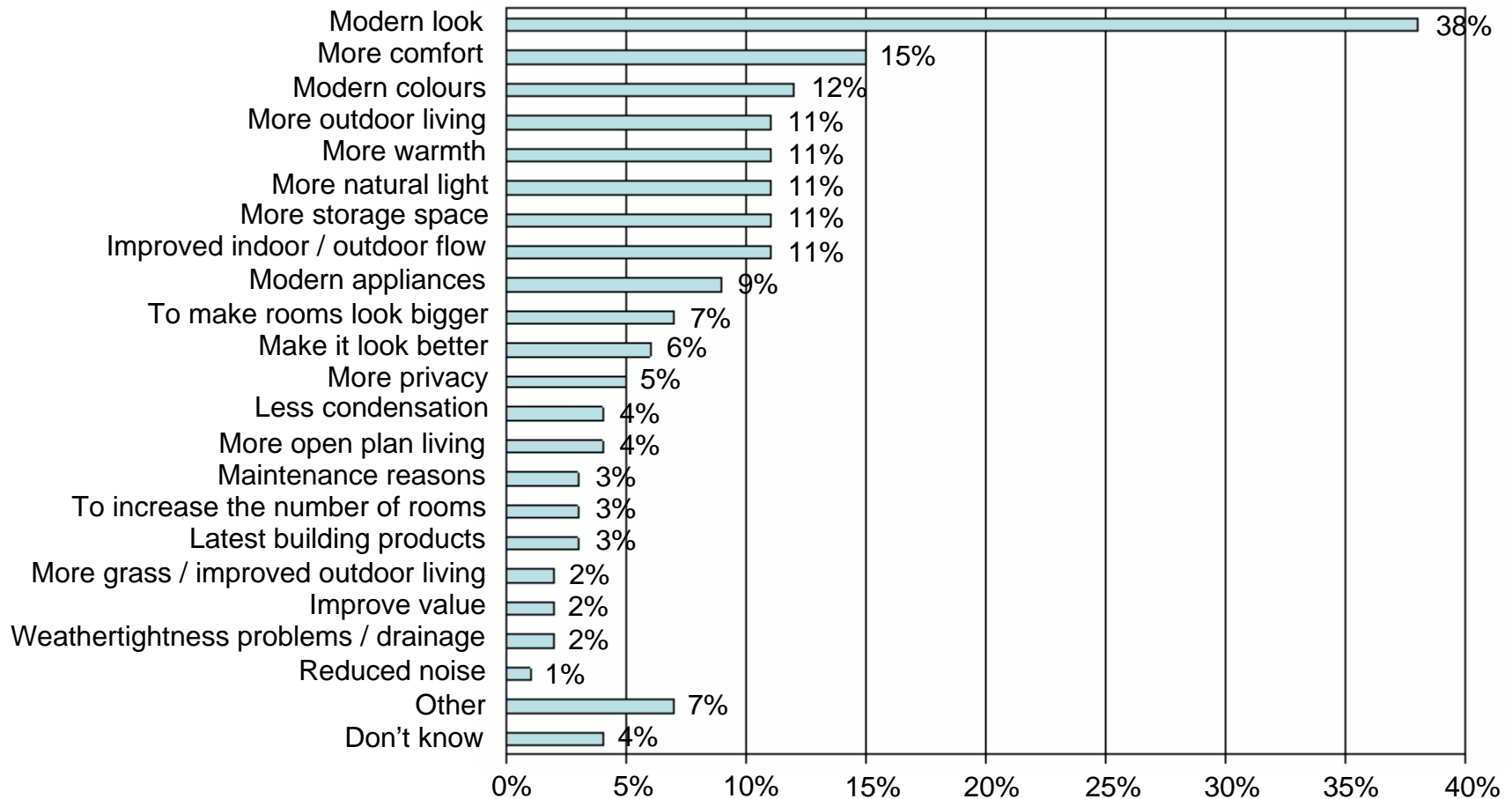
New vs Existing Homes

- 1.5 million homes in NZ
(1 million pre-1979)
- 25,000 built each year
- 7,000 demolished

**Affecting 90% of homes
requires a major emphasis
on retrofit**



Consumer decision drivers in the additions & alterations market



Source: Traffic / TNS A&A home survey, 2006

What is a sustainable retrofit?

- **Energy** (reducing demand from national grid, improve thermal performance, increasing use of renewable energy, better design)
- **Water** (reduced demand from reticulated water, integrated water management)
- **Indoor Environment Quality (IEQ)** (temp 18°C, humidity 20-70%)
- **Materials / Construction Waste** (minimise environmental impact, reduced waste)
- **Cost Effective** (benefits > costs)



What happens with current retrofit programmes?



- Review undertaken of previous/current retrofit programmes (mostly around energy & health)
 - Are targeted at low income (and often low energy using) households with standard packages nationwide
 - Do deliver some benefits for the people in the homes (particularly health benefits)
 - Don't deliver a high standard of sustainability (still too cold, don't save much energy as most savings "taken back" in comfort)
 - Where an efficient heating source is combined with insulation and ventilation do get improvements in both IEQ (temp/humidity) and energy savings

Beacon NOW Home[®] Renovation Project



Objective:

- To identify the best (most cost effective and easy to implement) packages and combinations of retrofit options to significantly improve the standard of sustainability of average New Zealand homes.
- To develop a cost benefit analysis at a house level for a range of retrofit technologies in the areas of energy, water, IEQ and waste.



Conclusions



- New homes are easily able to be developed which use substantially less resources in their construction and operation than “standard” New Zealand homes – at no greater cost
- Waitakere and Rotorua NOW Homes[®] are being used to provide real life data verification of efficiencies able to be achieved
- Papakowhai NOW Homes[®] Renovation Project seeks to develop learnings to inform mass retrofit of NZ homes
- Larger scale projects – Now 100 and Retrofit 1000 aim to engage wider parts of the industry and create partnerships whereby ordinary NZ homes will be able to be easily built and retrofitted to achieve a high standard of sustainability

Beacon Research Funders



NOW Home[®] Suppliers



- CHH Woodproducts
- Climate
- Dimond
- ECO-Block New Zealand
- EECA
- Energy Options
- Fisher & Paykel
- Fletcher Aluminium
- Winstone Wallboards
- G J Gardner
- Glover Real Estate
- Aquatica
- New Zealand Steel
- Kresta Blinds
- Nulook
- Pilkington New Zealand
- PlaceMakers
- Resene Paints
- Ross Roofing
- Exel Group
- Tasman Insulation
- The Laminex Group
- Joinery Direct
- Total Fascia
- Heirloom Copyright Beacon Pathway Limited 2007

Key Research Partnerships Now Home[®] Renovations



Research
Providers



Hosts



Suppliers
(products /
labour)

