



Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Waitakere NOW Home®: the power of one home

Beacon Symposium 2008

Andries Popping, New Homes Research Team Leader
(Apsoltec NZ Ltd.)

Beacon Pathway Limited

Waitakere NOW Home[®] Project



Hypothesis

- Using technology and knowledge available NOW , it is possible to build a home that is warmer, healthier, more comfortable, and more affordable to run than typical new housing.

Process

- Built in 2005, tenanted from September 2005 – March 2008
- Designed by architect Greg Burn
- Constructed by GJ Gardner Limited
- Home was occupied by an “ordinary” 4 person family
- Home was intensively monitored remotely and assessed against Beacon’s High Standard of Sustainability™

The High Standard of Sustainability™



	Zone 1	Zone 2	Zone 3	
Energy	New (kWh/year/house)	7,600	8,500	9,800
	Retrofit (kWh/year/house)	9,050	11,000	12,000
Water	• 180L mains potable water/person/day			
IEQ	• Temperature: mean minimum 18 ⁰ c living room; 16 ⁰ c bedroom • Ventilation: 0.4 -0.6 (new), 0.5 – 0.75 (existing) air changes/hour • Mean relative humidity: 20-70% in bedrooms and living space • Checklist of features for pollutants			
Materials and Waste	• Checklist for materials selection and construction waste guidelines • Checklist covering provision for composting, recyclables, no in-sink waste disposal unit			

Waitakere NOW Home[®]



- 3 bedroom home
- Size 146m²
- Built for \$213,853 + GST
- North facing
- Energy Climate Zone 1
- Metered water supply



FLOOR AREA

Living Area:	121.7m ²
Garage and Laundry Area:	24.5m ²
Total Floor Area Over Brick:	146.2m ²
Porch Area:	30m ²
Total Coverage Area:	149.2m ²



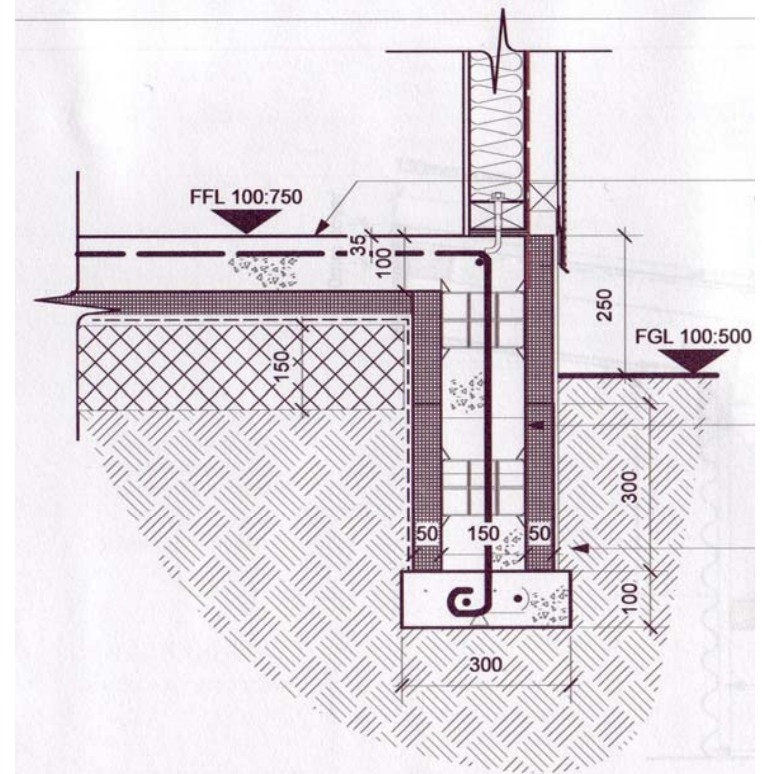
It looks like a normal suburban home



It looks like a normal suburban home



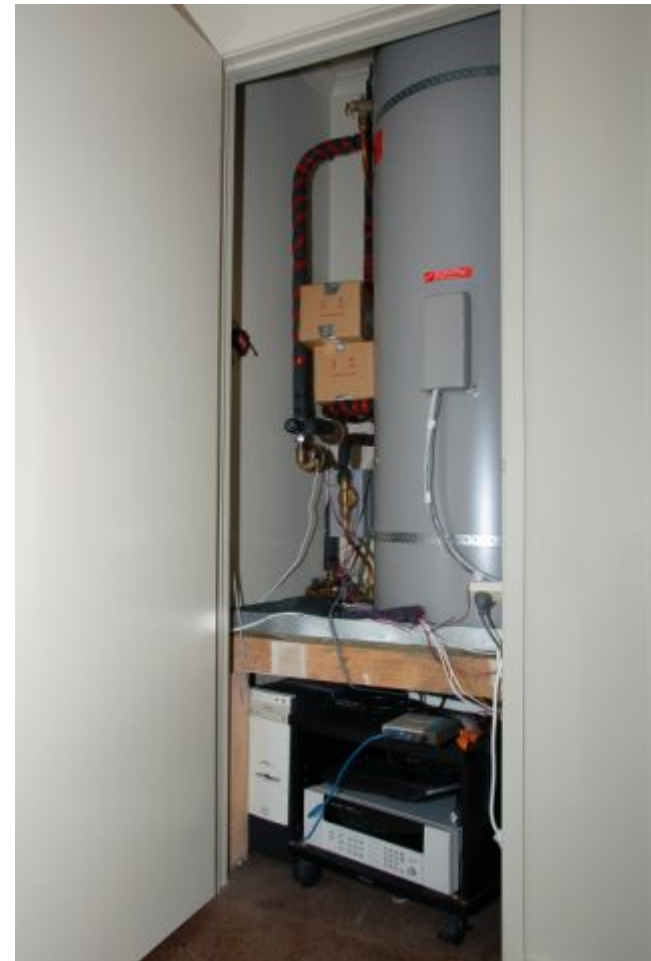
Harnessing the sun -north facing and thermal mass



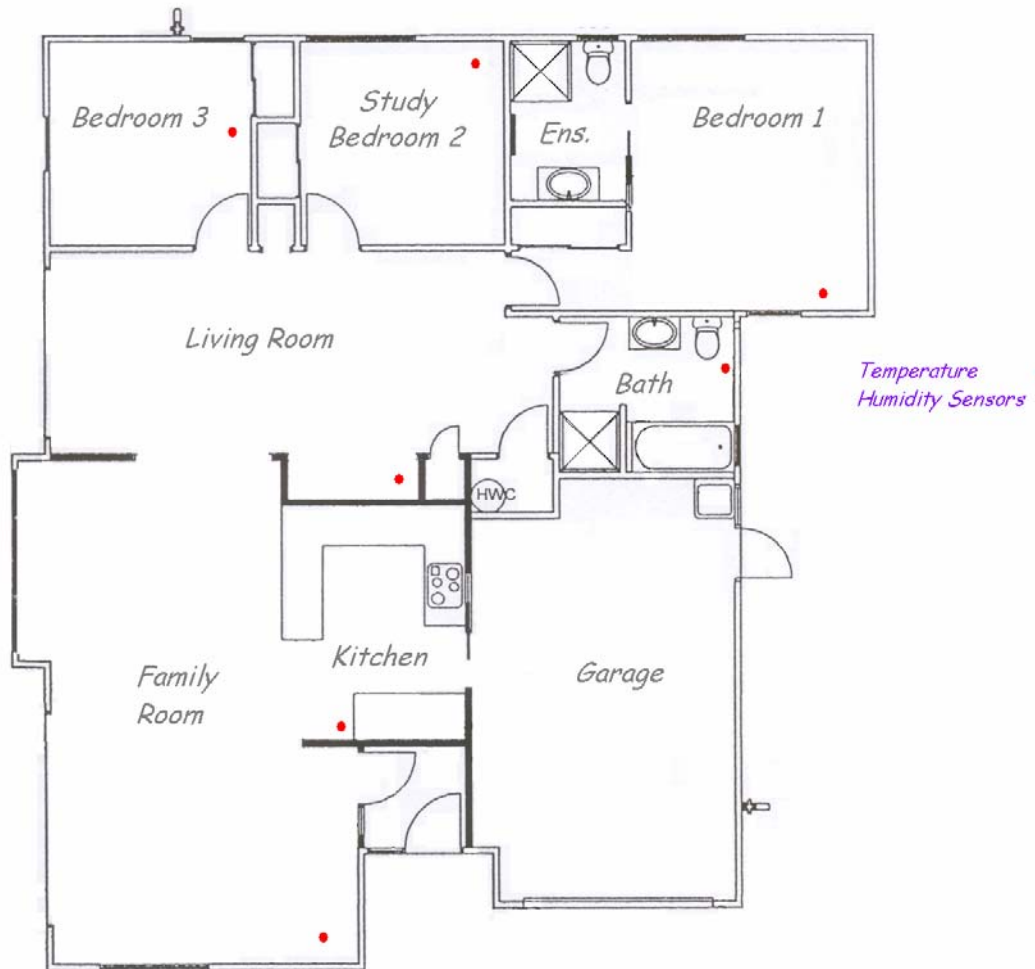
Insulated concrete slab

Monitoring programme undertaken by BRANZ Limited

- Energy end use data collection
- Water end use data collection
- CO₂ in living room
- Temperature and relative humidity in each room
- Post occupancy evaluation



Sensor locations



Construction waste

- Detailed management and monitoring of construction waste
- 189kg of waste diverted from landfill – only 8% of that generated
- A total of 2.3 tonnes of waste sent to landfill
- Major construction wastes
 - plasterboard
 - timber
 - concrete
 - packaging
 - contractors (drink bottles etc)

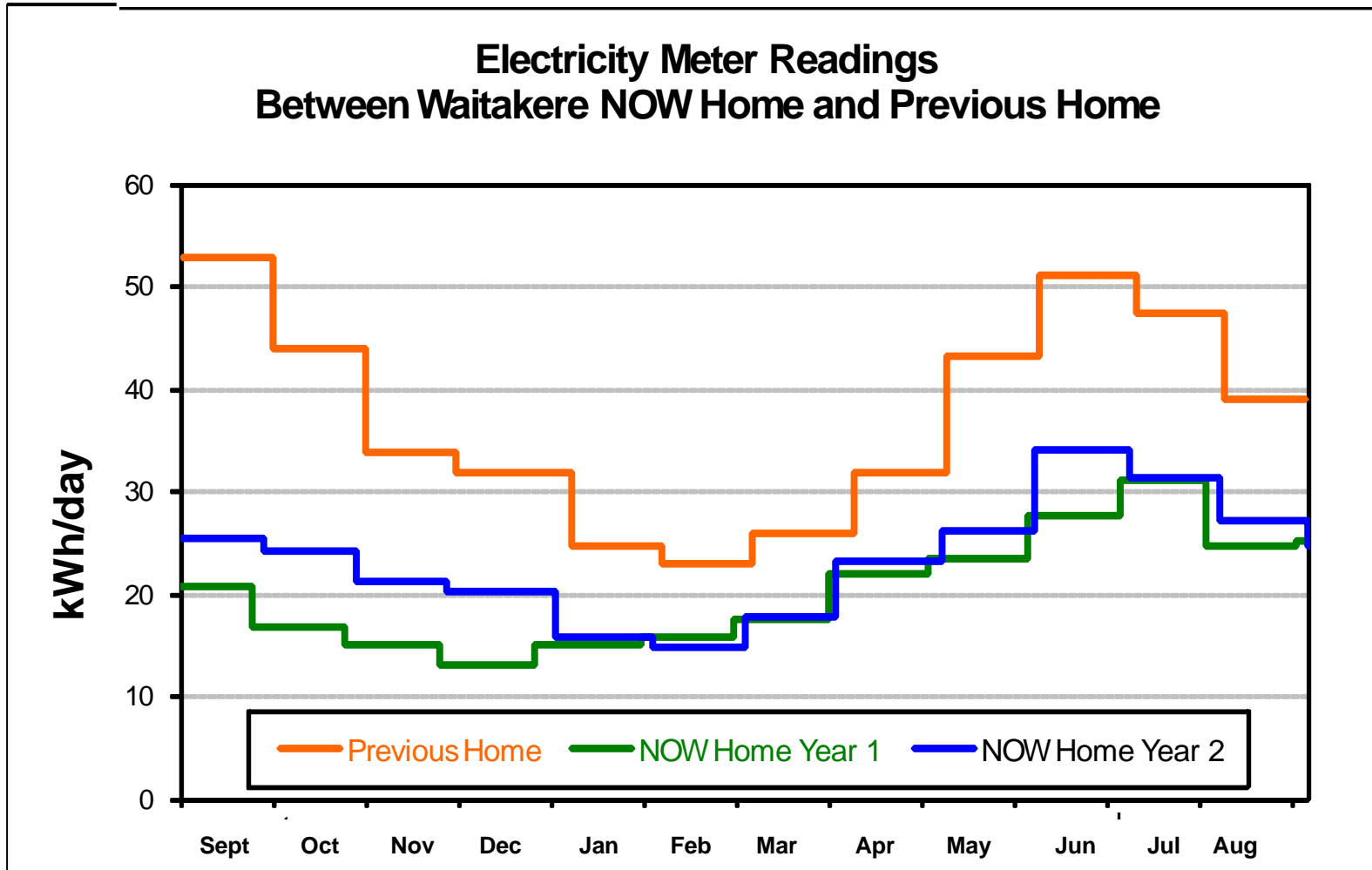


Findings – energy use



- First year of occupancy used 7400 kWh of electricity, with supplementary heating required on only 2 days
- Compared to their previous dwelling the family used 45% less electricity
- However an upward trend over the year in terms of electricity use was observed
- Second year of occupancy used 8500 kWh of electricity
- Matched pair analysis with HEEP homes indicates that:
 - in the first year the household used 33% less energy
 - in the second year the household used 23% less energy

Electricity usage comparison



So what was going on with energy?

- Thermal envelope performed well – met target that no more than 10 days/year of supplementary heating be required
- Solar hot water system contributed about 45% of water heating but was not oriented optimally for winter sun so performance could have been better



So what was going on with energy?

- Electricity use increases over time were largely driven by:
 - Increased hot water use
 - Increased/new appliance use (e.g. dryer, coffee machine)
 - Increased home office use
850 kWh/year for the computer server alone



Water use

- Similar water use over the first two years
- Reticulated water use 100 litres/p/d Year 1 dropping to 85 litres/p/d in Year 2
- Represents 40-48% reduction in reticulated water use compared to surrounding households
- Total per capita water use went from 189 litres/p/d in Year 1 to 172 litres/p/day.



Humidity and ventilation

- Relative humidity levels generally fall within recommended ranges for healthy homes 20%-70% humidity
- Year 1 winter humidity at times exceeded 70% in some rooms and condensation appeared on the master bedroom windows
- Addition of mechanical ventilation to bathroom and ensuite addressed this issue
- Summer humidity levels within the home remained within healthy parameters despite normal high humidity levels (>70% and often >90%) in the external environment



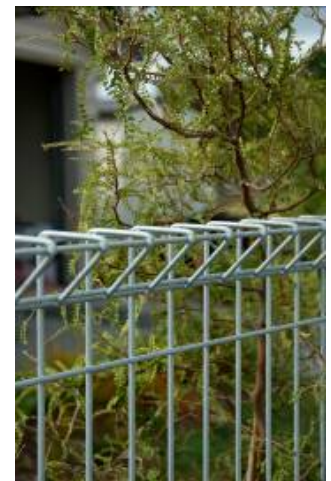
Temperature

- Winter temperatures within the home were able to be maintained above HSS™ benchmarks (16°C in bedrooms and 18°C in living spaces) with minimal heating
- Summer temperatures particularly in the evening were often very warm
- A solar powered stack fan was installed to address this issue



Outdoor and neighbourhood aspects

- Location in a park meant the family weren't connected to the wider neighbourhood
- Security concerns led to behaviours which didn't optimise performance of the house (e.g. indoor clothes drying, keeping windows closed)
- Proximity to shops, schools, playground and public transport valued (5-10 min walk to all)
- Found the garden hard work & weren't really gardeners
- Found the see-through fence affected their privacy and use of the outdoor space



Occupants' views: “It’s the best home we’ve ever lived in”



- Loved the home – its warmth, spaciousness, healthiness and efficiency, and the ease of keeping the concrete floor clean
- Regularly and consistently refer to significant health and wellbeing benefits from living in the house, including:
 - decreased levels of ill health incl. asthma
 - increased children’s confidence
 - a more active social life
 - enhanced interfamily relationships
 - better mental health *“You can’t help but be positive, we don’t get the winter blues”*

Impact of the house on the occupants

- Behaviour change did occur in relation to waste (composting) and using public transport
- Occupants became more social as a result of feeling happier about their home
- When choosing a home to buy, the NOW Home® experience meant they had some particular priorities:
 - sunny & light
 - tested for humidity and damp
 - double glazed and insulated



Where to next with NOW Homes®? - NOW 100 Project



- 100 NOW Homes® will be developed by private sector group builders in a range of locations around New Zealand in the next 12 months.
- A sample of these homes will be monitored and performance verified
- NOW Home® Process and Procedures provides specifications and guidance on how to design, construct and “operate” NOW Homes ®.
- These Procedures will be tested and reviewed with our development partners.
- This will be the first stage in building the momentum for mass uptake of NOW Homes®.

Conclusions

- Waitakere NOW Home[®] demonstrates that a well-designed new homes will use substantially less resources, are healthier and more comfortable than “standard” homes – at no greater cost
- Take back effects will occur over time, but there will be limits to this (number and type of appliances)
- Living in a more sustainable home can lead to positive changes to occupant behaviour and perceptions
- The NOW 100 Project is an important next step in building the momentum needed to establish large numbers of sustainable new homes across New Zealand.