

Low energy and affordable: the HomeSmart Home

The New Zealand Housing Foundation's HomeSmart Home introduced energy efficiency, passive solar design, good thermal envelope and energy generation to a standard NZHF design. The results produced a low energy and very affordable home for the family of six living in the house.

Passive solar design, thermal envelope and efficient choices

The HomeSmart Home's design incorporated good solar orientation with all living areas and bedrooms facing north and the garage to the south. It was well-insulated with R4.6 ceiling insulation, R2.6 external wall insulation, and uPVC-framed double glazing on northern windows, and thermal curtains for all windows and doors.

Heating, lighting and appliances were selected for energy efficiency. LED and compact fluorescent lighting was used throughout and easy reach switches made it straightforward to switch off standby power. Energy efficient appliances included a 4 star washing machine, 3.5 star dishwasher and 4 star fridge/freezer.

The improved thermal envelope (heavy insulation, double glazing) reduced heating requirements to virtually nil. A portable electric heater and the lounge inset heater were used initially to keep the newborn baby warm, but subsequently the heaters were not used at all. The house was warm, dry and healthy throughout winter, with the HomeSmart Home meeting benchmarks for healthy living room and bedroom temperatures.

Efficient water heating

A 310 litre heat pump hot water system with a 4 star energy rating was installed. This can save up to 62% of the energy used by a conventional electric hot water cylinder. The heat pump hot water system performed well and saved significant amounts of electricity, impressing the homeowners. With prices having come down further on these since the house was built, either heat pump or solar hot water systems should be considered as a standard feature to reduce running costs.



Photovoltaic energy generation

The house featured a grid-linked solar power system capable of producing in excess of 2100kWh per year. The system is made up of three main components: solar modules, inverter and array

frame. The solar modules comprise eight 175W 24V panels with a total surface area of 10.4m². The panels, mounted at an angle of 28° facing north-west-west, are fastened onto the roof using a solar array frame. The DC power produced by the solar panels is fed into an inverter which converts the energy to 240V AC. The resulting energy is connected to the switchboard in the house and then either used to meet the power needs of the home, or "fed" to the grid.

The photovoltaic system generated nearly a third of the electricity used in the home, about 2000kWh per year; the occupants directly used 1000kWh, the rest was returned to the grid. Unfortunately in New Zealand, excess electricity produced by a photovoltaic system cannot reverse flow through the meter and instead bypasses it, which means the homeowners are not getting the financial benefit of electricity exported back to the grid. With photovoltaic panel costs decreasing rapidly and electricity prices increasing, it is worth considering this technology.



The result? Low energy, affordable and healthy

The HomeSmart Home achieved a HERS (Home Energy Rating System) thermal rating of 8 stars out of a possible 10. This rating was confirmed by BRANZ's monitoring which showed that the HomeSmart Home was an exceptionally low energy home, using only a very low 3980kWh per year. It compares particularly well to other monitored homes, the Waitakere NOW Home (7400kWh per year) and a typical group builder home in Rangiora (14400kWh per year).

In terms of affordability, the family living in the HomeSmart Home appreciated the significant cost savings, particularly of the hot water system, and noted the house was very cheap to run. Compared to an average house in Auckland, the savings could have been as much as \$1625 per year from the energy efficiency and generation measures.

The family was clear about the health benefits of living in a warm, dry, well-ventilated house: no-one had been sick since arriving in the house and asthma inhalers were no longer needed. Text

For more information:

- Beacon website www.beaconpathway.co.nz/new-homes/article/energy_efficiency_of_the_homesmart_home