

Newington Smart Home – Design Brief

27 October 2009



1. Introduction

As part of the Newington Smart Village Project, a residential home has been acquired in Konrads Ave, Newington. This property will become the Newington Smart Home, a 'house of the future' showcasing and testing new technologies to reduce household energy and water use.

Newington houses were designed and built to minimize energy and water requirements. The Smart Home already has:

- passive design features such as a northerly aspect, well placed trees, window glazing and insulation to reduce the need for heating and cooling appliances;
- a 1kW solar power systems to supplement the home's electricity supply;
- a gas-boosted solar hot water system; and
- Recycled water for outdoor gardens and toilet flushing.

The Smart Home will be used to educate and inspire others to adopt energy and water saving behavior. As new technologies are introduced into the home, the community will be able to read about the family's experience and see the reduction in energy and water use online.

This document outlines the key initiatives to be undertaken at the house, and accordingly form the basis for a design brief.

2. The Newington Smart Village

Smart Village will use the best energy and water management technology available to give 1,000 households in Newington and Silverwater the ability to reduce their environmental footprint and their household utility bills. The \$10 million, two-year program was officially launched by EnergyAustralia on 17 October 2009 .

The Smart Village Program will involve:

- Next Generation Smart Meters: 1,000 household electricity smart meters with two-way communication will be installed as well as 1,000 water meters and 500

recycled water meters. This allows Sydney Water and EnergyAustralia to communicate with residents on household energy and water use via a one-stop-shop website or in-house display.

- Smart grid switches – New smart switches on the electricity network will give EnergyAustralia greater information and monitoring of the network, and of Smart Village energy use. It will also allow faster response to power outages.
- Creating Home Area Networks (“HAN”) so 100 homes can monitor their appliances and control them remotely via a website.
- Incentives to reduce energy use - Households can choose to trial innovative incentive packages and products, such as bill rebates for reducing energy use below normal in peak times, and free use of electric vehicles.
- In-house displays and tailored household websites, with real time information on energy and water use, cost, greenhouse impact. Includes the ability to add friends and compare use.
- Smart appliance monitoring and controls so households can remotely turn appliances on and off using iPhones (if they have them) or via a tailored website. This will help homes control energy using appliances and equipment, reducing running costs and greenhouse emissions
- Renewable energy solutions - Testing energy storage to offset peak electricity demand and adding renewable energy technologies to the electricity grid such as fuel cells; and
- Demonstrating and testing electric cars, energy storage and car recharging connection points on the electricity grid

3. Design selection process

EnergyAustralia is seeking to engage a suitable designer or architect to:

- Develop a detailed design for the renovation of the interior of the house, this process is not expected to involve the removal or alteration of the existing walls;
- Specify the required furniture and fittings for the home; and
- Identify and project manage the required tradesmen for the renovation process to completion.

The following process will be used to select a suitable designer or architect for the Newington Smart House:

- Offers will only be accepted from qualified designers or architects who have accreditation under the Green Building Council of Australia.
- Interested parties will be invited to submit a 3 page pitch summarizing their vision and overall concepts for the house re-design, as well as relevant experience before 5pm on 9 November 2009;
- EnergyAustralia will evaluate the pitches and select a shortlist of the 3 that best meet the selection criteria;
- The short listed parties will then be invited to submit a formal design brief. This design brief should include design approach, concept drawings, materials, budget estimate, and contractual terms.

Based on an assessment of each of the formal design briefs, EnergyAustralia will award the contract the most appropriate submission.



Figure 1 – Konrads Ave

4. Objectives

The Newington Smart Home will take a home already exhibiting good design features and incorporate the next generation of energy and water saving technologies. The key objectives of the Home are as follows:

- To showcase and test ‘best of breed’ appliances and quantify the potential energy and water savings;
- To demonstrate the opportunities and benefits of a HAN environment and assist in the recruitment of volunteers to participate in the HAN trial;
- To explore alternative electricity supply and storage options, such as micro generation and battery storage technology;
- To showcase the use of an electric vehicle and monitor its charging patterns, and potential integration with the battery storage; and
- To provide a feature location for education on sustainable energy and water usage, smart metering and publicizing the Newington Smart Village trial.

The home will essentially provide a real life laboratory, integrated with the intelligent electricity grid, for testing products that will help minimise energy and water use and greenhouse gas emissions. For EnergyAustralia, this will help us evaluate the practical potential for these solutions to shape future household energy management, network operation and government policy. Each of the above objectives is discussed in further detail below.

4.1. Energy and water efficiency

One of the key aims of the house is to demonstrate and test the most energy efficient or water efficient household appliances. It is anticipated that these products are likely to be at ‘pre-commercialisation’ stage, and able to demonstrate what future technology has to offer. EnergyAustralia will be inviting appliance manufacturers to include their leading-edge appliances to be field tested, with the results communicated to the public through online and print media channels.

The appliance options targeted for inclusion in the Smart Home include:

- state-of-the-art lighting solutions (Controlled plasma, LED) ;
- complete entertainment system including flat screen TV, CD player and hard drive and stereo;
- Kitchen electric appliances including fridge, oven, exhaust fan, microwave, dishwasher, kettle, toaster;
- Replace the ducted air conditioning with a pre-cooling/heat exchanger such as the one recently launched by Seeley;
- Computer and printer;
- washing machine and clothes dryer;
- devices to minimize the use of standby power; and
- Upgrade existing dual flush toilets, high water efficient shower heads and taps

4.2. *Home Area Network*

The Smart Home will be fitted with a HAN, monitoring the use of key appliances and allowing the remote (on/off) control of these appliances via an online portal.

The information collected will provide early insight into the performance of the appliances and equipment in the Smart Home and allow us to evaluate the HAN technology prior to full implementation.

The Smart Home will allow for thorough field testing of the preferred HAN solutions, and enable us to develop appropriate installation practices for the 100 trial sites.

Most importantly, interested residents will be able to get a full understanding of what HAN technology is about, with the aim of addressing any concerns that they may have about participating in the HAN trial.

4.3. *Micro Generation and Battery Storage*

Most of the houses in Newington have a 1kW solar PV system installed on the roof providing around 20% of the total electricity used by the household.

One of the aims is to explore the potential for the Smart Home to be operated with minimal electricity supplied from the grid using a combination of micro generation and battery storage.

One very promising technology is an Australian designed 2kW natural gas based fuel cell technology – known as “BlueGen”. EnergyAustralia has secured one of the first BlueGen units to be produced for installation at the Smart Home.

The house will also feature the latest in battery storage technology. This storage will allow excess energy generated during the day by either the BlueGen fuel cell or the solar PV system, to be stored for use at night. This use of these technologies will also help estimate:

- The potential for the household to export electricity to the grid during peak periods; and
- The benefit to electricity distributors and retailers that this stored energy might provide if available on a larger scale.

4.4. *Electric Vehicle (“PHEV”)*

EnergyAustralia is aiming to secure a pre-release PHEV from one of the number of manufacturers currently running international pilots. If this is achieved, then the aim is to:

- Measure charging patterns with typical family use of the vehicle;

- Test the PHEV as another form of useful energy storage to supply electricity to the grid during peak periods and recharge during low use periods; and
- Trial and evaluate potential metering options for PHEV's to charge outside the home at third party locations, and still be billed to their account.

Alternatively the car could simply demonstrate self sufficiency by charging up at night from the battery stored energy that was generated by the PV system during the day.

4.5. *Education and promotion of sustainable energy usage*

The final aim for the house is to provide a feature location for promotion of the Newington Smart Village, and provide a tangible example of low energy use for education. This is to be achieved in 3 key ways:

- An online virtual tour of the house, where customers can view each room and find out more about the appliances used and the estimated savings they can achieve. Customers would be able to learn what it is possible for them to achieve now, and gain insights into the home of the future;
- A monthly 'open house' where the public or stakeholders would be invited to view the house and be given information about the appliances, the HAN and smart metering; and
- The potential for a "writer in residence" to live in the house and produce regular blogs entries or press articles telling a story of how their energy usage and behaviour is impacted by the new technology on offer. This is discussed in greater detail below.

Writer in residence

As an opportunity to maximize the educational benefits of the house, EnergyAustralia is proposing to invite a family to live and report on their experience with the new technologies as they are installed. This reporting could include articles in print media including newspapers, magazines and online. They would also provide an accessible and believable subject for TV media for press releases.

Having a family also "humanises" the technology, and provides the potential for greater media coverage. This also means that EnergyAustralia could attract a significant level of interest from corporate sector participants looking to promote their new technologies. For example appliance manufacturers will be willing to provide more sustainable appliances for inclusion in the house if they know they will receive media coverage. Also PHEV manufacturers may be more amenable to providing a car if they know they will benefit from regular, high profile publicity.

To ensure sufficient quality of the written content, it is expected that a tender style process will be held to select a journalist with sufficient experience in the area of home

design or technology assessment. It is anticipated that the journalist would write a regular blog, which could include regular updates on the family's experience with the technology, and view the real-time energy usage of each appliance.

5. House makeover

5.1. House Requirements

As the house will be a focal point for publicity for the Newington Smart Village, it will be necessary to update the interior of the house. This will ensure that the house and appliances are presented in a manner that is photogenic, and accordingly maximises the amount of press generated. The focus will be on the ground floor where most of the appliances will be on display.

It is anticipated that this will include the following:

- updating the kitchen and laundry;
- new paint;
- replacing floor coverings and lighting,
- joinery to display the new appliances,
- swap out the cisterns to dual flush;
- swap out shower heads for more efficient models;
- new window coverings; and
- specifying standard household furniture items.

The upstairs bathroom fittings are considered to be in reasonable condition and should be retained where possible. However some work will be required to accommodate the additional plumbing work to install individual water meters throughout the home. This work will have to be well planned so that the final result is as aesthetically pleasing as possible.

The furniture may be leased or consideration given to a retailer providing furniture on loan (for example, there has been a suggestion that Ikea may like to promote its new green range).

5.2. Courtyard requirements

The design will also be required to extend to the courtyard area. Sydney Water in particular would like demonstrate the use of garden with minimal or no water usage. The designer will need to work with Sydney Water to include some modest landscaping, that is consistent with the interior design and could include:

- A slimline rainwater tank against the rear fence;
- Consider greater use of raised garden beds at rear of property to maximise access to light and provided additional garden-area seating;

- Test feasibility of vertical vegetable garden on rear fence;
- Removal of the existing water fountain;
- Incorporate worm farm 'nook' with convenient access to kitchen, and
- Expand plant portfolio to add interest.

Some additional work may also be required in the backyard to accommodate the the Blue-Gen micro generation unit, and in the garage for the battery storage and PEHV.

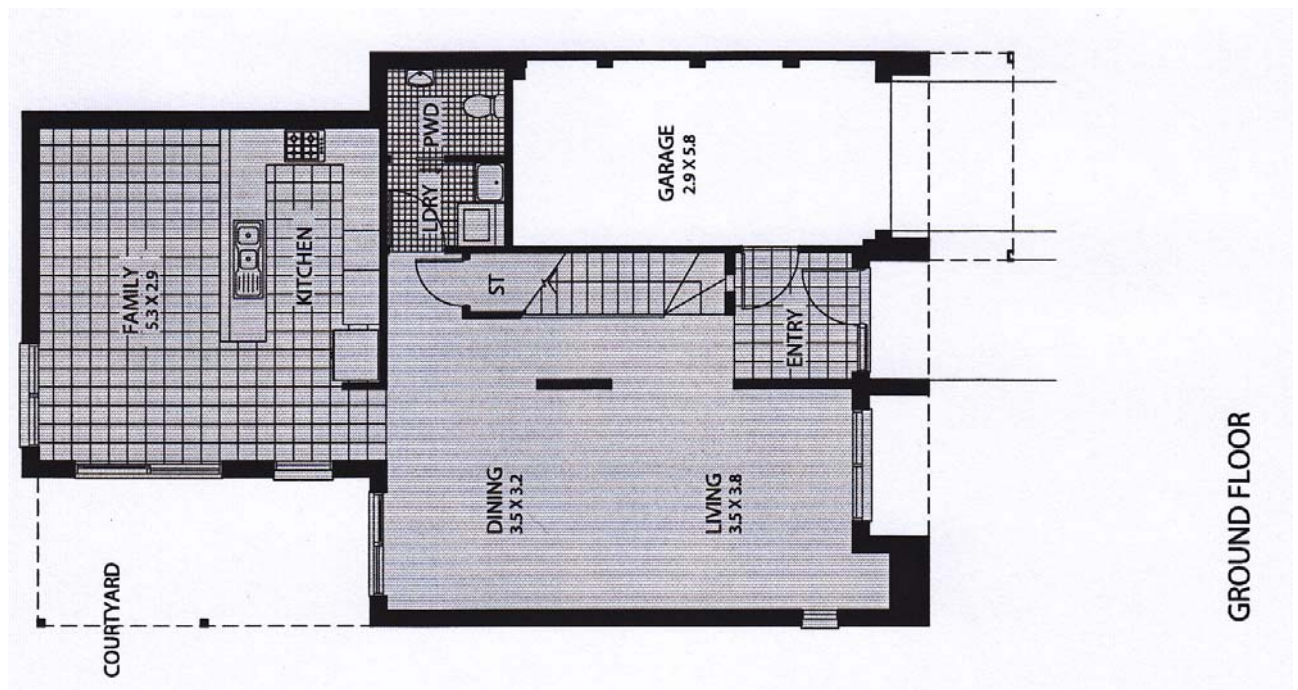
5.3. Design Brief

The objective of the house design is to present a modern, fun and uncluttered aesthetic that demonstrates that sustainability does not have to be incompatible with good design. While the design must be practical for a family of four, it needs to have a high level of visual appeal for media and the virtual tour. It should also present the appliances in an attractive manner that will generate sufficient on-line traffic. Materials used should be in-line with the house as a showcase for low energy and low water living and sustainability. A floor plan of the house is shown below at section 5.4

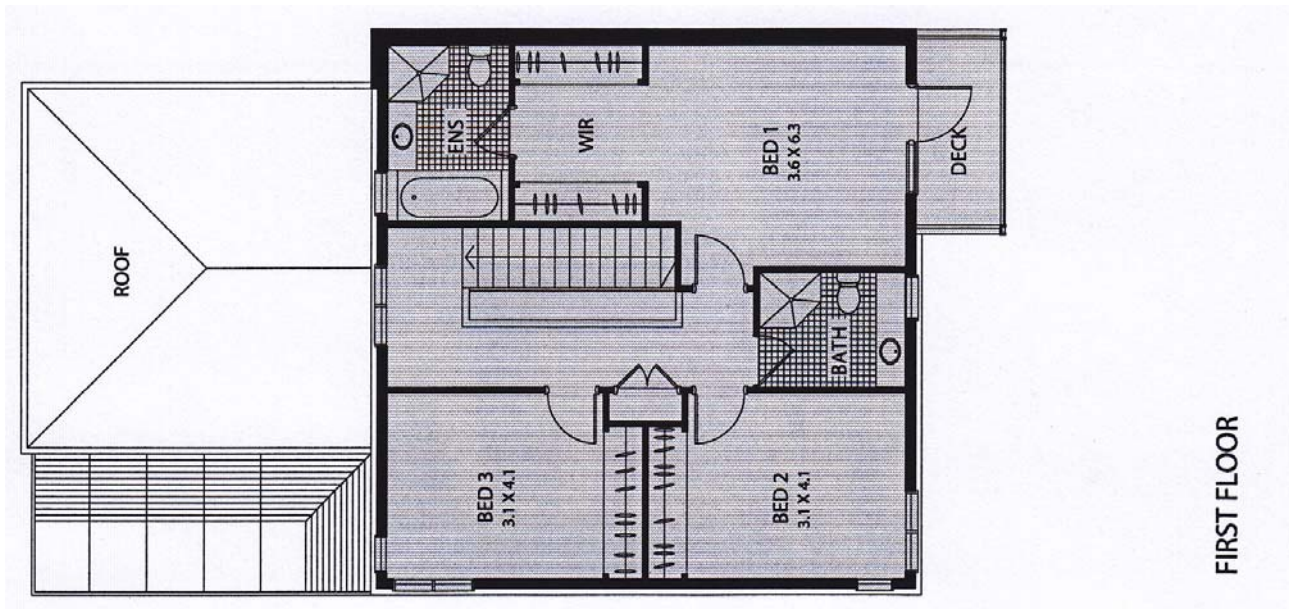
The preferred designer will be determined on the basis of the proposal that:

- best reflects this design brief; and
- demonstrates prior experience in executing engagements of this nature.

5.4. Floor Plan



Note that this floor plan does not accurately reflect the size of the courtyard. Photographs of the courtyard and interior are shown below.



6. Budget

The budget allocation for all components of the makeover, excluding appliances, but including furniture and fittings is approximately \$170,000.

7. Photo's





