

The Sustainable Living House Project



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Introduction

In early 2009 Alice Solar City (ASC), in conjunction with Desert Knowledge Australia COOLmob (now desertSMART COOLmob), held a competition to choose an average existing house to undergo a sustainability make-over and become the Sustainable Living House – a display home featuring a range of best-practice water and energy efficiency measures suitable for the arid desert environment, that members of the general public could experience, interact with and be inspired by.

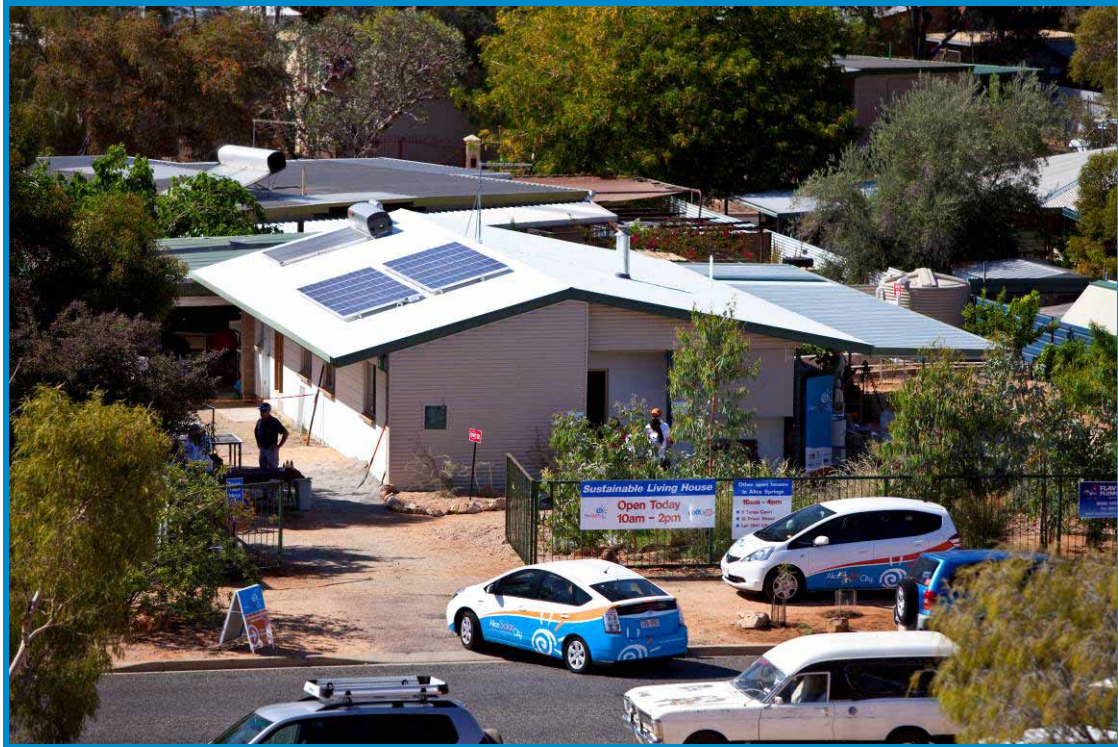


Figure 1 The first Sustainable Living House open day

The home in Kurrajong Drive, a typical ex-government house of concrete block construction, was selected from more than 60 entries. A range of energy efficiency, water efficiency and renewable energy products were installed throughout the house and garden and the public were invited to view and interact with the house on a series of open days held over a two year period.

The aims of the Sustainable Living House Project were:

- 👁️ To provide for a demonstration home for members of the public to 'touch and feel' the energy efficiency and solar energy measures being promoted by ASC and observe their benefits.
- 👁️ To generate further public interest in ASC through holding an open selection process as a competition.
- 👁️ To take Alice Springs residents on an energy efficiency 'journey', helping them to understand that the process is easy with the help of ASC and to help remove barriers to them taking up the measures themselves.
- 👁️ To generate on-going marketing and media opportunities as the project evolves, in terms of promoting the benefits of the energy efficiency measures installed, both quantitative (i.e. before and after energy and water consumption) and qualitative (i.e. thermal comfort) and the experience of the residents.
- 👁️ To transform the selected dwelling from an 'energy poor' house to an 'Energy Champion house'.

Process for Selecting the Sustainable Living House

The ASC Smart House project was announced through various local media and applications were called for from members of the public. Applicants had six weeks to submit an application, providing background information on the occupants and house type and addressing the selection criteria, as well as addressing their motivations for being involved.



Win a \$50,000 Home Sustainability Makeover

Alice Solar City and Desert Knowledge Australia COOLmob are looking for two Alice Springs households (a house and a unit) to undertake a free home energy and water makeover valued at up to \$50,000.

The makeover could include installation of energy efficient measures such as solar hot water, solar photovoltaic (PV) panels, insulation, painting the roof white, external shading and more.

An indoor, outdoor and garden water audit will be performed and installations could include flow restrictors, tap timers and an upgrade of existing fittings.

Contact the Smart Living Centre on 8950 4350 to get an application form or visit www.alicesolarcity.com.au/sustainable-living-house.

Applications close on 24 April 2009.*

*Households will be chosen through an open selection process. Applicants must be happy to open their home to the public 6 days per year (under supervision of Alice Solar City).

Alice Solar City ENERGY CHAMPIONS

DESERT KNOWLEDGE AUSTRALIA COOLmob

Australian Government Solar Cities

Figure 2 a newspaper advertisement for the Sustainable Living House competition

Selection criteria related to the suitability of the house for implementing energy and water efficiency measures, the typicality of the housing envelope, parking and access as well as general appearance and 'flow through' nature of the house to facilitate open days, the motivation and suitability of the householder(s) and their willingness to act as an ambassador for ASC and desertSMART COOLmob, among other factors.

A short-listing process and drive-by viewings by ASC staff were used to narrow down the list of applicants to approximately 5 households, according to those applicants that best fit the selection criteria. Shortlisted applicants were interviewed and a walk through assessment of each house was conducted to assess the suitability of the building for the energy efficiency measures. A summary of the selection process and the recommended household was provided to the ASC Consortium and the successful householder signed a formal agreement with ASC and desertSMART COOLmob, outlining roles and responsibilities of each of the parties.

The Sustainable Living House – 68 Kurrajong Drive

The House



Figure 3 68 Kurrajong Drive shortly after purchase

After an exhaustive selection process, 68 Kurrajong Drive in Alice Springs' New East Side suburb was chosen to become the Sustainable Living House. Kristelle Sherwood, the home owner, had bought the house a year prior and few changes had been made to the dwelling since it was built as government housing during the 1970s. Ex-government housing with a similar design and layout to the house on Kurrajong Drive is common in Alice Springs, and it was considered that choosing such a house would best highlight the transferability and suitability of energy measures for other homes around the town.

When Kristelle purchased the property there was very little shading around the house. One of the first measures she implemented was to construct a veranda on the southern side of the house to provide shaded outdoor living space. But the western concrete brick wall remained exposed to the afternoon sun, absorbing and storing the sun's energy and releasing it into the house long after the sun went down.



Figure 4 the house after Kristelle had the veranda installed, before the makeover

The bare corrugated iron roof further meant that the house absorbed a great deal of radiant heat over the course of a hot summers day, and the lack of substantial ceiling insulation (a few old fibreglass batts were sporadically scattered around the ceiling cavity, to no great effect) meant that this heat was transferred easily into the living spaces, as well as allowing the house to lose heat rapidly during winter.



Figure 5 the exposed western brick wall at the front of the house



Figure 6 the bare metal roof and aged solar hot water system before the energy makeover

Hot water was provided by an old Edwards solar hot water system, which, due to its age and condition, was regularly used on electric booster. Old, high-flow taps and shower heads meant that hot water was used up faster and a greater level of boosting was required.



Figure 7 the old solar hot water system

Some of the main appliances at 68 Kurrajong Drive were relatively old and inefficient. The existing refrigerator was a 1990s model 440L Westinghouse, with a rated electricity consumption of around 650 KWh per year. The washing machine was a relic from the past – a Hoover 770 top loader – which used 120 litres of water per load and had a relatively high level of electricity consumption compared to modern appliances.



Figure 8 Kristelle's old fridge and washing machine

The Garden

When Kristelle won the Sustainable Living House competition, the garden was a work in progress. A retaining wall for a veggie garden had been built and a few trees and shrubs had already been planted. Paving was being laid under the new veranda, but most of the plot was bare dirt and weeds. Due to the lack of garden before the makeover took place, water use in the house and garden was fairly minimal at the start of the Sustainable Living House Project.



Figure 9 Part of the garden before the makeover



Figure 10 View of the south side and front garden before the makeover

The Energy and Water Efficiency Makeover

A total of 19 energy and water saving measures were implemented at the Sustainable Living House. See the summary tables below for an outline of the measures taken to improve energy and water efficiency.

Energy Saving Measures
White Roof Paint
Solar Photovoltaic (PV) System
Solar Hot Water System
One-shot Booster Relay
Thermal Skin on Western Wall
External Shading
Heating, Zoning and Cooling
Low Energy Lighting
Smart Meter and In-house Display
Fridge Replacement
Ceiling Insulation
Solar Air Heater Installation

Table 1 energy saving measures at the Sustainable Living House

Water Saving Measures
Greywater System and Subsurface Irrigation
Rainwater Tank
Veggie Patch, Compost and Lawn
Arid Zone Swale and Native Garden
Low Flow Shower and Tap Fittings
Water Efficient Toilet
Water Efficient Washing Machine

Table 2 water saving measures at the Sustainable Living House

The total budget for the energy efficiency makeover was \$60,000, funded by ASC. For the water efficiency makeover, services and products were kindly donated by local contractors and a substantial donation was received from pharmaceutical company Roche, in order to implement many of the water efficiency measures. Federal Government and Northern Territory Government incentives and rebates for energy and water efficiency measures were utilised where possible, both to reduce costs of the project as well as to promote the incentives to the general public on open days. The Sustainable Living House Project utilised the following incentives and rebates to implement energy and water saving measures in the house:

Source	Incentive program	Used for...	Incentive amount
Australian Government	Home Insulation Program	Installation of ceiling batts	\$1,600
Australian Government	National Rainwater and Greywater Initiative Rebates	Rainwater tank and greywater system	\$500
ASC	Residential Incentive Program	Solar PV and energy saving measures	\$10,338
RET legislation	RECs/STCs	Solar Hot Water and Solar PV	\$7,911
NT Government	Water Saving Product rebate	Showerheads, tap fittings	\$50
NT Government	Water Saving Indoor Plumbing Rebate	Installation of dual flush toilet and low flow devices	\$100
NT Government	Water Saving Outdoor Plumbing Rebate	Greywater connection & Rainwater tank connection to hot water system	\$500
		TOTAL	\$20,999

Table 3 List of incentives and rebates used for the Sustainable Living House makeover

A range of measures were funded exclusively by Roche, details of which can be found in the following table.

Activity to be funded	Roche funding sought
Water audit	\$1,000
Indoor retrofit	\$3,000
Outdoor water efficiency upgrade	\$6,000
Source substitution	\$4,000
Coordination, interpretation, education and promotion	\$4,000
Administration (10%)	\$2,000
TOTAL	\$20,000

Table 4 funding acquired from Roche for water efficiency makeover

Energy Saving Measures

White Roof Paint

- The roof was originally unpainted galvanized iron. This has been painted a light colour to reflect heat during the hotter months and reduce the radiant heat gain inside the house. The white roof painting job was a donation by Barry Harrison.

Photovoltaic Power System

- Installed on the north facing roof is a BP Solar Energizer 2000, which generates approximately 3200kWh per annum at its current site, about 800kWh more than the annual household consumption. Installed as part of the ASC residential PV trial the homeowner moved onto the Cost Reflective Tariff trial, and received the peak period rate plus a top up for all power they generated, giving a great return on investment.



Figure 11 the 2KW BP Solar PV system

Solar Hot Water System

- ☀ A new 300 litre Solahart "302JOTP" solar hot water system was installed at 68 Kurrajong Drive. This Solahart model is a closed circuit system with a ceramic lined tank, to protect against freezing and Alice Springs' hard water conditions. This unit was kindly donated by Ingkerreke Outstation Resource Services.



Figure 12 the new solar hot water system on the painted white roof

One-shot Booster Relay

- ☀ When the solar hot water system was replaced a one shot booster was installed to improve booster use efficiency. When the household needs to use the electric booster in the hot water system the one shot booster automatically switches off the electric booster element after the water in the tank is heated to the required temperature. This prevents wastage from householders forgetting to turn off the booster. The One-shot booster was donated by CKS Electrical.



Figure 13 the one-shot booster relay button

Thermal Skin on Western Wall

- ☀ The western wall has no eave and previously received so much sunshine that the main bedroom on the other side of the wall was very hot for most of the year. The installation of an external colorbond "skin" with air cell insulation sandwiched between the wall and colorbond has effectively reduced solar access to the wall meaning the bedroom is now far more liveable.

External Shading

- ☀ To shade the southern half of the western wall, adjustable vertical shading was installed so the amount of sunlight can be varied according to seasonable requirements.



Figure 14 the thermal skin wall and external shading on the western side

Heating, Cooling & Zoning

- ☀ As you pass through the living room into the kitchen/dining area you will see the slow combustion wood heater which provides heating for the main living space. The design of the house allows for easy zoning of the main living space; by closing the door to the hallway, the heat is effectively trapped in the living room, reducing heat loss throughout the rest of the house.

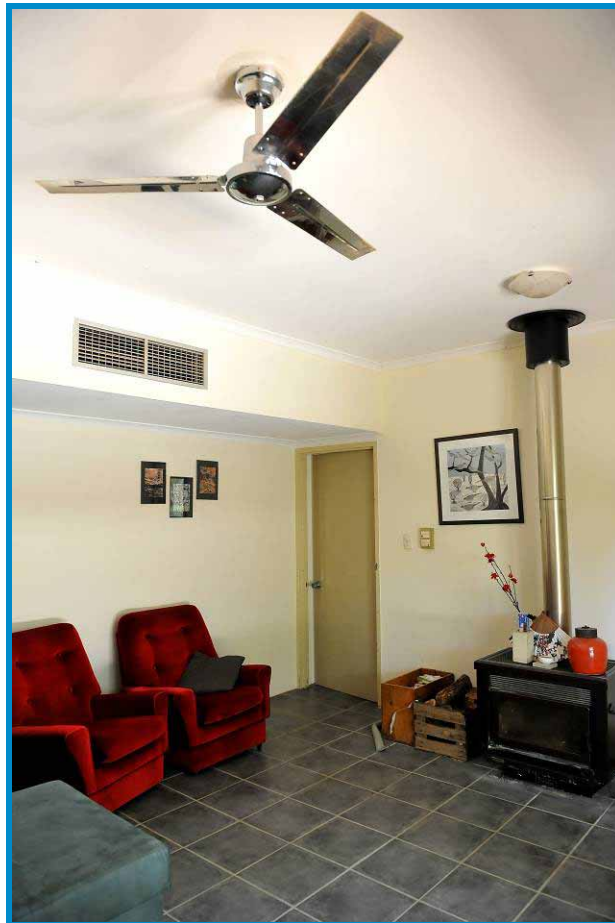


Figure 15 the living room is a good example of zoning

- ☀️ Cooling is provided using a combination of evaporative cooling, ceiling fans and natural ventilation which are all low energy options.

CFL/LED lighting

- ☀️ Lighting throughout the house is provided by compact fluorescent lamps (CFLs). In the kitchen there is a combination of CFL downlights and LED (light emitting diode) downlights instead of halogen lamps which are still very commonly used in these types of fittings. That means a reduction from 50 watts to 11 watts for a CFL replacement or down to 7 watts for an LED.



Figure 16 a variety of CFL and LED track lights were installed

Smart Meter

- The electricity meter has also been replaced with a smart meter which records and displays electricity consumption every 30 minutes. This allows the homeowner to track their electricity use all day, every day, helping them make smarter decision about when and how they use electricity.



Figure 17 smart meter recording electricity consumption and solar generation data

LCD In-house display

- As part of the BP Solar PV system, the householder received an in-house display, which displays real time and historical information on electricity consumption as well as solar generation via wireless communication with the smart meter. ASC customers who installed a BP Solar PV system also switched to a Cost Reflective Tariff, and the in-house display enabled them to monitor and adjust their consumption patterns to take advantage of peak and off-peak electricity pricing under the tariff trial.

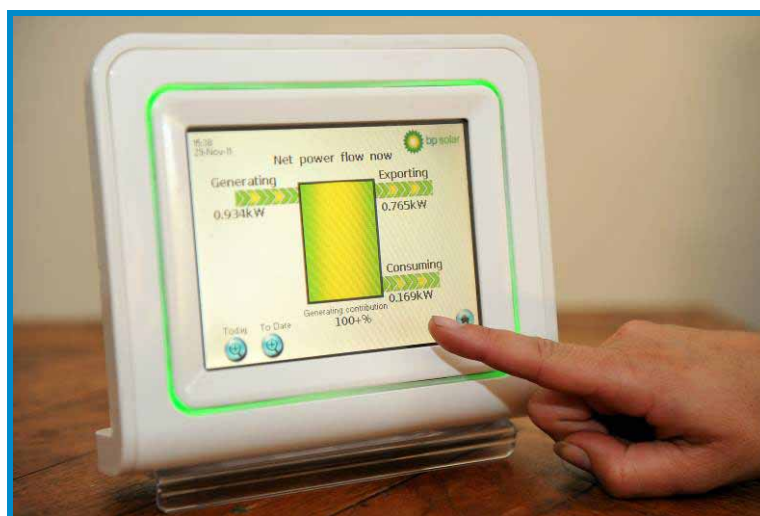


Figure 18 the In-house Display showing net power flow for the household

Fridge

- The original fridge which had a 3 star rating with a comparative energy consumption of 650kWh per annum has been replaced by an Electrolux EBM4300SC with a 5 star rating and comparative energy consumption of 406kWh per annum (Star ratings are based on the old energy rating scale, which was superseded in 2010).



Figure 19 Kristelle and her new fridge

Improving the ceiling insulation

- The Department of Environment, Water, Heritage and the Arts (DEWHA) provided a rebate of up to \$1600 for the installation of ceiling insulation during the Federal Government's Home Insulation Program, which ran from July 2009 to Feb 2010.



Figure 20 the ceiling insulation before and after installation

Solar Air heater installation

- A late addition to the energy efficiency makeover was the installation of a two-panel solar air heater from Ecoheat, which generates warm air and draws it into the house on cold but sunny days. Air is drawn into the panels, warmed by the sun and ducted into the living spaces with a small low wattage fan.



Figure 21 the Ecoheat solar air heater on 68 Kurrajong Drive

- The solar air heater is thermostatically controlled and the intelligent controller also draws cool air into the house during summer evenings once it registers the outdoor temperature as being cool enough.



Figure 22 the Ecoheat thermostat controller

Water Saving Measures

Greywater and Subsurface Irrigation

- ☞ The greywater system which diverts waste water from the laundry and bathroom to some of the fruit trees on the property. This is fed via subsurface irrigation to reduce evaporation and restrict direct contact with the greywater.



Figure 23 the greywater system

Rainwater tank

- ☞ A 5400L rainwater tank has been installed and placed in the corner of the property making use of an existing concrete slab. A first flush diverter and leaf beater reduce the amount of dust and other impurities collected in the tank.
- ☞ Rainwater is then pumped to the solar hot water system extending the life of the tank by reducing calcium build up in the tank as there are much lower levels of dissolved minerals in rainwater. If and when the rainwater tank empties, the pump automatically switches across to mains water until it rains again.

Veggie Patch, Compost and Lawn

- ☞ The patch of lawn has been planted with Kikuyu, a hardy grass which requires very little watering.
- ☞ A small vegetable patch demonstrates other elements of sustainable living such as local food production and composting.



Figure 24 visitors inspect the blooming veggie garden and the rainwater tank

Arid Zone Garden Swale and Native Garden



-  When the house was purchased the front garden contained little vegetation. Since then a swale has been constructed to improve water harvesting from natural rainfall events and the area has been planted exclusively with native plants well adapted to the arid zone that don't require large amounts of water. Since planting occurred these plants have been watered using a reticulated irrigation system and over time the amount of water used on this section of the garden has been significantly reduced as the plants become established. In the future, the front garden will eventually be taken off regular irrigation and watered only during long dry periods.
-  What's a swale? A swale is a low tract of land which acts as an open drain system designed to manage water runoff. In arid climates vegetation along the swale can benefit from the runoff concentrated in the area.



Figure 25 the swale under construction



Figure 26 the swale and native garden at the first open day

Water Efficient Toilet

- The old toilet had just a single flush function and used 12L of water per flush. This was replaced by a new toilet with a dual flush option, using just 3L or 4.5L per flush.

Low Flow Shower and Tap fittings

- As part of improving the overall water efficiency of the home the kitchen taps were replaced with 3 star water efficient fitting.



Figure 27 low flow taps were installed as part of the water efficiency makeover

Water Efficient Washing Machine

- The old washing machine was replaced by a new, energy efficient top loader with 6.0 kg capacity, decreasing water usage per load from 120L to 62L.



Figure 28 Energy and water rating labels for the new washing machine

Open Days

Between September 2009 and July 2011, the Sustainable Living House was made available for public viewing on a series of open days, held every two months. The event was advertised through local media releases and advertisements, radio segments, a column in the local newspaper and the ASC website, email newsletters to ASC customer and consortium networks, the Alice Springs Town Council Community Calendar, and a banner advertisement hung a few blocks away from the house on a prominent local roadway.

Displays

Upon arriving at the front gate of the Sustainable Living House, members of the public were given a brochure with a self guided tour map of property, with stops highlighting the various energy and water saving measures around the house and garden.

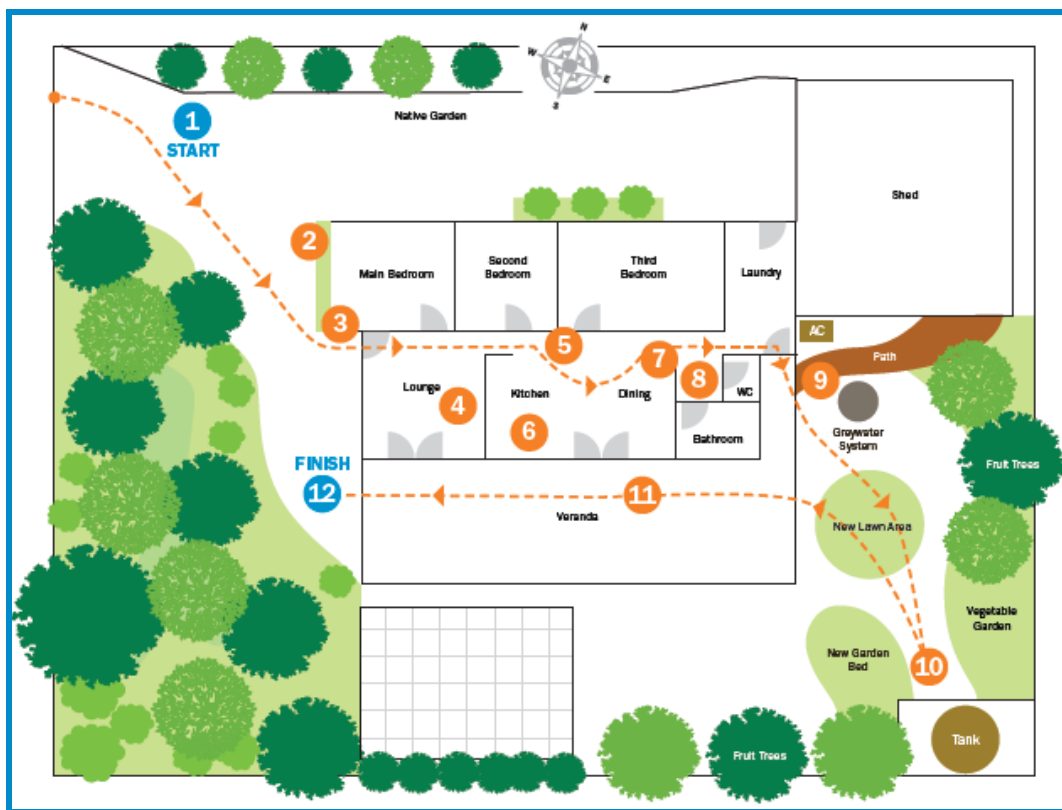


Figure 29 the self-guided tour map from the Sustainable Living House brochure

The self-guided format meant people could take their time, identify energy or water efficiency measures of particular interest to them and ask ASC or COOLmob staff on hand at the event for more information (Download the full self-guided tour document from our [website](#)). Kristelle's southern veranda area became a meeting place for the public to interact, and various displays informed visitors of the features of the house and garden, available rebates and incentives for water and energy efficiency and information on the ASC and desertSMART COOLmob programs.



Figure 30 the greywater system at stop number 9

About the garden swale

The swale was built for two main reasons. Firstly, the front yard slopes downwards to the house. Without any contouring and landscaping of the yard area, any rain which fell in the front yard washed towards and (sometimes into) the house. Secondly, planting around a swale allows any run off from the irrigation system to go into the swale rather than stay on the surface and evaporate. The plants roots direct themselves down into the water source (emulating a natural soak or desert river bed).

Steps in constructing the swale:

- 1 A bobcat was hired to dig a large hole across the front yard - like a large shallow swimming pool
- 2 An ad was put in the local paper for 'clean fill' and several people responded bringing rock and old concrete fence post foundations to fill up the hole. Rocks are ideal but anything clean that will allow air/ water gaps and won't compact down is OK.
- 3 Nicer rocks were placed on the surface of the swale and plants were planted around and a few ground cover plants on top of the swale.
- 4 Earth around the swale was landscaped to direct any rainfall to flow into the swale.



What plant is that?



1. Corymbia aperiina (Ghost Gum)
2. Myoporum parvifolium (Creeping boobialla - broad)
3. Myoporum parvifolium (Creeping boobialla - fine)
4. Eremophila glabra (Emu Bush - prostate)
5. Franteria ssp
6. Nicotiana glauca
7. Lemnongrass



8. Acacia cyperophylla (Red Mulga)



9. Eucalyptus pachyphylla (Redbud Mallee)
10. Atalaya hemisphaerica (Whitewood)
11. Dodonaea viscosa (Purple Hop Bush)
12. Eremophila maculata (Spotted Emu Bush)
13. Eucalyptus polytrachta (Blue Mallee)
14. Eremophila youngii (Native Fuchsia)
15. Eremophila maculata
16. Eremophila maccdonnellii (Splendid Fuchsia)



17. Eucalyptus camaldulensis (River Red Gum)
18. Senna
19. Artemisia sturtii
20. Eucalyptus citrodora (Lemon Scented Gum)

www.alicesolarcity.com.au

Figure 31 the garden information display sign

At the stop signs, more information could be found about each particular energy or water efficiency measure, as well as being able to see real time effects of these measures on display.

Electricity Consumption and Solar Generation

In the kitchen, people could interact with the in-house display showing energy consumption and solar generation, turn appliances on and off and see the electricity use go up and down. The Power Flow chart showed what proportion of the household's electricity consumption was covered with solar generation (more often than not it was 100% or more!) and the main screen showed the real cost of using various appliances.

Fridge Electricity Monitor

Visitors could also check on how much electricity the fridge was consuming via the PowerMate electricity monitor that was plugged in between the fridge and the power socket.

White Roof Paint Display

A small section of the roof sheeting over the verandah was painted with four different paints and thermometers were fastened to the underside of the roof sheet to display surface temperatures. This display demonstrated the temperature difference between a white painted roof and a grey or green roof, as well as comparing these temperatures against a coat of solar reflective paint.

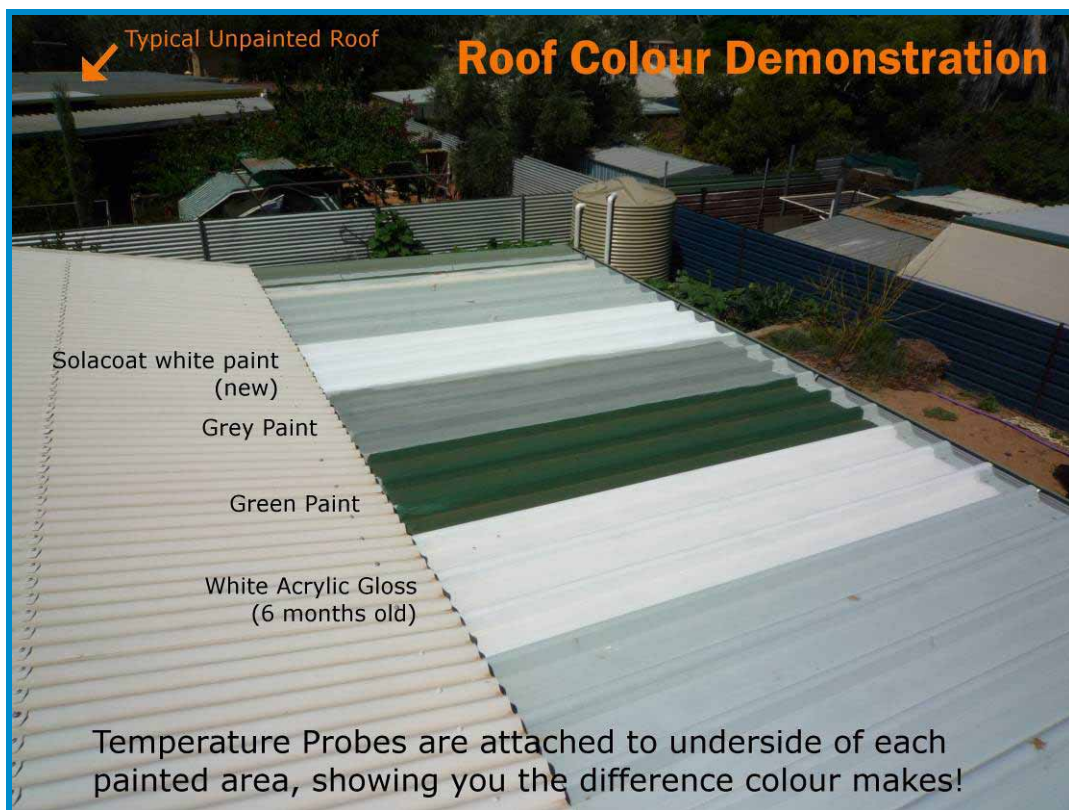


Figure 32 display sign from the roof colour demonstration

These thermometers were for public viewing and no data was stored from these measurements. However, a pattern became familiar to those who viewed the thermometers together over a number of open days. The green painted section was invariably the warmest, with the gun-metal grey in the order of a couple of degrees cooler. This was contrasted with the two white coats of paint, which were consistently and significantly lower temperatures. Depending on the weather, there could be up to 10-20°C difference between the white and the coloured roofs. This information was used to illustrate how a white roof will reflect more heat and keep the house cooler during summer.

The difference between the standard acrylic white gloss and the special reflective white paint was typically one or two degrees Celsius, which illustrated the adequacy of using a standard acrylic white gloss compared to a more expensive, specialist paint. One aspect worthy of additional investigation was how quickly and to what extent each type of paint

accrues and retains a layer of dust and grime which reduces performance. As can be seen in Figure 32 display sign from the roof colour demonstration, the standard acrylic white had accrued a noticeable layer of dust in comparison to the newly painted specialist reflective paint.

Visitors

More than 250 people visited the house on the first open day. 12 public open days plus a specially arranged visit for 63 school students brought a total of around 1300 visitors to the Sustainable Living House over the two year period - an average of more than 100 visitors for each open day. See a list of the various open day events below.

Date	Event	Visitors	Features
Sunday, 13 September 2009	National Sustainable House Day	250	Stuart Rotary Club sausage sizzle, Mayor of Alice Springs, opening speeches, energy and water efficiency advice
Saturday, 21 November 2009	Open Day	76	energy and water efficiency advice
Saturday, 13 February 2010	Open Day	174	energy and water efficiency advice
Saturday, 10 April 2010	Open Day	58	energy and water efficiency advice
Saturday, 5 June 2010	Open Day	43	energy and water efficiency advice
Saturday, 7 August 2010	Open Day	76	energy and water efficiency advice
Sunday, 12 September 2010	National Sustainable House Day	44	energy and water efficiency advice
Saturday, 20 November 2010	Open Day	76	energy and water efficiency advice
Saturday, 26 February 2011	Open Day	62	energy and water efficiency advice
Saturday, 7 May 2011	Open Day	71	energy and water efficiency advice
Friday 1 April 2011	School Student Visit	63	3 classes of students from OLSH were given presentations on energy and water efficiency and sustainability in general.
Saturday, 30 July 2011	Uterne Solar Power Station Open Day	159	Held in conjunction with Uterne Solar Power Station official open day, prizes offered for attendees of both
Sunday, 11 September 2011	National Sustainable House Day	140	Variety Club sausage sizzle, series of talks from local energy and water efficiency experts,
TOTAL VISITORS		1,292	

Table 5 a list of events at the Sustainable Living House



Figure 33 members of the public arrive at the Sustainable Living House

The first open day included a sausage sizzle run by the local Stuart Rotary Club, a speech by the Mayor of Alice Springs, Damien Ryan, and some of the suppliers and installers of the various efficiency measures were on hand, alongside ASC and desertSMART COOLmob staff, to explain the houses features to the general public.



Figure 34 Robbie Henderson, then Program Manager at desertSMART COOLmob, talks to visitors

The final open day saw 140 unique visitors to the house. The event was again timed to coincide with the national Sustainable House Day. This open day was catered with a sausage sizzle by the Variety Club, and a number of talks were given from local garden expert Geoff Miers, greywater expert Jason Flavell, ASC Manager Sam Latz and then DesertSMART COOLmob Program Manager Maggie Turnbull. This was the final opportunity for members of the public to see and interact with the energy and water efficiency measures at the Sustainable Living House.

Survey of Visitors

On five of the open day events, a feedback survey was handed out to members of the public in attendance, to try and gauge their specific interests and attitudes towards the Sustainable Living House. Prizes were offered for the completion of the survey. The survey asked respondents:

- 👁️ Whether their useful level of knowledge of each of the energy saving and water saving features had improved as a result of their visit to the Sustainable Living House; and
- 👁️ Whether their motivation to implement each of the energy saving and water saving features had increased as a result of their visit to the Sustainable Living House.

91 people completed the survey over 5 open days. Here are a few of the more interesting results:

- 👁️ A large majority of respondents felt their useful level of knowledge had improved about all of the efficiency measures in the house
- 👁️ The efficiency measures that respondents already had the greatest level of useful knowledge about (and therefore reported no improvement) were:
 1. appliance star ratings (46% of respondents reported already having installed energy/water efficient appliances)
 2. painting the roof white (24% already had a white roof)
 3. rooftop PV systems (27% had installed one already), and
 4. vertical shading (25% already had shading installed)
- 👁️ The efficiency measures that respondents reported the greatest improvement in useful knowledge about, were:
 1. water efficient garden design
 2. solar air heating*, and
 3. thermal skin walls

**The solar air heater was not installed for the first two open days, so fewer people responded to this category*

- 👁️ The efficiency measures respondents reported feeling most motivated to implement were:
 1. In-house Displays (63% of respondents were motivated to install one)
 2. Thermal Skin Wall (57%)
 3. Painting the roof white (56%)
 4. Water efficient garden design (55%)



Figure 35 ASC staff member Lisa Chin talks to a family about the in-house display

Performance Monitoring & Data

Despite a comprehensive monitoring plan being developed in the early days of the project, few of the planned monitoring projects were completed for a number of reasons. No temperature data were recorded before the makeover begun, which would have been valuable to produce a comparison of household temperatures before and after the energy efficiency measures were undertaken. A lack of budget and time resources on behalf of desertSMART COOLmob meant that the planned water monitoring activities were unable to be realised.

However, a small number of monitoring projects were completed and data collected from the household paints a great picture of sustainability.

Electricity Consumption

The household electricity consumption was particularly low to begin with, so no dramatic changes were expected to occur to her electricity consumption levels. However, a notable drop in electricity use during the winter period is evident, which can be put down to:

- ☀ the minimisation of electric boosting through the installation of the new solar hot water system,
- ☀ the installation of ceiling insulation,
- ☀ the solar air heater providing free heating during sunny winter days thereby offsetting the use of electric heaters.

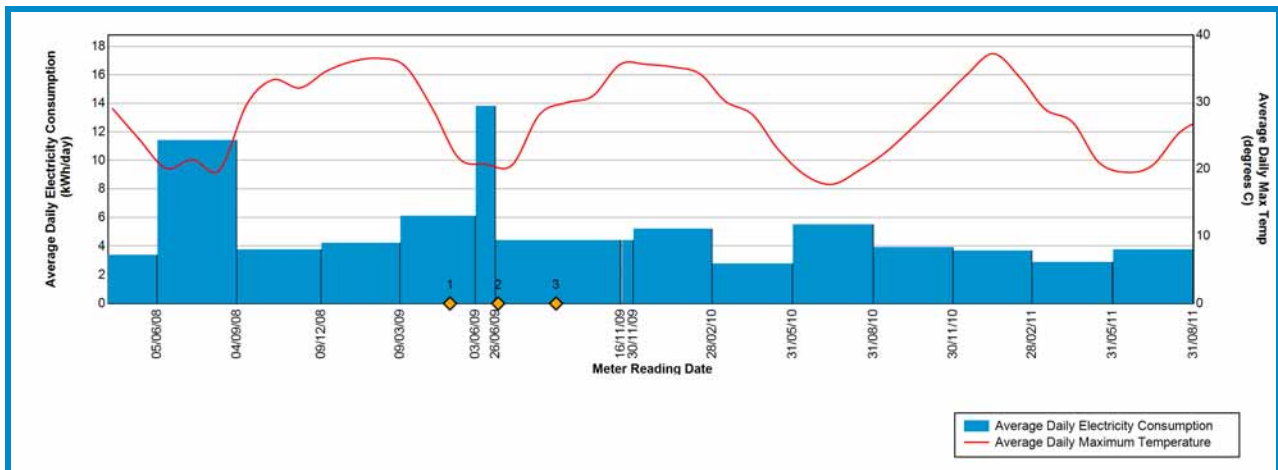


Figure 36 electricity consumption graph for the SLH

Solar Power Generation

The smart meter records solar generation data which is transmitted wirelessly to the in-house display, where it can be viewed in real time. The smart meter can also be read remotely by the Power and Water Corporation and this data was compiled by ASC into a PV System Report for the householder. The following table shows how the solar PV system performed each month since installation and what percentage of consumption was covered by generation.

Month	Year	Days of Operation	KWh Generated		KWh Consumed		Generation as a % of consumption
			Total	Daily Average	Total	Daily Average	
Feb	2012	29	296.5	10.2	93.1	3.2	318
Jan	2012	31	317.2	10.2	337.4	10.9	94
Dec	2011	31	318.5	10.3	123.4	4.0	258
Nov	2011	30	281.6	9.4	150.9	5.0	187
Oct	2011	31	280.9	9.1	108.1	3.5	260
Sep	2011	30	276.6	9.2	92.9	3.1	298
Aug	2011	31	288.6	9.3	89.8	2.9	321
Jul	2011	31	217.7	7.0	121.6	3.9	179
Jun	2011	30	217.1	7.2	136.3	4.5	159
May	2011	31	238.6	7.7	118.3	3.8	202
Apr	2011	30	300.6	10.0	62.3	2.1	482
Mar	2011	31	245.6	7.9	89.0	2.9	276
TOTAL		366	3279	9.0	1523	4.2	215%

Table 6 solar power generation and electricity consumption compared

Solar Air Heater Performance

It was difficult to perform accurate modelling of the solar air heater due to a range of variables, although it is possible to make theoretical estimates from the data collected. Based on temperature data gathered from the Sustainable Living House during the month of July, ASC was able to estimate the amount of energy generated by the solar air heater on a typical day.

During winter the solar air heater starts pumping warm air into the house as soon as the sun comes up, and won't shut off until the room reaches the set temperature or until the sun goes down. Effectively, the system runs most of the day during winter (around 8 hours). The Ecoheat system is capable of producing heat equivalent of over 10 kWh of electrical

energy in one day under optimal conditions – a full day of direct sunlight with no shading or obstruction on the panels. This is equivalent to about a third of the typical Alice Springs household daily electricity consumption.

To generate an equivalent amount of heat with direct electrical heating would cost around \$2.58 each day – a total cost of \$232 or more for a 90 day winter period. In comparison, the energy from the solar air heater comes at a daily cost of around 15 cents (to power the 70 W fan). To heat a home for the same winter period costs less than \$10 using a solar air heater.

Fridge Monitoring

The PowerMate extrapolates from the data gathered to produce an annual KWh consumption figure. The final reading after 2 years of monitoring showed that the fridge used 446 KWh a year – 40 KWh per year more than the consumption stated on the energy ratings label. This could be attributed to Alice Springs being on average warmer than the standard test conditions used for determining a fridge's energy rating and consumption.

Water Monitoring

Water consumption in the house has been reduced by replacing the various original fittings with models that have higher water efficiency. See the table below which compares the old settings with the new.

Prior to retrofit	Old Water usage	New fitting – WELS rating	New Water usage
Single flush toilet	12L per flush	4 star dual flush toilet	3L half flush 4 ½ L full flush
Showerhead	15L per minute	3 star fittings	9L per minute
Bathroom taps	12L per minute	3 star fittings	6L per minute
Washing machine	120L per load	4 star washing machine	62L per load

Table 7 water saving measures

As the retrofit included establishing a native garden and a vegetable patch, overall water use increased over the course of the sustainable living house project. This was thought to be an acceptable increase due to the nature of the garden as a model for the general public.

Local Media

The Sustainable Living House project garnered a lot of local and regional media attention during the course of the 2 years. Reports covered the opening of the competition and awarding of the prize, progress on the makeover and a number of open day features. Engagement with local media kept the Sustainable Living House in the public eye and contributed to the overall success of the project. See some examples of the positive media reports below.

Alice house goes solar

A TERRITORY house is to get a \$50,000 green makeover.

The home in Kurrajong Drv, Alice Springs, is already lauded for its "sustainable" features.

But now it will get solar power, a solar hot water system on the roof, new energy-efficient white goods, shading, efficient irrigation for the garden, insulation, low-energy light

bulbs, curtains and door weather seals.

The makeover is being carried out by the Alice Solar City project.

Kristelle Sherwood said the house was a "blank canvas" when she bought it in 2007.

"It did not have a single plant in the garden but since then I have planted over 50 native trees and shrubs," she said.

QUEENSLAND

"It is a good start — but there is a long way to go for my home to become more sustainable."

Solar project boss Brian Elmer said the makeover would turn the house into an "energy champion".

The home will be open to the public as part of Sustainable House Day in September.



FEEL THE HEAT: Brendan Coffey and Kristelle Sherwood at the Kurrajong Drive home in Alice Springs, which has been awarded a \$50,000 solar makeover. Picture: DERRICK DEN HOLLANDER

Figure 37 story announcing SLH prize winner

\$50,000 brightens the day

Daniel Burdon

AN Alice Springs woman has won a \$50,000 sustainable living house makeover of her Eastside home.

Kristelle Sherwood bought her former public housing home on Kurrajong Drive in late 2007.

She said when she bought the property it was a blank canvas, and the house was a fairly standard Alice Springs three bedroom home.

Ms Sherwood said: "When I bought the house it did not have a single plant in the garden but I have

planted more than 50 native trees and shrubs.

"I have also planted a vegetable garden and fruit trees, installed a veranda for shade and changed tap fittings.

It's a good start, but there

'When I bought the house, it did not have a single plant in the garden but since then I have planted more than 50 native trees and shrubs'

is a long way to go for my home to become more sustainable."

The Sustainable Living House project was an initiative of Alice Solar City and COOLmob water conservation programs.

Ms Sherwood will get solar hot water systems, solar power, energy efficient white goods, garden irrigation, shading and home insulation.

Alice Solar City general manager Brian Elmer said the house would allow people to see "first hand" a wide range of measures that will significantly reduce water and power bills.

Mr Elmer said he expected the house to be open to the public on Sustainable

House Day in September, and on other days over the next two years.

COOLmob project manager Robbie Henderson said: "We will also be looking at installing water efficient measures such as a five-star rated dual-flush toilet, front-loading washing machine, grey water system and rainwater tank."

Each open day will showcase the progress of the home as it becomes more sustainable, including presentations, displays, and the results of monitoring how the house is performing.



COOLmob project manager Robbie Henderson, Kristelle Sherwood and Brendan Coffey, and Alice Solar City general manager Brian Elmer at Kristelle's home which will get a \$50,000 solar makeover. Picture: DERRICK DEN HOLLANDER

Figure 38 Centralian Advocate feature on the SLH

Alice power house

It makes 6 times electricity needs



Alice Solar City general manager Brian Elmer with horticulturist Graeme Martiska and Kristelle Sherwood at the house. Picture: DANIEL BURDON

Daniel Burdon

A HOUSE in Alice Springs produced more than six times the electricity it used in one month. And it will be open to the public tomorrow as the town's best sustainable living house.

Kristelle Sherwood owns the house at 68 Kurrajong Drive which has had several improvements since its previously open in September, including a new zoned irrigation system.

Alice Springs Desert Park horticulturist Graeme Martiska installed the system, which has three zones — one for a native garden, one for a vegetable garden and the third for citrus trees.

He said different types of plants needed different amounts of water and light to grow

properly, and that having one controller instead of a range of plastic hose timers was a good plan, and could save water if used properly.

Ms Sherwood said that, in October, the solar panels on the roof produced 373kWh, of which she and her partner only used 61kWh.

The remaining 312kWh was sold back to the town grid — which will help her save on future water and power bills.

Ms Sherwood said: "I might even get some money back as well."

The Alice Solar City Sustainable Living House will be open for visitors who want to know more about saving energy and water from 1pm until 4pm tomorrow.

● See Page 17

Figure 39 Local media story on the Sustainable Living House

Don't miss eco home

SUSTAINABLE homes around Australia will be holding open days for National Sustainable House Day on Sunday.

It is the final opportunity to inspect the Sustainable Living House at 68 Kurrajong Drive.

In early 2009 Alice Solar City, with Desert SMART COOLmob, went on the search for a household to become a public showcase for sustainable living.

More than 60 entries were received from the community with six being shortlisted before the final property was chosen.

The person who owns the Sustainable Living House bought the property in 2007 and had been working to make the home more sustainable.

After winning the competition, \$50,000 was spent on the house to make it a model of sustainability.

Making the house available for public inspection was part of winning the competition and Sunday sees the end of the open days.

Current occupier Maggie Turnbull said it has been easy to adjust to living in the house.

Only a little bit of consideration was needed for maintaining efficient use of some of the house's water and energy-saving measures.

With a grey water recycling system in place, she said it was important what bathroom and laundry products she was using.

Ms Turnbull added that it wasn't a problem when she realised what would be healthy for citrus trees would probably be healthier for her skin and hair.

The grey water system has a filter and is used for sub-surface watering in the garden.

A rainwater tank has been installed with a clever design which diverts the first-run dirty water from the roof after a long period between rains.

The water comes back to the house and is heated by the sun for delightful hot showers.

The house has a "one-shot" booster for when there are cloudy days which is manda-

tory with installation through the Alice Solar City project.

When Ms Turnbull went through her energy-use history on the LCD energy generation and consumption display in the house, the only spike during recent months was for a one-time use of the booster.

Energy use in the house was very low compared to an average home.

The house has the roof painted white to reflect heat and has a second 'skin' on the western side to help reduce the house heating up.

Along with shade screens and the use of plants to help keep the sun off the house, Ms Turnbull said she probably used the airconditioning less than a dozen times last summer.

There are many more measures in the house that make it sustainable so take this last chance and come to the open day and see for yourself.

Figure 40 Centralian Advocate article about the last SLH open day





Partners and Sponsors

The Sustainable Living House Project was the result of a collaborative partnership with a number of local and national stakeholders, and built on the success of the Arid Land Environment Centre's 'Cool Living House' project that ran from 2002 to 2003.

The following people and organisations were crucial to the setup and operation of the project over the two year period.

Sustainable Living House Project Managers







The Sustainable Living House Project was managed by a number of key staff members from ASC and desertSMART COOLmob over the course of the two year program:

-  Lisa Chin (ASC)
-  Robbie Henderson (desertSMART COOLmob)
-  Karen Montey (ASC)
-  Maggie Turnbull (desertSMART COOLmob)

Reference Group

The Sustainable Living House reference group was a dynamic group of stakeholders with diverse interests, expertise and experience in urban sustainability. The group met regularly with ASC and Desert Knowledge Australia COOLmob (now desertSMART COOLmob) project managers to offer innovative ideas, provide constructive feedback, identify opportunities and develop partnerships to support the development of the Sustainable Living House project.

Reference Group Members

-  Alan Whyte (Power & Water)
-  Glenn Marshall (ALEC)
-  Tanya Howard (NRETAS)
-  Roger Chapman (Sustainable housing expert)
-  Gary Dinham (Alice Springs Desert Park)
-  Laurelle Halford (Creative Territory)

Other Contributors

ASC and desertSMART COOLmob would like to thank the following organisations, businesses and individuals for their contributions to the project:

-  Roche Products
-  Power and Water
-  Department of Natural Resources, Environment, the Arts and Sport
-  Arid Lands Environment Centre
-  Alice Springs Desert Park
-  CKS Electrical
-  Barry Harrison Painting
-  Ingkerreke Outstation Resource Services
-  BP Solar
-  Agnew Electrics
-  Jason Flavell - Flavell Plumbing
-  Geoff Miers' Garden Solutions
-  Roger Chapman

You can still tour the Sustainable Living House! The interactive Sustainable Living House tour is available to view at www.sustainablelivinghouse.com.au