

A U S T R A L I A N

ZERO EMISSION DEMONSTRATION HOUSE



Australian Zero Emission House

AUSTRALIA'S FIRST ZERO EMISSION HOUSE DESIGNED FOR THE EVERYDAY FAMILY



3

The AusZEH Demonstration House is a new 4 bedroom detached 8-star energy rated home that aims to deliver a residential home with a net zero footprint. The demonstration house forms part of the AusZEH project which aims to demonstrate technologies and innovative solutions to reduce greenhouse gas (GHG) emissions in the housing sector.

AUSTRALIAN ZERO EMISSION DEMONSTRATION HOUSE

WWW.AUSZEH.ORG.AU

This project has brought together industry and government in a consortium including:



The aim is to deliver a carbon neutral home through a combination of energy efficient design and building practices and on-site renewable energy supply so that its net or remaining total GHG emissions is zero.

After the Zero Emission Demonstration House (AusZEH) is on display and open to the public for a period of time, the AusZEH will be occupied by tenants for approximately twelve months

while monitoring energy use and GHG emissions over this period. The monitored demonstration home will consequently provide the industry with live household energy usage reports.

The AusZEH's performance will then be evaluated against other homes within the surrounding suburbs to gauge the success of the project and help identify key areas for further improvement.

ZERO EMISSION FOR A CLEAN, GREEN FUTURE

4



Achieving Zero Emission will be the result of the homes:

- ✓ **8-STAR
SMART DESIGN**
- ✓ **ENERGY SAVING
AND EFFICIENCY**
- ✓ **SOLAR ENERGY
GENERATION**

KEY ENVIRONMENTAL AND MARKET OUTCOMES:

Outcome 1: To use 70 per cent less energy than a traditional home.

About half of Australia's yearly GHG emissions from buildings come from energy usage in homes. This is 13 per cent of total GHG emissions from all sectors, and keeps growing everyday.

Outcome 2: To apply 8-star smart design and building principles developed for the AusZEH to mass market housing into the future.

Outcome 3: To develop a simple and practical energy management and monitoring system to enable households to make the right decision on energy consumption and use.

Households don't really have a level of understanding on energy consumption, as demonstrated by the imbalance between peak and off peak demands. We want to be able to highlight what can be achieved and the behaviours that can be changed through smart house design, as well as smart monitoring of household usage.

Outcome 4: To use the data and insights gathered from the monitoring system and research project to identify key areas of development and improvement for sustainable housing into the future.



SUMMARY

LOCATION

Laurimar community (Delfin Lend Lease),
Doreen

HOUSE

Kube Collection (by Henley Properties)
Model KZ001

HOUSE FAÇADE

Model - Z1

HOUSE SIZE

241.5m² (26.0 squares)

HOUSE DIMENSION

12.6m width 24.4 depth

8-STAR ENERGY RATING INCLUSIONS

- Good design orientation and shading
- Brick veneer construction and insulated waffle pod
- EnviroSeal™ roof and wall insulation
- Double glazing to all windows & sliding doors
- Advanced home sealing to significantly reduce air leakage throughout the home
- Solar hot water system
- Zoned Inverter ducted heating and cooling system
- Energy efficient lighting & appliances
- Three 1,000 litre water tanks used for flushing toilets and watering the garden
- Water recycling system
- Smart household energy management system
- 6 kilowatt solar energy generation system

5

8-STAR SMART DESIGN

6

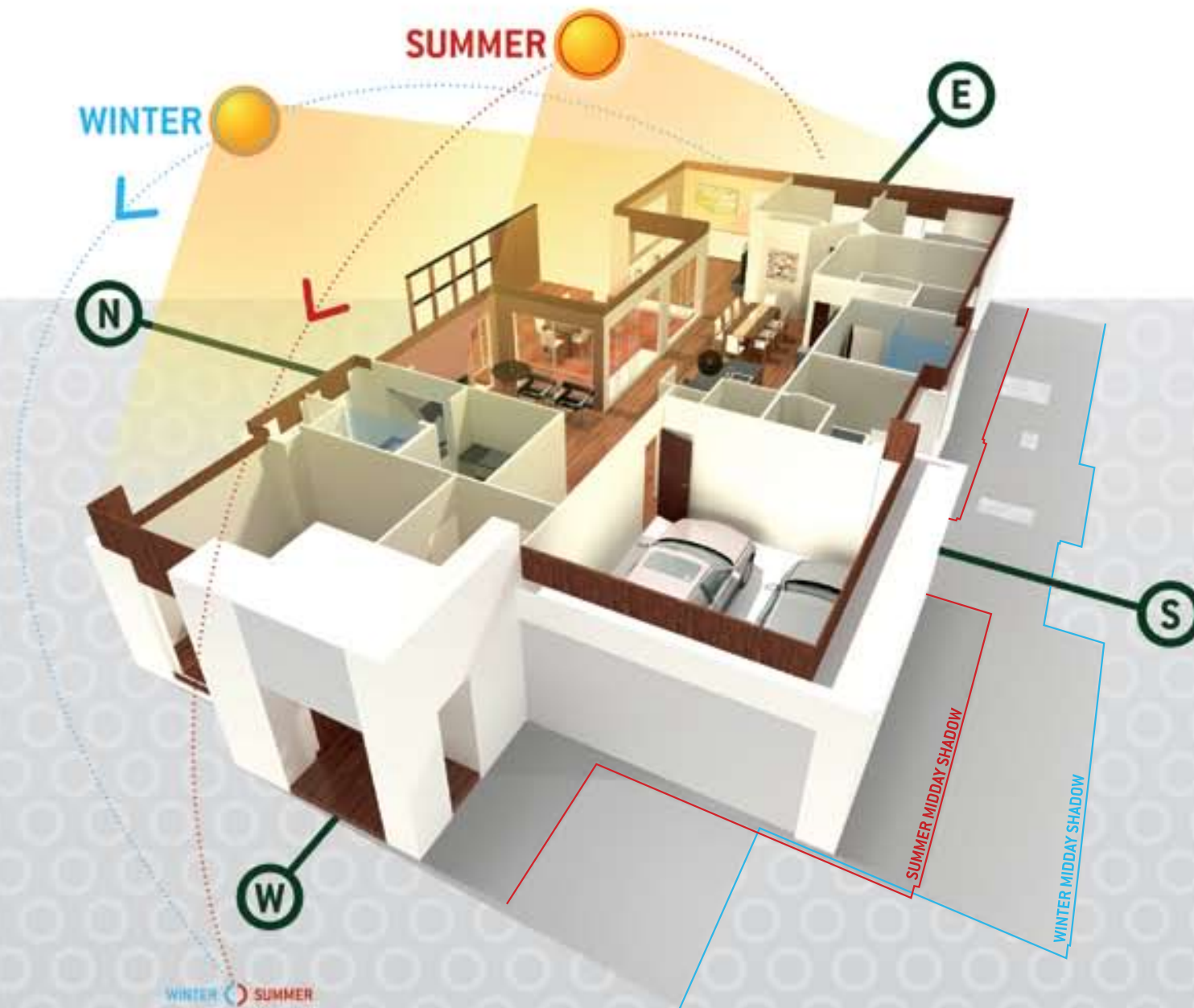
The AusZEH, designed by Henley Property Group in consultation with CSIRO and Delfin Lend Lease, has achieved an 8-star energy rating using the 'AccuRate' assessment tool.

A house energy rating is an index of a building's thermal performance (i.e. heating and cooling requirements) for residential homes in Australia.

Developed by the CSIRO, the 'AccuRate' software has been designed to simulate the heating and cooling energy efficiency of residential buildings.

When you walk into the AusZEH, it may look like any other new home. The difference, however, lies within – its thermal performance. With an 8-star energy rating, the AusZEH relies on the combination of the following features:

- northern orientation and retractable shading options
- brick construction and higher levels of insulation to the wall and the ceiling
- double glazing to all windows and sliding doors
- insulated waffle pod concrete slab (foundation)



AUSZEH PERFECTLY IN ITS ENVIRONMENT

7

ORIENTATION AND SHADING OF THE AUSZEH

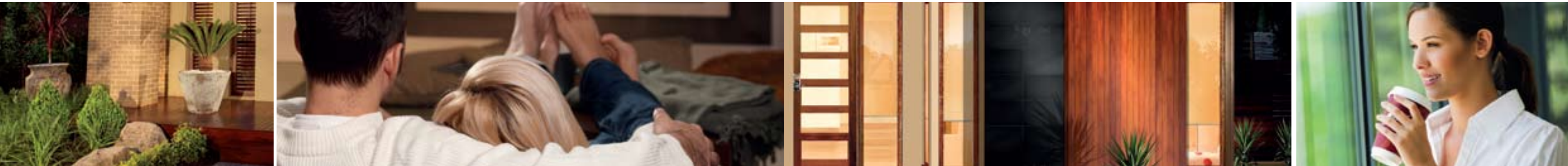
Good orientation works on the basis of designing a home which takes advantage of its climatic and regional conditions. Good orientation increases the energy efficiency of a home by reducing the need of additional heating and cooling, resulting in decreased GHG and lower energy bills.

The AusZEH is located in a climate that requires more heating than cooling to keep the home at a comfortable temperature. The AusZEH uses the sun as a natural source of free heating during the winter (a.k.a: passive heating). The smart design therefore makes the most of the sun's warmth to heat the home with the living rooms' windows facing north. The windows transfer winter solar energy when the sun sits low in the sky and excludes summer sun when it's sitting directly above the house.

The northern windows are also shaded from the hot summer sun using an extendable awning and exterior blinds by Helioscreen. The exterior blinds are made from a fabric that reduces the sun's heat by up to 90 per cent.



8-STAR SMART DESIGN AT EVERY CORNER



BRICK VENEER CONSTRUCTION

8

The AusZEH has been constructed from wooden framing with brick veneer. This makes the AusZEH warmer in winter and cooler in summer as the thermal mass releases and absorbs heat to balance internal and external temperature fluctuations.



WAFFLE POD

An insulated waffle pod is an engineered slab design featuring a grid of internal beams created around polystyrene pods. This is the same material used in a take away coffee cup, and just like it keeps your coffee hot; it keeps this house warm by minimizing heat loss to the ground below.



INSULATION

Insulation acts as a barrier to heat flow and is essential to keep your home warm in winter and cool in summer. A well insulated and well designed home will provide year round comfort, cutting cooling and heating bills significantly.

You might often see insulation referred to with an R-Value, but what is it? The R-Value refers to the thermal resistivity of the insulation and, in simple terms, the higher the R-Value, the better the thermal performance.

Bradford Gold batts are designed to insulate by reducing heat transfer through the roof and external walls

of the house. They are placed in the wall cavity of the frame and act like a blanket thrown over your house.

With this in mind, the AusZEH has been built with CSR Bradford EnviroSeal™ and Bradfords Gold Batts, using R6 in the ceiling and R2.5 in the walls.

The Enviroseal™ wall wrap and roof sarking is a reflective foil which improves thermal comfort by reducing radiant heat transferring into the home. This wrap is attached to the wall frame and roof trusses then sealed with tape to reduce airflow.



WINDOWS & GLAZING

Window or door glazing has a major impact on the energy efficiency of the building envelope. Windows can account for more heat gain or loss than any other element of the home.

For that reason, several factors need to be taken into consideration such as building materials, climatic conditions, the size and location of windows and thermal properties of glazing units.

Firstly, the balance between the size of the windows and the extent of the insulated wall is important as up to 40 per cent of the energy used to heat or cool a home can be lost through the windows. The AusZEH windows have

been carefully chosen to maintain year-round comfort by reducing the need for artificial heating and cooling and hence minimising energy consumption.

The AusZEH has been constructed with timber windows which in turn transfers less heat than other materials such as aluminium. These windows have two panes of glass with a sealed gap which contains a substance that removes the moisture trapped in the air space. These double glazed windows reduce the amount of heat gain through summer and stop heat escaping from the house in winter. In fact, these windows reduce winter heat loss by a massive 60 per cent!



AIR BARRIER TECHNOLOGY

9

Uncontrolled Air Leakage is a major source of energy loss that contributes unnecessary cost to the heating and cooling of many homes. The cracks and sources of leakage in a house that allow conditioned internal air to escape to the external environment need to be controlled. The Air Leakage of AusZEH has been minimised by the inclusion of simple sealing actions undertaken throughout the build & construction phase of the house.

Essentially, the use of high quality building products and quality construction methods with an eye for detail, have resulted in a huge improvement in the home's leakage performance. The resultant air leakage performance of this house is approximately 60 per cent improved in comparison to a standard 5-star rated home.



ENERGY SAVING & EFFICIENCY

SOLAR HOT WATER

10

Traditionally in Victoria, hot water systems have been the single biggest energy consumer. However, over recent years solar hot water systems have been reducing this load.

This home utilises a twin flat panel solar hot water system to provide up to 75 per cent of the hot water needs using the sun's unlimited free energy.



INVERTER HEATING & COOLING SYSTEM

The AusZEH has been equipped with a Daikin Ducted System. This split system which has a heating capacity of 16.3kW and cooling capacity up to 15.0kW is more energy efficient than a conventional non-inverter system. It uses advanced technology that gently increases or decreases power until it reaches the desired temperature, maintaining it without great fluctuations.

This technology in conjunction with the ZEH's four zoned areas, optimise comfort levels while offering savings on running costs, as unnecessary consumption is eliminated by air conditioning only the areas needed.



OPERATING LIGHTING

The AusZEH has been equipped with what at first sight might look like normal halogen downlights. These lights, however, are in fact energy efficient compact fluorescent lights that use 25 per cent of the power of halogen lights.

Many people mistakenly think that low voltage halogen lamps are low energy lamps, but in fact, each light consumes 50W with an additional 10W being consumed by the transformer, compared to the 15W from the lamps installed at the AusZEH.



SAVES MONEY AND THE ENVIRONMENT

ENERGY EFFICIENT APPLIANCES

11

Kitchen appliances can consume a lot of power. The appliances at the AusZEH have high star ratings, which mean that they consume less power than many of their rival products.

When selecting your appliances make sure you check the star rating. Dishwashers, fridges, washing machines and now televisions all have a star rating which lets you compare how much electricity and gas different products use. The more stars on the label, the more energy efficient your household appliance is.

WATER SAVING

WATER TANKS

12

The house has three 1000 litre water tanks that store rain water that falls on the roof. This water is used to flush the toilets and water the garden. Over a year, these tanks can capture 80 kilolitres of water and could provide 50 per cent of the homes water requirements.



WATER RECYCLING

The AusZEH has a sophisticated water recycling system that takes the water from the showers, bath and washing machine, filters it and pumps onto the garden to keep the garden healthy and alive. Depending on usage patterns, the system can recycle up to 500 litres of water a day.



SUSTAINABLE WATER USE IS ONE OF OUR NATION'S MAJOR CHALLENGES

13



SOLAR ENERGY GENERATION

14

The AusZEH has been equipped with a Rezeko 6kW array of 36 solar panels mounted on the roof for on-site energy generation.

Each solar panel contains photovoltaic (PV) cells which convert free solar energy - the most abundant energy source on the planet - into electricity.

These PV cells produce direct current (DC) electricity which is then directed to an inverter that converts the low voltage DC to higher voltage alternating current (AC) power. This AC current then goes back into the grid which is consequently tracked by the AusZEH Home Energy Management System to calculate the difference between the electricity used and produced by the AusZEH.



AUSZEH GENERATES ITS OWN ENERGY

15

SMARTER HOUSEHOLD ENERGY MANAGEMENT TO REDUCE EMISSIONS

The AusZEH energy management system has been developed by the Centre for Technology Infusion at La Trobe University in partnership with CSIRO and Telstra.



INTELLIGENTLY CONTROL YOUR HOME'S ENERGY USE

AusZEH has a specially designed energy monitoring and management system that allows the occupants of the house to monitor and control:

- power used by individual appliances and in different zones of the house
- power generated by the on-site PVs and stored on-site
- power drawn from the grid
- water drawn from the mains
- water drawn from the on-site rainwater storage

The system can also estimate and display energy, cost and emission savings from a range of energy-saving options, such as reducing stand-by power, or more effective usage of heating, cooling and lighting systems in the house. A reporting engine is able to generate customised reports of power consumption for different timescales, household appliances and zones.

The system is able to intelligently control the main energy-consuming devices in the house, such as air conditioning, hot water booster, and electric vehicle charging, depending on the

price of electricity at different times of the day, the occupants preferences, and the availability of solar power from the on-site PVs. It can also automatically switch off stand-by power in different zones of the house at specified times. The intelligent control options can be overridden by the occupants at any time through the touch-screen interface.

The system allows energy stored in an electric vehicle, or on-site batteries to be used to power appliances in the house during times of peak electricity demand or price.

TOUCH SCREEN HOUSE DISPLAY



All energy and water usage information is displayed in the house on a touch-screen interface, that can be accessed remotely via the internet or a mobile phone. The display will show the occupants at-a-glance energy consumption of different appliances in the house (e.g. the air conditioner) or of specific zones (e.g. living areas or kitchen).

The occupants can drill-down on individual appliances or household zones to display breakdowns of daily, monthly, or annual consumption patterns, costs and carbon emissions. This information will help them adapt their behaviours to reduce emissions, and take maximum advantage of the on-site PVs.

TOUCH SCREEN ENERGY MONITORING



The monitoring and control system in AusZEH is 'smart-grid' ready, which means that devices can potentially be controlled via the main house 'smart meter' according to the occupants agreement with their electricity provider.

In addition to the central touch-screen interface, the occupants will also be able to interact with the household energy management functions through a suite of new generation devices under development by Telstra, that will be specially connected to the house energy management infrastructure. These include a set-top box, the wireless internet router, a portable tablet computing device, and the occupants mobile phones.

SUSTAINABLE HOMES ARE THE FUTURE

18

Our vision is to continue to push the boundaries and look forward to providing Australian families with the opportunity to access sustainable and affordable homes into the future.

Henley has always lead the way in pioneering sustainable and environmental initiatives in new homes. From being the first major builder to introduce 5-star energy rating homes, five years before the government made it mandatory through to other leading sustainable initiatives such as 5-star heating as standard.

The CSIRO, Henley and Delfin Lend Lease are committed to continually pushing these boundaries. Our collective aim is for one day all new homes to significantly reduce household energy requirements and generate their own solar power, saving GHG and electricity bills into the future.



BECAUSE IT
MATTERS FOR
OUR CHILDREN
AND OUR
CHILDREN'S
CHILDREN

19



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