





UDIA State Conference 2008

“MYTH BUSTERS”

Sustainable Energy use in the Home
&
House Energy Ratings



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What is Sustainable Development?

“Sustainable Development is development that meets the needs of the **present** without compromising the ability of **future generations** to meet their own needs”

Source: Report of the Brundtland Commission: Our Common Future 1987

There are hundreds of definitions for Sustainable Development. When referring to sustainable developments, the issue is the efficient use of resources and minimising the negative effect on the environment.

The description used here is from the United Nation's Brundtland Commission.



Build a Sustainable Building?

MYTH!

- It doesn't exist yet (but we are working towards one!)
- We need to make urgent changes, because on a global scale, buildings:
 - Consume about 40% of all material resources
 - Consume about 40% of all energy produced
 - Generate about 40% of the solid waste stream
- A true sustainable building will have:
 - Zero environmental emissions
 - Zero environmental depletions

Source: Solar Dwellings



- **Sustainable design**
 - Design for climate
 - Passive solar design
 - Active solar design
 - Passive cooling
 - Energy efficient design



Source: Building Code of Australia

What do these mean?

You may have heard the terms - what do they mean?

Sustainable design (to current BCA standards) takes a life cycle approach to building design – the construction cost of the building compared to the running costs for water and energy over the lifetime of the building.

To achieve sustainable design it is imperative to design for climatic conditions so that the home reduces reliance on mechanical heating and cooling. This will result in less energy consumption and less waste.

This seminar will outline and explain each of these elements of sustainable design (relevant to the climatic zone).

Why Design for Sustainability?

- An energy efficient home results in:
 - Greater comfort levels
 - Reduced energy use
 - Reduced energy bills
 - Reduced greenhouse gas emissions

If you're building or renovating it makes sense to make your home as energy efficient as possible.

An energy efficient home offers many advantages, including:

- More time in the year that it is naturally comfortable, and
- Less impact on the environment.




Designing an Energy Efficient Home

- Design for thermal comfort
- Design for reduced reliance on mechanical heating and cooling
- Design for reduced energy consumption
- Design for greater cost savings
- Design for lower greenhouse gas emissions
- **Design for climate**

It cannot be stressed enough that to create a more comfortable home,—the home must be designed appropriately for the climate in which it is to be built.

A building that is designed to suit the climate will maintain a more comfortable temperature all year round, reducing reliance on artificial heating and cooling and thus reduce energy consumption, running costs and greenhouse gas emissions.



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Building Design

6 Main Points

1. Type of Construction/Building materials (including thermal mass)
2. Site and orientation (considering the sun's path overhead - including internal room layout)
3. Windows
4. Airflow/Ventilation
5. Shading (including landscaping)
6. Insulation

A house design relies on combining a range of key factors.

Good design will take into consideration:

6 Main Points

- Type of Construction/Building materials (including thermal mass)
- Site and orientation (including internal room layout)
- Windows
- Airflow/Ventilation
- Shading (including landscaping)
- Insulation

The key objective lies in modifying each element to suit the climate zone for which the house is being designed.

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Building Design: Solar Design

Active Systems

- Solar hot water
- Photovoltaic energy
- Solar air heater



Source: Solar Dwellings

Passive Systems

Heat and air move by natural means.

The building structure acts as:

- Solar collector
- Heat energy storage
- Heat energy transfer mechanism
- Cross ventilation control

Minor role by occupants or mechanical systems (open/close windows and drapes)

There are two approaches to using solar energy in buildings:

Active systems involve energy collection and then use:

- Solar hot water
- Photovoltaic energy
- Solar air heater

Passive systems use design and materials to control energy flow through a building (solar and wind energy). Heat and air moves by natural means.

The building structure acts as:

- Solar collector
- Heat energy storage
- Heat energy transfer mechanism
- Cross ventilation control

Minor role by occupants or mechanical systems (open/close windows and drapes)

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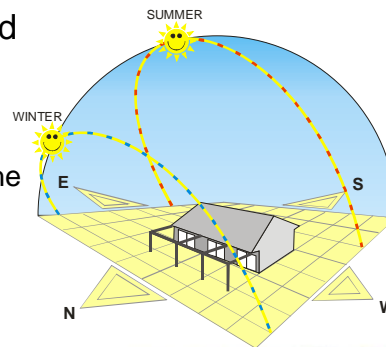
In hot and humid climates such as the North West of Western Australia, (where it is warm to hot year round), the aim is to utilise passive methods of creating airflow to help keep the building cooler while preventing solar heat energy being collected and stored.

In temperate and cold temperate climates such as the South West and lower South West of Western Australia, (where there are four distinct seasons with warm to hot summers and cool to cold winters), the aim is to utilise passive methods of creating air flow to keep the building cooler in summer. In winter solar passive collection, conduction and storage design methods should be utilised to keep the building warmer.



Building Design: Passive Design

- Orientation is a key design feature for all climates.
- Ideally buildings should be orientated to within 15 degrees of North to:
 - prevent summer sun penetration
 - direct cooling breezes to ventilate the building
 - keep the home naturally warm in winter (cooler climates).



The sun's path in the sky varies from season to season.

Correct **design of** eaves overhang on the North allows simple exclusion of excess summer sun **while allowing** penetration of winter sun.

Other exterior shading devices such as sails, trees, pergolas and verandahs can **also** be used to control sun penetration in various seasons. The appropriateness, amount and positioning of shading varies for different climate zones.

Good orientation allows passive sun **heating effects** and ventilation control **through the use of breezes to provide heating and cooling at low or zero** cost.



Energy efficient homes are all about house design - MYTH!

- Lot size and orientation has great potential influence over house performance
- In WA it is relatively easy to meet current minimum BCA energy efficiency standards
- More difficult to go further than 5 star without consideration of correct lot orientation.



Using the compass card

- North – the most comfortable place to be
- South – cool breezes
- East – keep the summer sun out
- West – very hot so shade in summer

You will have a compass card in your info packs, please get them out and we will quickly work **with** them together.

Move so that the 'N' needle lines up with the 'N' sector on the card. Design Guidelines are on each compass point (N, S, E, W) and are appropriate for temperate climates such as Perth and the south-west of WA.

If you are building a new home, take these concepts into account **to** integrate solar passive design **into the house design**.

If you are living in an existing home, can you make changes your home to incorporate these guidelines, such as add exterior awnings or create shade using trees and vines?



This seminar will focus on:

- House Energy Rating – the thermal performance of your home and how to achieve (at least) the minimum standards; and
- Energy Efficient House Design

The purpose of this seminar is to outline the steps you can take at the building or renovating stage to reduce your need for heating and cooling energy and associated greenhouse gas emissions.

This seminar will also cover the Building Code of Australia (BCA) Energy Amendments (that is the current regulations relating to the design of homes for energy efficiency) and the tools used to rate a home's compliance with these regulations.

The seminar will equip you with the background knowledge to ask the right questions of your builder/designer or architect on energy efficient house design.



Building Code of Australia (BCA)

- New Energy Efficiency Measures 1 May 2006
 - Provide a minimum standard
 - Are designed for conditioned spaces
 - Are a nationally coordinated response to lowering greenhouse gas emissions

EQUIVALENT TO A MINIMUM 5 STAR RATING

The BCA provides standards that must be followed when building a house in Australia. The Energy Amendments provide a minimum standard which must be reached to achieve a benchmark of thermal energy performance.

The amendments cater for *conditioned spaces* only – that is areas in your home that may need additional heating and cooling for comfort, e.g. bedroom or living areas.

Greater thermal performance and energy efficiency is readily achievable.

The minimum standard which must be achieved for all new dwellings from May 2006 is equivalent to the 5 Star rating.

The house energy rating system assesses (evaluates) the thermal performance of the home – that is how well the home is naturally (passively) heated and cooled, therefore reducing reliance on mechanical heating and cooling systems and the greenhouse gas emissions they produce.


The 5 Star Plus measures introduced in Sept 2007 have added minimum requirements for water heating systems, in addition to the minimum 5 Star thermal energy requirement.

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BCA and House Energy Ratings

Two Common Methods

- Deemed To Satisfy
 - A checklist is passed for all items
 - Equivalent to 5 Star rating
- House Energy Rating Software
 - Minimum 5 Star rating



There are two common methods used to assess the home's energy rating.

The Deemed to Satisfy (DTS) method uses a checklist which assesses such things as the building fabric, external glazing building sealing, air movement and services.

This method assesses the home to the minimum standard required by the BCA. It can only indicate if it passes or fails the minimum standard.


The House Energy Rating can not only indicate if the design meets the minimum standard, but also how much higher it rates, up to 10 stars.

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BCA and House Energy Ratings

- Energy Rating Tools
 - FirstRate
 - AccuRate
 - BERS Pro

- Greater design freedom
- Rate whole building
- Rate may exceed minimum



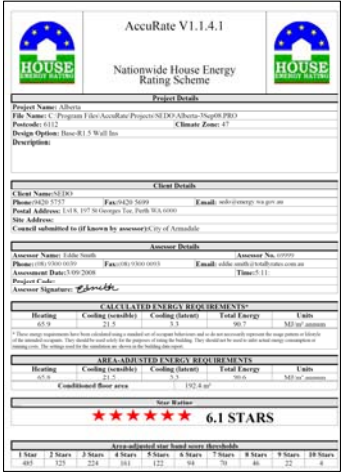
Second generation House Energy Rating Software (HERS) rates a home's thermal performance on a scale of 1-10. The Sustainable Energy Development Office (SEDO) recommends the use of second generation energy rating tools by an accredited assessor to assess your new house for BCA approval. AccuRate is recommended for use in the North West of the State.

These rating tools allow greater design freedom than the Deemed to Satisfy checklist method as they rate the thermal performance of the whole building rather than simply checking off each individual part. By rating the whole building the tools allow more flexibility in the total building design. For example you may wish to include a large window to the west to take advantage of an ocean view. To counteract the heat of the sun entering from the west, you may wish to incorporate things such as increasing the home's insulation levels, the efficiency of the glazing, or cross ventilation, so that it is cooled by sea breezes— the rating tools will rate the overall performance allowing maximum flexibility.

Your home may well exceed the minimum 5 Star standard. This can translate as a selling point for the home as a higher rating should result in lower energy requirements.

House Energy Rating Software

- AccuRate will provide the benchmark for accrediting other HERS software for use with the BCA requirements. Other software packages will have to give results consistent with AccuRate.



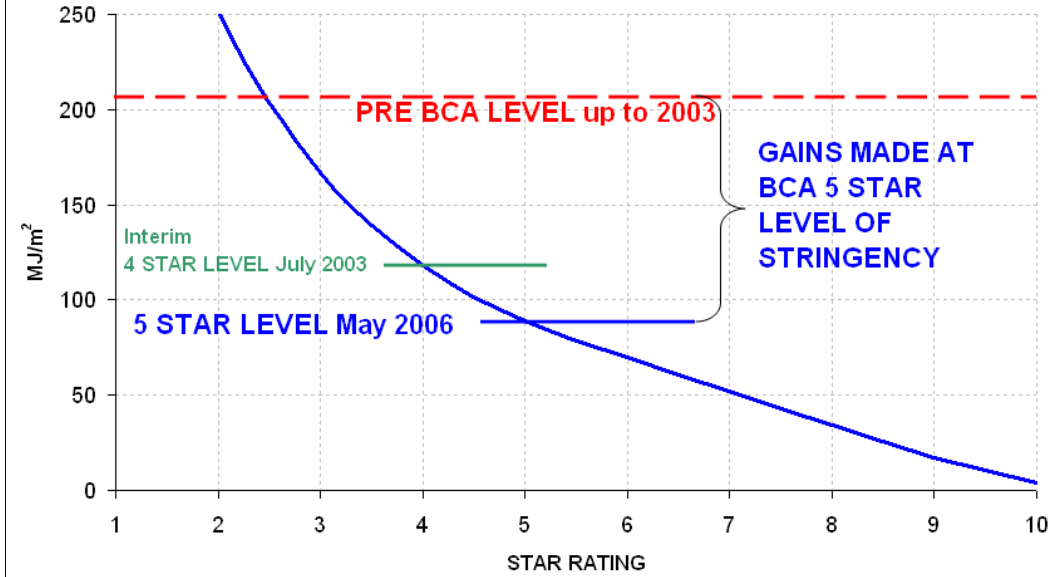
The new second generation software AccuRate enables a sophisticated assessment of the energy use performance of the building. Included in the calculations are **important factors affecting building thermal energy performance such as** regional climate data, the unique design of the building as well as the relevant thermal properties of the building materials.

AccuRate simulates energy performance more accurately in all climate zones including:

- better modelling of the cooling effect of air movement
- a floor area correction so that smaller houses are not penalised in the star rating
- **ability to model house by including zones for individual rooms**
- a wider range of construction materials
- improved modelling of reflective insulation
- integration with the windows energy rating scheme (WERS)
- more stars – now up to 10
- an easier to use interface more suited to newer computer operating systems **<recommend delete last point>**

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Looking Back Before the BCA

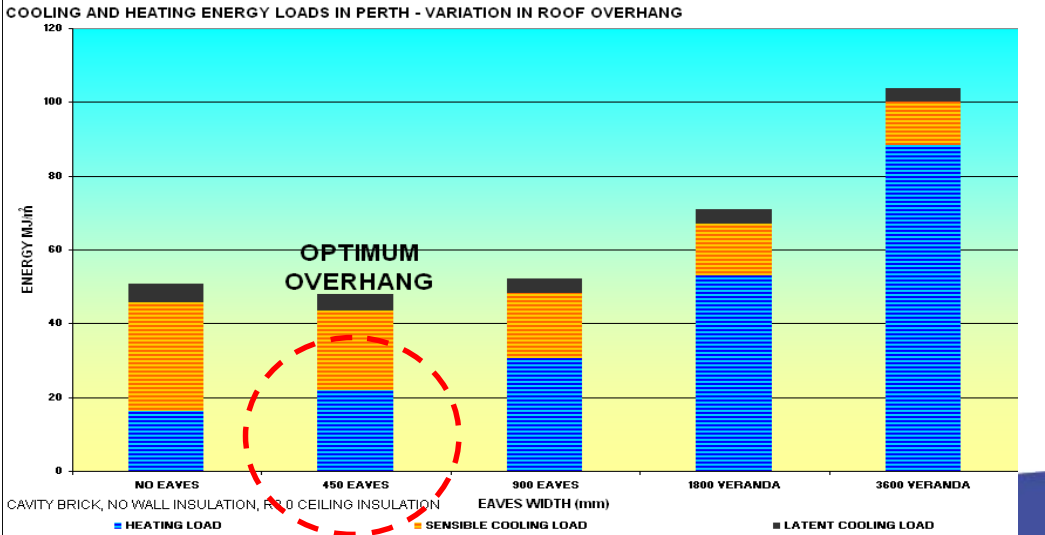




**All houses should have eaves;
MYTH!**

- Some media commentators claim that all houses should have eaves
- SEDO undertook research in 2007 using *AccuRate*
- Perth climate requires both heating and cooling, with heating requirements significant
- Small advantage with optimum eaves of 450mm. No eaves better than large eaves!

- ROOF OVERHANG





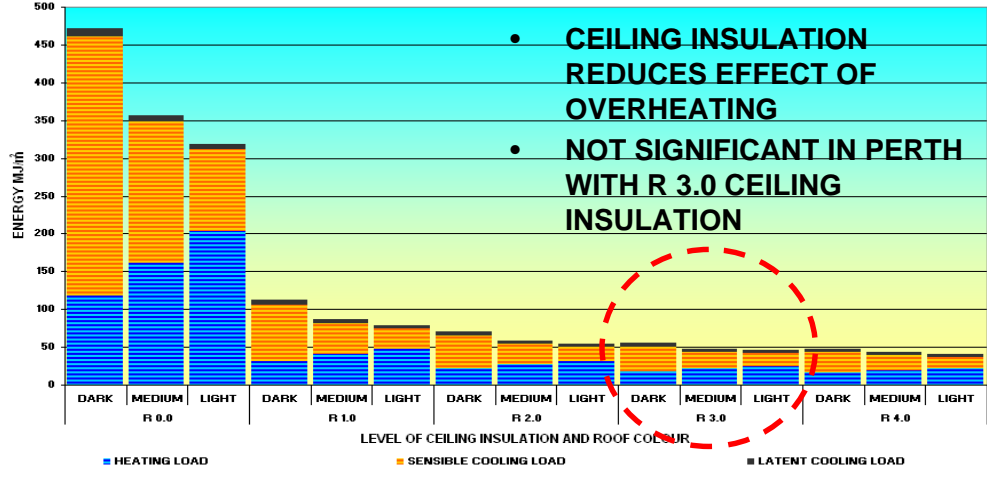
Dark coloured house roofs should be banned - **MYTH!**

- Some media commentators claim that all roofs should be a light colour
- SEDO undertook research in 2007 using *AccuRate*
- Ceiling insulation significantly reduces the effect of overheating
- Roof colour has little impact on total energy use – focus on other areas for savings!

- ROOF COLOUR

COOLING AND HEATING ENERGY LOADS IN PERTH - VARIATION IN CEILING INSULATION AND ROOF COLOUR

CAVITY BRICK, NO WALL INSULATION, 450 EAVES WIDTH





BCA does not reward passive solar design - **MYTH!**

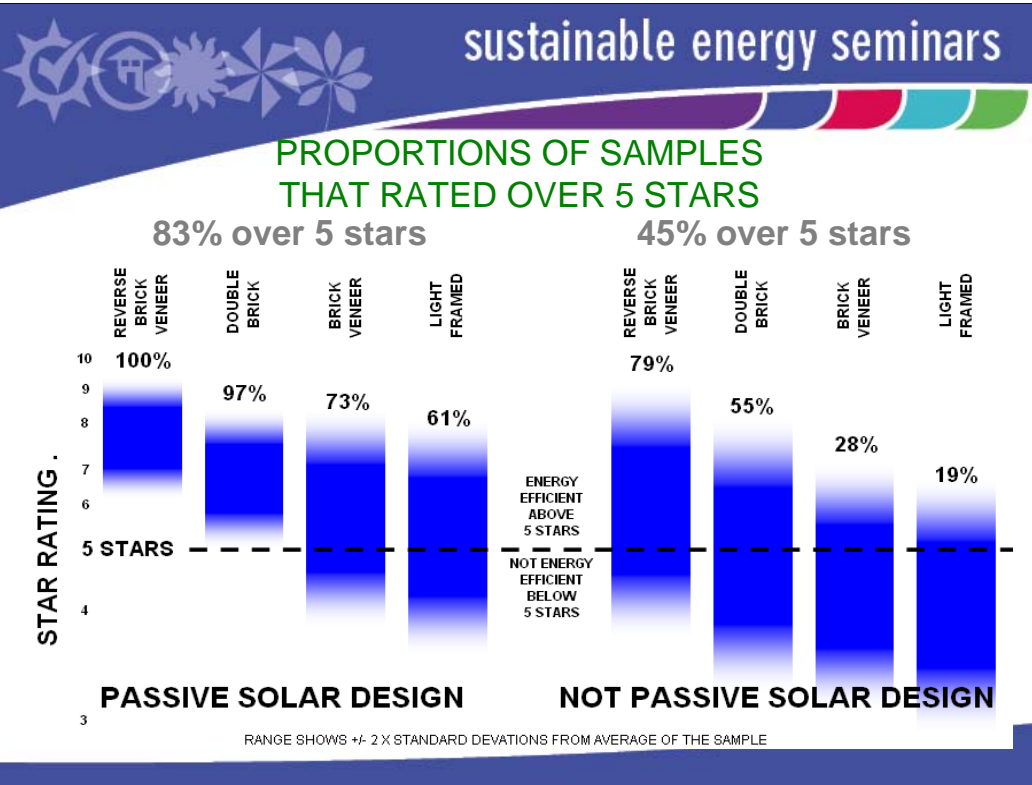
- BCA 5 star rewards passive solar design over non passive solar design at no additional cost
- Passive solar design substantially reduces winter heating loads, with external wall material a minor factor
- Internal mass greatly reduces summertime cooling loads, with passive solar design a minor factor

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The BCA in the Future?

- COAG is currently looking for accelerated energy efficiency measures for the built environment – to compliment the CPRS (ETS)
- Australia lags the world with the existing 5 star minimum energy efficiency measures
- COAG will considering how the BCA (including Class 1,10) can be reviewed for regular increases in stringency over time, in excess of the existing 5 star level – when?



Air conditioner settings – **MYTH!**

- Myth - Setting your air conditioner thermostat to its lowest setting when you start it will cool your home faster.
- Fact – no, this won't cool your home faster, it will just use more energy.

– Heating 18-20° C

– Cooling 24-27° C







Keep older Refrigerators – **MYTH!**

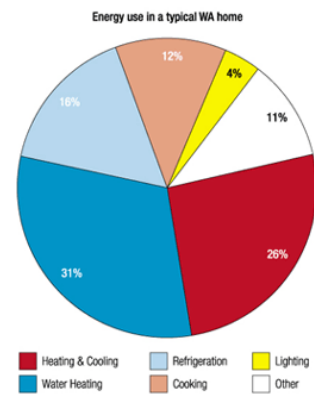
- Myth: If you have got an old refrigerator that is still working, don't get rid of it. Put it in the garage and you'll end up saving money by having extra storage for drinks and food.
- Fact: No, older refrigerators use a lot of energy. If you fridge is more than 8 years old it will use more than double the energy of a new refrigerator of the same size!





Refrigeration largest energy consuming appliance - **MYTH!**

- Traditionally the refrigerator/freezers are the largest energy using appliances in the home.
- Recently large flat-screen TVs (Plasmas) have taken over as the energy guzzlers
- MEPS & Labelling coming!







Low voltage = low energy use = MYTH!

- Myth: Low voltage lighting such as 12 volt halogens are energy efficient.
- Fact: Low voltage does not mean low energy use – most halogens are 50 Watt and there has been a huge increase in installation in homes.

Inefficient incandescent lighting is being phased out from 2009 onwards!





New houses are Government's focus

MYTH!

- Myth: Governments are targeting only the new housing construction industry with sustainability measures such as 5 star plus.
- Fact: National and State working to finalise regulations for mandatory disclosure of house energy performance at point of sale or lease – 2009/10.



NABERS Home – National Australian Built Environment Rating System

- Voluntary performance-based rating system for existing homes.
- NABERS rates a home on the basis of its measured operational impacts on the environment
- Energy and Water at present –
Waste etc to follow later





Summary – What is Passive Solar Design For a Perth House?

- North orientation of living spaces
- Concrete slab on the ground
- R3.0 plus ceiling insulation
- Medium to light roof colour
- Aluminium sliding clear glazed windows
- North facing windows 40% to 60% of north wall
- East facing windows < 20% of east wall
- West facing windows < 20% of west wall
- South facing windows < 40% of south wall
- 450 mm wide eaves (600mm shadow line)



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Government Resources

- Energy Smart Line:
[Call 1300 658 158](tel:1300658158)
- Sustainable Energy Development Office
www.sedo.wa.gov.au
- Energy Smart Directory
www.energysmartdirectory.com.au
- Office of Climate Change (WA)
www.greenhouse.wa.gov.au
- Your Home guide (Commonwealth)
<http://www.yourhome.gov.au/>

There are also a number of Government resources available to help you use energy in a more sustainable manner at home.

The Energy Smart Line, which is operated by the Sustainable Energy Development Office, is open from 9am to 5pm Monday to Friday.

It provides advice on a range of energy efficiency and renewable energy related topics for householders and small business. An answering service is available over weekends – just leave a message and an advisor will return your call on Monday.

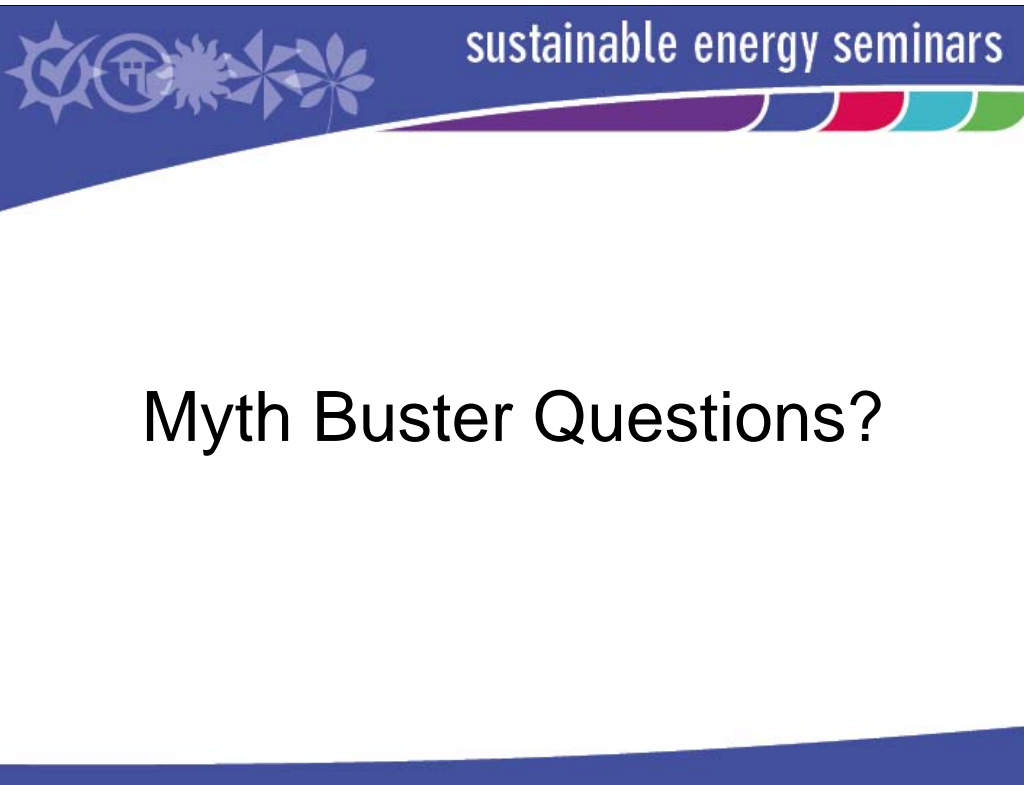
The Sustainable Energy Development Office's website also provides a host of information to help you save energy at home.

The Energy Smart Directory is an on-line database of sustainable energy products and services which is also run by the Sustainable Energy Development Office.

It lists a range of valuable contacts, including house energy rating assessors and experts in sustainable energy building design, lighting and renewables.

The Office of Climate Change within the Department of Environment and Conservation was established to support the roles and responsibilities of the Minister for the Environment; Climate Change.

The Commonwealth Government delivers a number of programs related to its climate change strategy. The Your Home website detailed above contains a range of information on the science of climate change, and tips to assist your household in reducing greenhouse gas emissions.



Questions??? (**PRESENTER:** See the Frequently Asked Questions sheet for this seminar to find some answers)

Thank you for attending the seminar.

We would appreciate if you could take the time to fill in the feedback forms.

We look forward to seeing you at future seminars in the series.

Insert slide specifying details, contact details, dates etc of upcoming seminars.

