

# Rating tools

**To reduce the environmental impact of a building we need to be able to measure and quantify its performance so that different options can be compared. There is a wide range of rating schemes and assessment tools that measure different aspects of building sustainability**

## WHY WE NEED RATING SCHEMES

Rating schemes allow us to compare the environmental performance of similar products, whether they be fridges or houses. This allows more informed choices for consumers and a means to measure progress in reducing our environmental impacts.

Rating tools are used as part of rating schemes to establish the level of environmental performance.

Australia is part of a growing international movement in the development of building environmental rating schemes and tools. These range from single issue schemes, such as appliance energy ratings, to whole building environmental assessments.

Most people are familiar with the energy star and water efficiency ratings now found on many white goods. These allow a purchaser to choose the most efficient products. These are examples of rating tools that measure one aspect of environmental performance.

Currently most rating tools only focus on one aspect of environmental performance, but some do consider more than one.

Rating tools have an important role to play in helping us achieve more sustainable buildings by providing assessment methods and benchmarks that can be used to set minimum standards required by regulation and to encourage best practice.

For example, the Building Code of Australia (BCA) now requires a minimum energy star rating for new single dwellings of 3.5 or 4 stars dependent on the climate zone. This will increase to 5 stars in 2006 for most climate zones.

However, while minimum standards eliminate worst practice they do not necessarily encourage best practice.

A good rating scheme should:

- > encourage innovation by providing flexible compliance paths and not be overly prescriptive
- > have a capacity for regular benchmark creep in line with industry capacity to deliver
- > be able to measure both minimum mandated and best practice
- > integrate the use of current rating tools
- > allow more impact categories to be added

Rating schemes and tools allow assessment of progress towards environmentally sustainable buildings with very low or zero impacts.

## WHAT TYPES OF TOOLS ARE AVAILABLE

Rating tools fall into two broad types, although some combine both approaches.

- > those that predict performance at the design stage, such as house energy rating tools.
- > those that measure actual performance of buildings or products, such as appliance energy efficiency labels.

Aspects of building environmental performance that can be rated include:

- > Thermal performance of the building envelope.
- > Performance of individual components such as windows.

- > Energy efficiency of appliances such as white goods and gas heaters.
- > Water efficiency of appliances and fixtures such as washing machines and showers.
- > Environmental performance of a whole building.

The rating schemes for energy and water efficiency of appliances are covered in other Fact Sheets. [[See Energy Use Introduction, White Goods, Reducing Water Demand](#)]

## HOUSE ENERGY RATING TOOLS

House Energy Rating Schemes (HERS) assess the thermal performance of residential buildings. They calculate the heat gains and losses that a home will experience which determines how much artificial heating and cooling may be required.



HERS do not include the energy use of appliances such as white goods or the embodied energy of the building materials.

The actual amount of gas or electricity used for artificial heating and cooling is influenced by the behaviour of the occupants and efficiency of appliances, in addition to the thermal performance of the building.

The Nationwide House Energy Rating Scheme (NatHERS) is managed by the Australian Greenhouse Office. All HERS software used to assess compliance with the BCA and other regulations needs to be accredited under NatHERS.

HERS tools are typically computer based. The main software tools in use are:

- > NatHERS, and its soon to be released update called AccuRate
- > BERS
- > FirstRate

These assessment tools are based on a program developed by CSIRO. It enables a sophisticated assessment of the hour by hour performance of the building. Included in the calculations are regional climate data, the unique design of the building as well as thermal properties of all materials.

To enable comparison of the building performance, distinct from other variables such as occupant behaviour, ratings are based on standardised assumptions about the occupation and operation of the building.

Performance can be described in terms of heating and cooling loads or degree hours, hours of discomfort or indoor temperatures.

For regulatory purposes, the assessment is expressed as a star rating. The more stars the better the performance.

Anyone can buy and use the HERS software, but ratings used for assessing compliance with regulations can only be issued by trained and accredited assessors.

**Contact details for Accredited Assessors in your area can be found at: [www.nathers.gov.au](http://www.nathers.gov.au)**

### NatHERS

NatHERS software, not to be confused with NatHERS Scheme, is an envelope energy rating tool developed by CSIRO. NatHERS software is currently the most widely used of the HERS tools. It has been widely tested, calibrated and verified to produce consistent results for most of the climate zones.

NatHERS software requires detailed information about the building such as orientation, construction type, insulation levels, window size and orientation, shading, overshadowing, ventilation, etc. For an experienced operator, data entry can take from 30 minutes for a simple design to an hour or more for a complex design.

NatHERS software can produce detailed information on the building's thermal performance month by month. This is useful for architects and building designers to improve the design.

The basic output is a simple report that shows how much heating and cooling energy would be required to keep the house comfortable and a 1 to 5 star rating of the energy performance.

NatHERS software can also be run without heating and cooling energy inputs to show the hourly temperatures in the house without any heating and cooling appliances.

See the case study "7.1 Modifying a Project Home" which shows how various changes to the building envelope are assessed by NatHERS software.

### AccuRate

Use of NatHERS software over several years has uncovered some limitations in the software. While some of these were overcome by improvements to NatHERS software, it became necessary to significantly overhaul both the data input method and the calculation engine.

A second generation version called AccuRate which addresses these issues will be released in late 2005. AccuRate will replace NatHERS software. The new version simulates energy performance more accurately in all climate zones.

The improvements include:

- > better modelling of the cooling effect of air movement
- > a floor area correction so that smaller houses are not penalised in the star rating
- > more internal zones
- > 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

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.

NatHERS Interface

**NatHERS V2.32**  
Nationwide House Energy Rating Scheme

Job Name: Fry Street    Job No:    Run No: 1    Climate Zone: 17  
 Client:    Site Address: 2067    NSW  
 Assessor:    Date: 29/6/2005    Time: 10:13    Page: 1

**Energy Rating Report**

Description:

RATED ENERGY REQUIREMENTS*				
Heating	Cooling (Sensible)	Cooling (Latent)	Total Energy	Units
94.5	60.5	6.6	161.5	MJ/m <sup>2</sup> .annum
26.2	16.8	1.8	44.9	kWh/m <sup>2</sup> .annum

\* These energy requirements have been calculated using a standard set of occupant behaviours and do not necessarily represent the usage patterns or lifestyle of the intended occupants. They should be used solely for the purposes of rating the building. They should not be used to infer actual energy consumption or running costs. The settings used for this simulation are shown in the Building Data Report.

★ ★ ★ ☆ **3.5 STARS**

AccuRate Interface

**AccuRate Regulatory Version**  
May 2005 (expires 30 Sept 2005)

Nationwide House Energy Rating Scheme    CSIRO

Project Name:    Postcode: 2022  
 File Name: C:\AccuRate\Projects\2002005.prj    Climate Zone: 24  
 Design Option: Room Design  
 Description:

Client Name: NatHERS Data  
 Phone:    Fax:    Email:  
 Postal Address:  
 Site Address:  
 Council submitted to (if known by assessor):

Assessor Name:    Assessor No:  
 Phone:    Fax:    Email:  
 Assessment date: 29/06/2005    Time: 10:13  
 Assessor signature:

RATED ENERGY REQUIREMENTS*				
Heating	Cooling (Sensible)	Cooling (Latent)	Total Energy	Units
200.0	60.0	1.0	267.0	MJ/m <sup>2</sup> .annum
55.0	12.0	0.0	68.0	kWh/m <sup>2</sup> .annum

Conditioned floor area: 110.0 m<sup>2</sup>  
 Area-adjusted star band score: 3.5

**Star Rating**

★ ★ ★ ★ ☆ **4.5 STARS**

**BERS**

BERS (Building Energy Rating Scheme) is a similar tool to NatHERS software. BERS is currently based on the same NatHERS calculation engine, but is incorporating all the same improvements as AccuRate based on the new calculation engine.



BERS has the ability to assess the impact of a number of ventilation options. It is considered to be more suitable for use in hot humid climate than the current version of NatHERS software. It is most widely used in Queensland, but can be used in all Australian climate zones.

It needs the same level of detail as NatHERS software but uses a simple graphical interface to make data entry quicker and easier.

Information about the building, the climate type and the conditions of use is selected from pictures displayed on the screen.

**RATING TOOLS**

Floor plans are drawn with a mouse. This eliminates the need for time consuming data entry of dimensions, orientations, adjacent zones etc. making data entry fast and accurate.

BERS has been developed by Solar Logic in Brisbane. Solar Logic runs training courses to accredit BERS assessors.

**FirstRate**

The FirstRate House Energy Rating Software package was developed by the Sustainable Energy Authority Victoria (SEAV). It provides a simple and quick method to assess and improve the energy efficiency of house designs and completed homes.

FirstRate is the HERS of choice in Victoria, although NatHERS software can also be used. Western Australia, South Australia and the ACT thermal performance standards are also based on FirstRate.

FirstRate was developed by correlating the energy use predictions of NatHERS software with building element properties. FirstRate is based on the results of around 55,000 simulations in each Australian climate zone.

A demonstration version of FirstRate can be found on the CD ROM version of this document.

FirstRate measures the energy efficiency of a house by allocating a point score for various design features (such as building fabric, window design, insulation, orientation and other features) and provides an overall rating on a scale from 0 to 6 stars.

A useful tool for builders, designers, architects and planners, or indeed anyone who needs to know how energy efficient a home will be.

A QuickRate rating mode is available. This fast mode is particularly useful at the sketch design stage.

SEAV run an Accredited Energy Rater program for energy assessors operating in Victoria. SEAV proposes to upgrade FirstRate to comply with the new NatHERS standard.

**BUILDING COMPONENT RATING TOOLS**

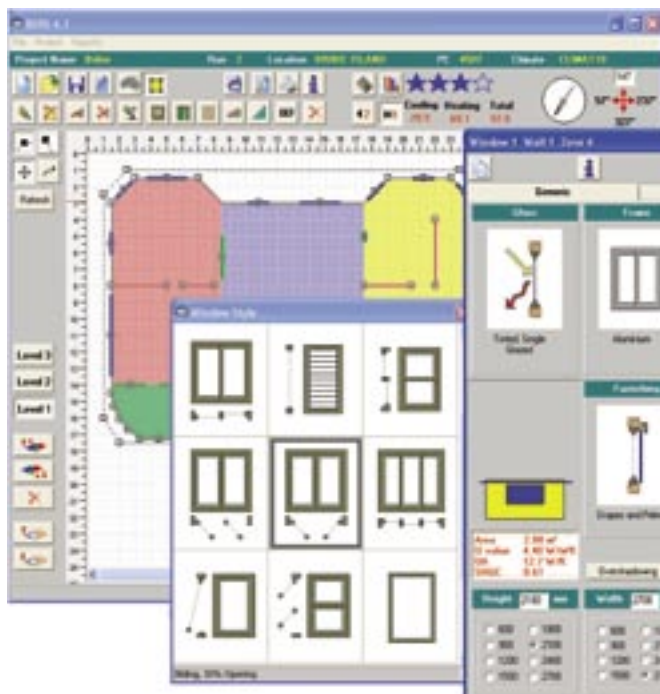
**WERS**

The Window Energy Rating Scheme rates the heating and cooling energy performance of windows in residential buildings anywhere in Australia.

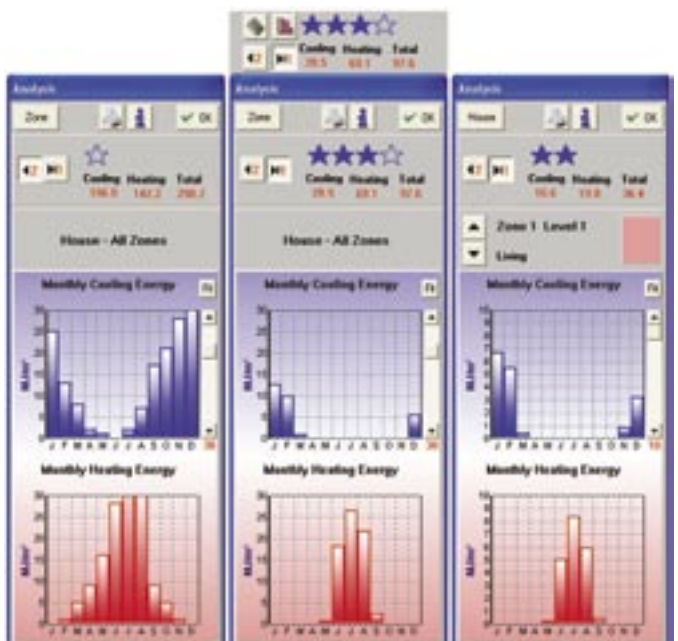
The library of WERS ratings for rated windows can be used as a direct input to AccuRate.

[See: How to Use WERS]

BERS Interface



BERS cooling/heating Interface



## OTHER BUILDING ASSESSMENT TOOLS

### Energy Smart Home Rating

The Energy Smart Home Rating was developed by the NSW Department of Energy, Utilities and Sustainability (DEUS). This easy-to-use tool compares the actual performance of an existing house to the average household of the same type in NSW. It is a performance-based rather than a predictive tool. The rating is based on greenhouse gas emissions rather than energy consumption.



The web-based tool is available for anyone to use, and Official Ratings are also available in some areas. The website also provides a diagnostic tool, the Virtual Home Audit, to provide personalised energy saving advice. It is a useful educational tool.

### BASIX

The NSW Government has introduced the Building Sustainability Index (BASIX) that applies to all new dwellings in NSW from 1 July 2005.

BASIX is a planning regulation that sets greenhouse gas emission and water use percentage reduction targets for new dwellings when compared to similar sized houses in the same geographical location.

The percentage reduction approach provides an easy to understand comparison for users.

BASIX covers the building envelope thermal performance, but also includes a wider range of household energy uses such as heating and cooling appliances, lighting and water heating when determining compliance.

In common with many multiple issue tools, BASIX uses some existing tools such as NatHERS and appliance energy and water ratings as part of the assessment process.

To assess thermal performance compliance, either

- > the simulated heating and cooling loads predicted by NatHERS must be entered or
- > the building fabric must comply with a set of more restrictive 'Deemed to Satisfy' requirements.

The simulation method provides more flexibility in design options. BASIX sets a maximum limit for both the cooling load alone and the total heating and cooling load. The simulation results must be less than these allowable maximums to achieve compliance.

BASIX expands the use of HERS ratings by requiring more stringent thermal performance targets for larger houses and by setting maximum cooling loads to reduce summer peak electricity demands.

It uses the HERS rating to estimate greenhouse gas emissions based on the efficiency and type of heating and cooling appliances selected to be installed.

### NABERS

NABERS (*the National Australian Built Environment Rating System*) is a scheme for rating existing buildings on the basis of their measured operational impacts. It rates both the building and the user and applies to existing buildings of all types except industrial

NABERS is not a predictive tool and is not intended to be a replacement to other ratings systems that focus on the design stage, such as HERS.

NABERS covers a very wide range of issues using a whole of life cycle approach. Issues covered are:

- > Energy
- > Refrigerants (greenhouse and ozone depletion)
- > Water
- > Storm water runoff and pollution
- > Sewage
- > Landscape diversity
- > Transport
- > Indoor air quality
- > Occupant satisfaction
- > Waste and
- > Toxic materials.

The scheme is currently being commercialised and is expected to be available for official use in late 2005. The spreadsheets for undertaking a rating are available to download at no charge.

### ABGR

The ABGR (*the Australian Building Greenhouse Rating*) scheme rates commercial office buildings only according to their actual greenhouse gas emission performance, using 12 months' energy data. It awards from one to five stars.



ABGR can be used to 'badge' a new building design but actual operational performance must be verified for a final rating to be awarded.

The tool is available to download for no charge from the ABGR website.

### Green star

Green star, developed by the Green Building Council of Australia (GBCA), can be used as both a design and operational assessment tool. It considers a wide range of environmental categories:

- > Indoor Environment Quality
- > Energy
- > Transport
- > Water
- > Materials
- > Land Use, Site Selection and Ecology
- > Emissions
- > Management

Like BASIX, Green Star incorporates other ratings tools such the ABGR in its assessment.

Green star is currently only available for commercial office buildings, but the GBCA intends to expand the range of tools to cover retail, industrial, residential and other buildings.

The Green star tool can be downloaded at no charge from the GBCA website.

## INTERPRETING RATING TOOL RESULTS

When considering the results of rating tools, it is necessary to put them into perspective. Some things to consider are:

### Does the rated performance of an individual item give a true representation of its performance in the application proposed?

It needs to be considered in context. For example, in a warm climate, an unshaded wall of WERS 5 star cooling rated windows will cause more overheating in summer than a similar sized bank of zero star rated windows with well designed external shading. A NatHERS, BERS or FirstRate assessment would reveal that the window rating alone does not give the complete picture.

### Does the rating reflect all the impacts or simply focus on a single issue?

The rating reflects the aspect being rated. For example, an appliance might carry a five star energy rating but be inefficient in its use of water.

### In which case would a similar product with a 3 star energy rating and high AAAA water rating be the better choice if you live in an area where water is in short supply?

There is also the energy used in pumping and treating the water and wastewater to consider. Fortunately, the most energy efficient appliances are usually also the most water efficient.

### Does the rating system address relative scale in assessing the impact?

Not usually. A 400 square metre home and a 150 square metre home may have the same HERS star rating. However, the larger home will use more resources and embodied energy in its construction than the smaller home. It will also probably require more heating and cooling energy to be comfortable due to its larger volume.

### Would alternative options beyond those being rated yield equivalent benefits over total lifecycle?

Tradeoffs are a part of every home design and construction process so it is necessary to consider what level of thermal comfortable is desired and what overall environmental impact is acceptable.

For example, it may be better to build a home from low embodied energy materials but have a lower rating, rather than use a high embodied energy but low maintenance fabric on the building envelope and aim for a higher rating.

#### ADDITIONAL KEY REFERENCES

BERS

[www.solarlogic.com.au/Default.htm](http://www.solarlogic.com.au/Default.htm)

BASIX, the NSW Building and Sustainability Index

[www.basix.nsw.gov.au](http://www.basix.nsw.gov.au)

Energy Smart Home Rating

[www.energysmarthome.com.au/main1.1](http://www.energysmarthome.com.au/main1.1)

NABERS (the National Australian Built Environment Rating System)

[www.deh.gov.au/industry/construction/nabers/overview.html](http://www.deh.gov.au/industry/construction/nabers/overview.html)

NatHERS [www.nathers.gov.au](http://www.nathers.gov.au)

BDP *Environment Design Guide* DES

23 May 2005 AccuRate: 2nd Generation Nationwide House Energy Rating Software  
[www.architecture.com.au](http://www.architecture.com.au)

FirstRate

[www.seav.vic.gov.au/buildings/firstrate/index.asp](http://www.seav.vic.gov.au/buildings/firstrate/index.asp)

The Green Building Council

[www.gbcaus.org](http://www.gbcaus.org)

Australian Building Greenhouse Rating

[www.abgr.com.au](http://www.abgr.com.au)