NATIONWIDE HOUSE ENERGY RATING SCHEME (NatHERS) –

SOFTWARE ACCREDITATION PROTOCOL

NatHERS National Administrator

June 2012

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Preface

This *Nationwide House Energy Rating Scheme (NatHERS) – Software Accreditation Protocol* (Protocol) was prepared by the NatHERS National Administrator (currently the Commonwealth Department of Climate Change and Energy Efficiency) with the assistance of the state and territory building energy efficiency policy agencies and the Australian Building Codes Board. It was approved by the NatHERS Steering Committee (Energy Efficiency Working Group, E2WG) of the Select Council on Climate Change on 26 June 2012.

NatHERS supports improvements to the thermal performance (energy efficiency) of Australia's residential buildings by providing a standardised approach and guidelines for energy rating software used to assess dwellings across Australia.

This single Protocol combines and replaces the *Procedure for Accrediting Software under the Nationwide House Energy Rating Scheme (April 2007 and 2011)* and the Australian Building Codes Board *Protocol for House Energy Rating Software (Version 2005.1*).

Background

NatHERS is a government initiative administered by a Steering Committee of officials from State, Territory and the Australian governments. The Steering Committee provides overarching policy direction and approves any changes to NatHERS (including the accreditation of a new Software Tool or new version of an existing tool). The NatHERS National Administrator administers this Protocol and software accreditation applications on behalf of the NatHERS Steering Committee.

Accredited NatHERS software tools can be used to assess the thermal performance (energy efficiency) of the building fabric of both new dwellings and existing dwellings when undertaking an extension as required by State and Territory building regulations.

Software is used to provide a star rating for meeting minimum energy equivalence regulatory requirements for dwelling design under the National Construction Code. Depending on the dwelling's predicted annual energy load (heating and cooling) and the corresponding Star Band for the particular Climate Zone, a star rating will be generated with a value between 0 to 10 stars. A higher star rating than the minimum regulatory standard can therefore be used to promote better practice when marketing a property.

The Star Band Criteria (Appendix D) in this Protocol were developed for and approved by the NatHERS Steering Committee. The Star Bands provide a benchmark for comparing the relative level of thermal efficiency of certain residential dwellings across Australia (e.g. detached houses, townhouses, row houses and some apartments.)

NatHERS, including the Star Band Criteria, may be subject to revision from time-to-time as it is improved and developed. This Protocol may therefore be amended as necessary, subject to the approval of the Steering Committee.

Status of the Protocol

The National Construction Code (NCC) is reviewed annually to update approaches to minimum building requirements and is adopted by States and Territories through their building legislation. The NCC permits the use of NatHERS accredited Software

Tools to demonstrate and assess the heating and cooling load requirements of a dwelling as part of the Energy Efficiency Provisions of the Building Code of Australia (Part 3.12, Volume Two, National Construction Code and Section J, Volume One, National Construction Code).

1. Scope and minimum software requirements

1.1. Scope

The primary aim of this Protocol is to ensure that NatHERS accredited Software Tools apply a standardised approach and produce consistent results in the assessment of Energy Loads and Energy Ratings of dwellings (noting that NatHERS accredited software may be used to rate residential apartments and other dwellings with suitable building dimensions and functions, in addition to attached and detached housing).

This Protocol outlines the requirements and processes for the accreditation of new Software Tools and new versions of previously accredited Software Tools. The Protocol only applies to dwelling thermal performance (energy efficiency) assessment software which is designed to calculate Energy Loads and/or Energy Ratings. Software Tools may be used to calculate the Energy Loads and Energy Ratings for the purpose of meeting requirements under State and Territory building regulation.

In relation to building energy efficiency standards, Regulation Mode is the mode of operation necessary for assessing compliance with energy equivalence requirements (minimum star rating) under the National Construction Code, noting that different types of regulations may require different or separate modes. Other modes of operation can be a function of accredited software for the purpose of providing additional information to software users only. These non-regulation modes of operation are not covered by this Protocol.

This Protocol contains two parts:

i. **Minimum Software Requirements** (section 2) defines the essential requirements of a Software Tool that must be met in order to receive accreditation.
ii. **Assessment Process** (section 3) outlines the process and requirements for the software accreditation.

2. Minimum Software Requirements

A Software Tool must either:

a) use the Chenath Engine and satisfy the requirements of 2.1, 2.4, 2.5, 2.6 and 2.7; or

b) satisfy the requirements of 2.1 to 2.7.

2.1. Regulation Mode

A Software Tool must have at least one Regulation Mode that operates in accordance with the '*Principles for Ratings in Regulation Mode*' document approved by the Steering Committee (refer also to 3.2.1).

An Energy Rating shall only be generated and documented from software operating in Regulation Mode. This Software Accreditation Protocol applies to the Regulation Mode(s) of a Software Tool only.

2.2. Thermal assessment calculation engine

A Software Tool's thermal assessment calculation engine must:

a) be based on well-established models that are in accordance with the principles of thermodynamics and fluid mechanics. The calculation method used must be documented and be available for inspection;

b) include hourly calculations of heat flux across the building's surfaces for every day of the year;

c) include zoning of enclosable conditioned and unconditioned areas in a dwelling by function as described in the document *'Principles for Ratings in Regulation Mode*';

d) have hourly calculations aggregated to the reporting requirements listed in 2.6 and 2.7.

2.3. Climate data

The hourly climate data files used in a Software Tool must satisfy the requirements of 2.3.1.

2.3.1. Climate Zone

A Climate Zone in NatHERS software tools represent a geographical region, not necessarily contiguous, which is allocated to one of 69 weather data stations. The Climate Zones must be based on the locations listed in the approved Climate Zones, (see Table 5, Appendix C) and applied to the Climate Zones as shown in the NatHERS Climate Map (available on the NatHERS website). Further information regarding the definition of Climate Zone borders and a copy of the Climate Zones files may be obtained from the National Administrator.

2.4. Energy Load

The total Energy Load must be determined for both heating and cooling, based on the predicted annual conditioned Energy Load for a dwelling set out in the *Principles for Ratings in Regulation Mode* document.

The total annual Energy Load must be calculated using Equation 1 and be reported using the Star Band Criteria in which it falls (see also 2.6).

*Equation 1: EL = ((HL+CL)/CFA)*AA*F

Where:

EL = Total Energy Load (MJ/m^2 conditioned floor area.annum)

HL = Total heating load (MJ/.annum)

CL = Total cooling load (i.e. the sum of the sensible and latent cooling loads) (MJ/.annum)

CFA = Conditioned Floor Area (m^2)

AAF = Area Adjustment Factor

2.5. Area Adjustment Factor

The Energy Load must be adjusted by a factor that increases the Energy Load for buildings with larger Conditioned Floor Area, and reduces the Energy Load for buildings with smaller Conditioned Floor Area, in proportion to the total building surface area to floor area ratios of a range of dwellings in the particular Climate Zone. Software Tool developers should contact the National Administrator for the equation and documentation for the Area Adjustment Factor (AAF).

In Regulation Mode, Energy Ratings must be based on Energy Loads that have been adjusted by an AAF. In Regulation Mode an unadjusted Energy Rating cannot be reported.

The AAF must be present in the Software Tool to account for the difference in total building surface area to floor area ratio in small versus larger dwellings. Smaller dwellings have a greater total building surface area to floor area than larger dwellings. Since heat transfer through the building fabric is proportionate to total building surface area, an AAF is required to ensure that smaller dwellings (with less building surface area however, larger surface area to floor area ratio) are compared with larger houses fairly and therefore rated based on adjusted energy loads.

2.6. Energy Rating

The Energy Rating of any dwelling must be determined by applying the total Energy Load and Climate Zone to the Star Band Criteria (see Table 6, Appendix D). Further information about determining the Energy Rating between the Star Bands can be obtained from the NatHERS Administrator.

Note - The Energy Rating of any dwelling must be reported to the Star Band Criteria in which it falls (an increment of 0.5 star in the correct Climate Zone) in a printable format.

2.7. Reporting

2.7.1. Report

The Software Tool must be capable of producing a comprehensive report and a universal certificate in accordance with 2.7.2, and a different report for each Regulation Mode.

2.7.2. Minimum reporting requirements for universal certificate

Each universal certificate generated from Regulation Mode must include the following information:

- Total Energy Load in accordance with 2.4;
- Total heating load, in accordance with 2.4;
- Total cooling load, in accordance with 2.4;
- Energy Rating in accordance with 2.6;
- Construction types (e.g. brick veneer or timber);
- Window types and glazing - U-value and solar heat gain coefficient (SHGC);
- Insulation details (e.g. roof, ceiling, wall and/or floor);
- Name and version of Software Tool used (including name and version of calculation engine and graphical user interface e.g. AccuRate, Version XX as specified by the National Administrator);

- Statement that the Software Tool was run in Regulation Mode;
- Statement of the name or type of Regulation Mode in which the Software Tool was run to produce the assessment;
- The regulatory purpose(s), if any, the rating was generated for;
- Date the Energy Rating was generated;
- Accredited NatHERS assessor unique identifier, state/territory licence or registration number, if applicable;
- A declaration that can be signed by the assessor that indicates that they have undertaken any training to use the Software Tool for the regulatory purpose it was generated for; or a declaration that the report or certificate is not intended to be used for regulatory purposes.

3. Assessment Process

New Software Tools are assessed relative to the Benchmark Software Tool. Due to the level of testing, validation and quality assurance that must be demonstrated to achieve NatHERS software accreditation, the accreditation procedure is divided into an Expression of Interest (EOI) stage (3.1) and a formal application stage (3.2). Satisfactory completion of the EOI stage is a pre-requisite for submission and consideration of a formal application. The EOI process set out below also provides an early opportunity for the National Administrator to work with the Principal Representative and assist with any issues that may arise throughout the software accreditation process.

All stages of accreditation of a Software Tool must be prepared and lodged at the expense of the Principal Representative. If the National Administrator makes any request for further clarification or validation work, this must be undertaken at the Principal Representative's expense.

A Software Tool is not NatHERS accredited unless, and until, the Steering Committee has approved its accreditation and a Deed of Agreement has been executed between the Principal Representative and the National Administrator.

3.1. Expression of Interest

The Principal Representative must submit an EOI to the National Administrator in accordance with 3.1.1 to 3.1.3.

3.1.1. Compliance with Minimum Software Requirements

The Principal Representative must submit a written declaration that the Software Tool complies with the Minimum Software Requirements described in section 2 of this Protocol.

3.1.2. Independent assessment

The Principal Representative must submit details of independent, experienced, thermal performance assessor(s) and the assessment procedures that the Principal Representative will engage in the software testing. Curricula vitae and a declaration about any actual or perceived conflict of interest from the assessor(s) must be provided. If an actual or perceived conflict of interest exists for the nominated assessor(s), the National Administrator may require the Principal Representative to select independent assessor(s) for whom an actual or perceived conflict of interest does not exist.

3.1.3. Version of Software Tool

A complete, operational version of the Software Tool being submitted for accreditation must be provided to the National Administrator at no cost.

3.1.4. Submission of EOI

Completed EOIs must be submitted to:

NatHERS National Administrator
Building Energy Efficiency Branch
Department of Climate Change and Energy Efficiency
GPO Box 854
CANBERRA ACT 2601
Email: buildings@climatechange.gov.au

3.1.5. Response to the EOI

Upon receipt and acceptance of a completed EOI, the National Administrator will invite the Principal Representative to lodge a formal application for NatHERS software accreditation. The invitation shall remain open for a period of six (6) months.

If within this time, a formal application is not submitted, the Principal Representative will need to request an extension from the National Administrator, should they still wish to proceed with a formal application. Requests for extension of time for a period of time, or a number of periods totalling greater than six (6) months, will require approval from the Steering Committee.

3.2. Formal application for accreditation

Within six (6) months of receiving an invitation to formally apply for NatHERS software accreditation, the Principal Representative will undertake software testing and application requirements as set out in 3.2.1 to 3.2.5.

Following receipt of a formal application, the National Administrator will provide the Principal Representative with the:

- standard set of base dwelling designs and accompanying material for the three (3) stages of software testing described under 3.2;
- results spreadsheet for recording the results of the software testing.

The National Administrator will respond to queries about the accreditation process within ten (10) business days, or as agreed between both parties. (*Note*: queries should be submitted by the Principal Representative in writing to the National Administrator).

3.2.1. Software testing

The Software Tool must be tested using variations of the base dwelling designs to explore the impact of specific material or building design changes on the performance assessment of the base dwelling when compared to the Benchmark Software. The variations are designed to explore the impact of:

- Insulation levels
- All window types including fixed and opening (effective aperture size)
- Floor type (concrete slab or raised timber)
- Roof type (attic or flat)
- Mass
- Glazing type
- Glazing to floor area ratio
- Orientation
- Infiltration e.g. ceiling and heating vents
- Other key construction techniques that may apply to particular Climate Zones such as different building styles in tropical and cyclone areas.

There are three stages of software testing:

Stage 1 - 4 base dwelling designs modelled in 1 specified Climate Zone (total of 4 tests)

Stage 2 - 4 base dwelling designs, each one modelled in 8 specified Climate Zones (total of 32 tests)

Stage 3 - 21 dwelling designs (4 base designs + 7 variations + 7 specification changes + 3 orientation changes), each modelled in 8 specified Climate Zones (total of 168 tests).

All base dwelling designs and associated variations must be tested using the dwelling designs, including variations, specification changes and the Climate Zones specified by the National Administrator. (Testing in the prescribed range of Climate Zones to represent the range of climates across Australia, these being cool temperate, temperate, warm temperate, hot humid, sub-tropical, and hot arid zones, and consideration of inland and coastal climates.) Each simulation must be run in accordance with the Software Tool developer's own procedures that are specified in their training manuals. The developer's own procedures must not conflict with the 'Principles for Ratings in Regulation Mode' approved by the Steering Committee.

Where there are any specific house configurations or building elements, that the applicant's software cannot model, these will not form part of the simulation sample and thus not contribute to the accreditation test results. The applicant's software will consequently be excluded from modelling these configurations or building elements in its usage for regulation purposes and a clear statement of these limitations will be evident in the user manual, the appropriate input screens and the printed output. However, where there is a methodology approved by the Steering Committee for assessing common building elements, it is expected that all accredited software tools will successfully incorporate this methodology. The Steering Committee reserves the right to not accredit a tool based on restrictions of use.

Software testing results must be entered into the results spreadsheet provided by the National Administrator. Every green and orange box of the results spreadsheet must be completed for each stage of software testing. The electronic files for each of the software simulations must be submitted with the results spreadsheet (see 3.2.3).

The results spreadsheet must be accompanied by a declaration from the assessor(s) stating that the testing is their work carried out in accordance with 3.1.2.

3.2.2. Training program and user support

A training program for users must be made available and designed to meet the approved qualifications for NatHERS assessors as notified on the NatHERS website. In addition, the Software Tool developer must maintain a software users' helpdesk and publish a sufficiently detailed user manual to provide guidance for software users. This must be capable of being amended to reflect approved changes to the Scheme.

3.2.3. Application process

The application for accreditation must contain:

- a complimentary, commercially ready copy of the software;

- all results of software testing in 3.2.1. including results spreadsheet, electronic files for each software simulation and declaration from the independent, experienced nationally accredited assessor(s) (*Note*: results can be provided to the National Administrator after the completion of each of Stages 1 to 3 in 3.2.1 or after the completion of Stage 3);
- evidence of training package for users referred to in 3.2.2;
- contact details for the Principal Representative of the Software Tool developer.

Completed applications must be submitted to:

NatHERS National Administrator
Building Energy Efficiency Branch
Department of Climate Change and Energy Efficiency
GPO Box 854
CANBERRA ACT 2601
Email: buildings@climatechange.gov.au

Incomplete applications will not be considered.

Unsuccessful applicants will be notified by the National Administrator and may reapply with new simulation results after making modifications to the Software Tool.

3.2.4. Testing the suitability of software for accreditation

The National Administrator and Steering Committee will determine the suitability of software for accreditation by comparing all test results to the same simulations performed with the Benchmark Software.

The purpose of this test is to provide assurance that all Software Tools accredited under NatHERS deliver consistent and comparable results without any significant systematic bias towards either over or underestimating heating and cooling energy loads. Results showing bias greater than 75 per cent will not be accepted. The accreditation test to determine this outcome is as follows:

3.2.4.a All the individual simulations must achieve the following minimum result:

i. the simulated heating load is within either ±10 per cent or ±10 MJ/m^2.annum of the benchmark load; and

ii. the simulated cooling load is within either ±10 per cent or ±10 MJ/m^2.annum of the benchmark load;

AND

3.2.4.b At least 95 per cent of the individual simulations must achieve the following more stringent result:

i. the simulated heating load is within either ±5 per cent or ±5 MJ/m^2.annum of the benchmark load; and

ii. the simulated cooling load is within either ±5 per cent or ±5 MJ/m^2.annum of the benchmark load;

OR

iii. if conditions 3.2.4.b i and ii are not met, the Energy Rating must not be more than 0.25 stars different from the Energy Rating of the Benchmark Software as determined after rounding down results to the nearest quarter star by the National Administrator.

AND

3.2.4.c the final results do not show that the software consistently overestimates or consistently underestimates energy loads. If a systematic bias of 75 per cent of the allowable range as specified in 3.2.4.a&b is apparent in the results, the Steering Committee may require further information on the source of the bias, refuse the application for accreditation, or request a correction factor for the bias is included in the calculation of energy loads and/or ratings.

3.2.5. Notification and conditions of software accreditation

Once the Software Tool meets all of the requirements set out above, the National Administrator (on behalf of the Steering Committee), will offer NatHERS software accreditation to the Principal Representative through a Deed of Agreement – *note* - the Software Tool will not be accredited until a Deed of Agreement is executed. The Deed of Agreement will establish terms and conditions for NatHERS accreditation, including:

3.2.5.a *Period of software accreditation*

Accreditation of a Software Tool is valid for:

- the commercial life of the Software Tool; or
- until the Software Tool is upgraded or changed by the software provider, or as requested by the Steering Committee under 3.2.5.b; or
- evidence becomes known to the National Administrator by a suitably qualified expert that the Software Tool does not now meet the requirements of this Protocol; or
- two years, from the date set out in the Deed of Agreement, whichever occurs first, with the option of an extension after consideration of a request from the Principal Representative to the National Administrator. The extension request will be considered by the Steering Committee.

Note - To align with State and Territory regulatory processes, which may include the adoption of the National Construction Code series (released on 1 May every year), the Steering Committee may grant a delayed date of effect for the accreditation. The date of effect can be no later than 6 months from the date the application for accreditation is approved by the Steering Committee. Any release of new, or upgrade of existing NatHERS software tool which changes the stringency levels as set out in 3.2.4, should ideally occur at least 6 months prior to the adoption of the National Construction Code series.

3.2.5.b. *Incorporation of reasonable changes*

The Steering Committee may direct Software Tool developers to incorporate reasonable changes into a Software Tool. Such changes may include instructions on standardising certain outputs from a Software Tool (e.g. certificate generated). The National Administrator will work with the Principal Representative to determine the changes. The Principal Representative will be responsible for implementing any such changes and the associated costs.

3.2.5.c *Minor changes or software bug fixes*

Minor changes or software bug fixes need to be explained to the National Administrator who will have the discretion to determine if a software upgrade needs to be undertaken in accordance with 3.2.6.

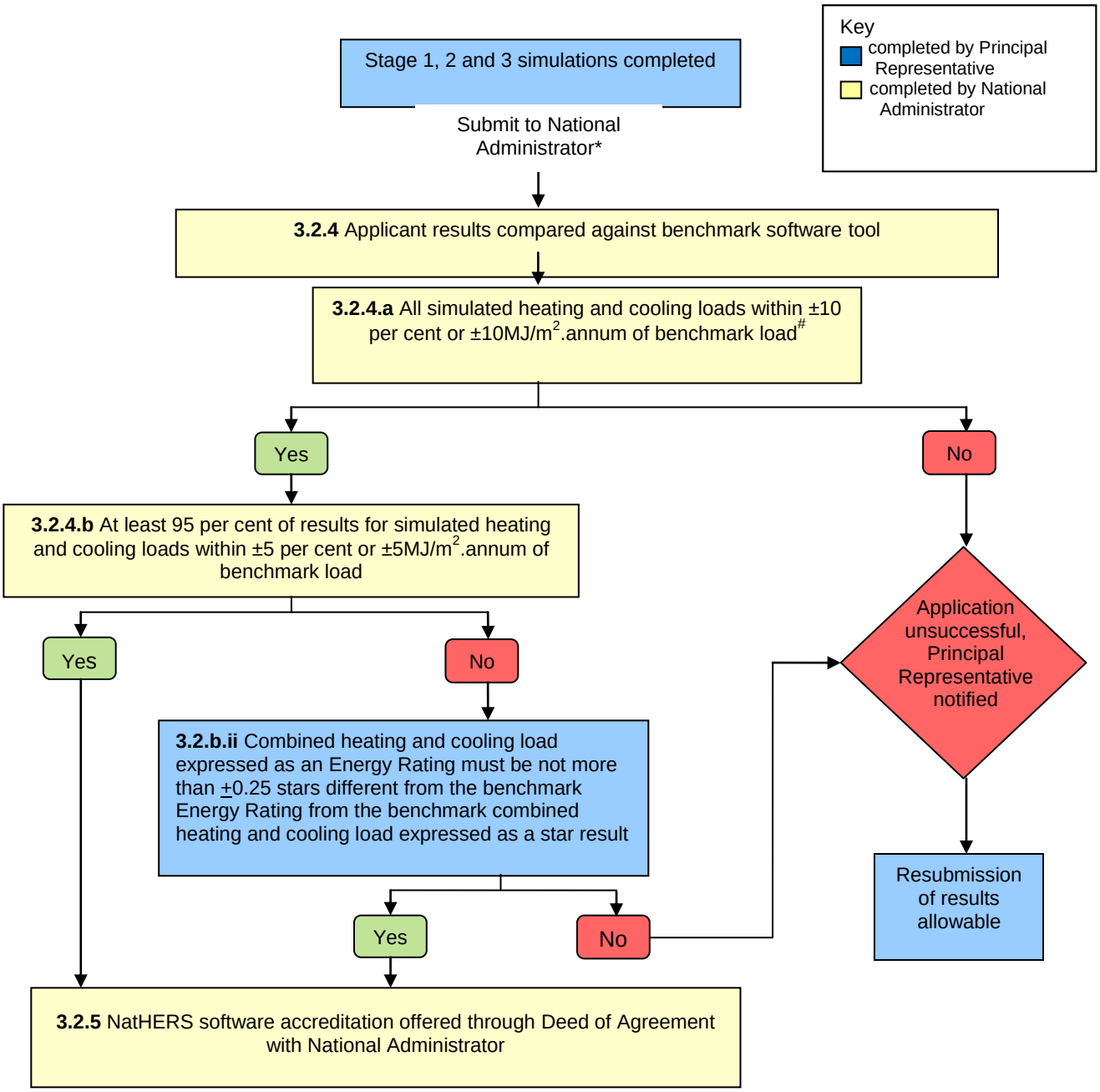
A Software Tool will not be accredited under NatHERS until a Deed of Agreement is executed between the National Administrator and the Principal Representative.

The National Administrator will maintain a list of NatHERS accredited Software Tools and make this list publicly available on the website.

The software testing and accreditation process, including tolerance, is summarised in Figure 1. Note that this flowchart is provided for guidance only. The conditions described in 3.2.1 to 3.2.5 (inclusive) must be followed in full.

Figure 1. Software testing and accreditation process

Note - this diagram provides a simplified overview of the process described in sections 3.2.4 and 3.2.5



*simulation results may be submitted for each stage separately, or combined (see **3.2.3**)

specific dwelling configurations that the applicant software cannot model will not form part of the simulation sample and thus not contribute to the accreditation test results.

3.2.6. Process for upgrading software

All revisions, updates or new versions of previously accredited Software Tools must repeat software testing for Stage 2 (see 3.2.1). The Principal Representative must submit:

- completed results spreadsheet for the repeat Stage 2 software simulations and electronic files for each simulation;
- a written statement from the independent, experienced, NatHERS assessor(s) (described in 3.1.2) who completed the testing, declaring that the testing was their work and outlining methodology or assumptions used in the assessment not explicitly covered in the software user instructions, as applicable;
- evidence of the updated training package for users referred to in 3.2.2;
- sufficient commercially ready copies of the software for distribution to each state and territory building authority for review purposes.

Applications will not be considered until all these requirements are provided to the National Administrator.

Any revisions, updates or new versions must be identified by suffixes to the software tool version number as approved by the National Administrator on behalf of the Steering Committee e.g. AccuRate Sustainability Version 2.0.2.13'x'; BERS Professional Version 4.2.110811'x' and First Rate 5 v 5.1'x'.

The Principal Representative may also submit additional supporting information that could assist the National Administrator to verify the accuracy of the updated Software Tool.

The National Administrator will assess the Stage 2 results against those previously submitted at the time of original accreditation for that Software Tool. The repeat Stage 2 results must be within 1 per cent of each of the heating, cooling and total Energy Loads for each Stage 2 simulation calculated by the original, accredited version of the Software Tool as submitted to the National Administrator at the time of accreditation. The Steering Committee may accept a tolerance of >1 per cent where a suitable explanation (and supporting information) is provided. If the changes are >1 per cent, then the timing of the release as described in Section 3.2.5a will ideally apply.

If the updated Software Tool meets the process described above, and the Steering Committee approves the accreditation, then the National Administrator will offer NatHERS software accreditation to the Principal Representative through an amendment to the Deed of Agreement. An updated Software Tool will not be accredited under NatHERS until an amended Deed of Agreement is executed. The Deed of Agreement will establish terms and conditions for NatHERS accreditation, as provided at 3.2, and as approved by the National Administrator on behalf of the Steering Committee.

Appendix A – Definitions, acronyms and related documents

AccuRate Software

The commercial Software Tool developed by CSIRO comprising a graphical user interface and the Chenath Engine.

Area Adjustment Factor

An adjustment formula applied to the Energy Load to account for different rates of heat transfer due to differences in dwelling size. The Area Adjustment Factor (AAF) takes into account the ratio of dwelling surface area to its floor area and the Climate Zone.

Benchmark Software Tool

The combination of the Chenath Engine and AccuRate graphical user interface. The Benchmark Software was developed by CSIRO.

Chenath Engine

The government developed calculation engine that predicts annual totals of hourly heating and cooling energy requirements for residential buildings. CSIRO maintains the Chenath Engine and licenses the engine to software tool developers. Details of the current version are available from the National Administrator. Internal heating (sensible and latent loads) and cooling load settings for the Chenath Engine are included at Appendix B. All currently accredited NatHERS software tools use the Chenath Engine.

Climate Zone (NatHERS)

Climate Zones in NatHERS software tools represent a geographical region for which there is a corresponding NatHERS climate file containing hourly data for meteorological variables of temperature, humidity, wind speed and solar radiation, for weather stations (refer Appendix C). Climate Zones represent a geographical region, not necessarily contiguous, which is allocated to one of the weather stations. *Note* – the National Construction Code identifies eight climate zones. The climate zones currently used in NatHERS software tools should be referred to as 'NatHERS Climate Zones'.

Cooling and Heating Thermostat Setting

In order to calculate the energy needed for cooling, a cooling thermostat temperature must be assumed (Table 4). The temperature at which people feel comfortable, however, varies according to climate because humans adapt to their climate conditions i.e. the warmer the climate, the higher the temperature at which they feel comfortable. When dwelling zone temperatures become uncomfortably warm (assumed to be 2.5 degrees above the thermostat setting), the Chenath engine 'cools' zones to a specified thermostat temperature. This temperature varies according to Climate Zone based on the calculation of the temperature at which people will feel neither too cool nor too warm in that climate ('thermal neutrality').

The dwelling zone temperatures predicted by the Chenath engine are perceived environmental temperatures i.e. they take into account both the air temperature and the radiant temperature of the surrounding surfaces in the zone, air movement and humidity, and are a better measure of human comfort than air temperature alone.

Dwelling

For the purpose of this Protocol, dwelling includes attached and detached housing, and residential apartments and other buildings with suitable building dimensions and functions as described in Class 1, 2 and 4 buildings under the National Construction Code.

Conditioned Floor Area

The total enclosed zone area of the dwelling that is actively heated and/or cooled, excluding areas within a dwelling that can be separated and are not actively heated or cooled e.g. a separate laundry, toilet, bathroom, garage, sub-floor and roof space, measured in square metres (m^2).

Energy Load (Thermal)

The predicted annual, energy requirements in conditioned zones arising from space conditioning to maintain thermal comfort within a dwelling reported in megajoules (MJ/m^2.annum). The Energy Load can be determined as a total, heating or cooling load in accordance with the formula in 2.4. *Note* – all energy loads referred to in this document are 'thermal' energy loads, not energy derived from electricity, gas or other supply sources.

Energy Rating

A star value (from 0 to 10 stars) that is calculated based on the predicted annual Energy Load and the Star Band Criteria for each Climate Zone (see Appendix C). The predicted annual Energy Load and the corresponding star rating band for the particular Climate Zone is the design's star rating for regulatory purposes. When using software in Regulation Mode, it must be reported in half (0.5) star increments.

Heating Thermostat Setting

Refer to the definition of Cooling and Heating Thermostat Setting.

Latent Heat Load

The heat which must be extracted to condense water vapour.

National Administrator

The National Administrator is the body that is appointed by the NatHERS Steering Committee to administer certain parts of NatHERS in consultation and agreement with relevant government agencies. The Department of Climate Change and Energy Efficiency (DCCEE) is the current National Administrator.

Principal Representative

The Principal Representative of a Software Tool developer will be the primary contact between the National Administrator and an applicant for accreditation. The Principal

Representative must have the authority to enter into a Deed of Agreement with the National Administrator if an offer of NatHERS software accreditation is made.

Regulation Mode

A mode of software operation where a number of building fabric and occupant behaviour assumptions are fixed in order to allow an equal comparison between houses for the purposes of establishing a energy star rating for regulation. The occupant level and building fabric settings are set in accordance with this Protocol and cannot be changed by the user. Regulation Mode is the mode of operation necessary for assessing compliance with energy equivalence requirements (minimum star rating) under the National Construction Code, noting that different types of regulations may require different or separate modes.

Regulatory certificate

A print out from an accredited software package stating a range of information about the assessment including items such as, the area corrected total heating and cooling load, the net conditioned floor area, Climate Zone and energy rating (stars) for the purposes of demonstrating compliance with minimum star rating requirements.

Scheme

The Nationwide House Energy Rating Scheme (NatHERS) which is the government initiative in Australia that facilitates nationally consistent energy assessments from accredited software tools. It can be used to assess the thermal efficiency (energy efficiency) of a dwelling's fabric based on its design.

Sensible Heat Load

The amount of heat that must be extracted from air in a zone in order to maintain the prescribed heating thermostat setting excluding any latent heat required to condense water vapour.

Human activity in the house adds heat from cooking, lighting, appliances like fridges and freezers and just the heat generated by the human metabolism. The Chenath engine applies sensible heat gains to the zones in the house depending on their type e.g. cooking and fridge in a kitchen, appliances like televisions and stereos, and lights in living rooms, and the heat gain from sleeping people in bedrooms.

Software Tool

Energy rating software that determines an Energy Load and Energy Rating (between 0 to 10 stars) based on the design and thermal properties of a dwelling. Software Tools contain a calculation engine (that calculates heat transfer and conditioning energy requirements for a dwelling) and a graphical user interface (where software users input design and construction elements for the dwelling).

Star Band Criteria

The Star Band Criteria (approved by the Steering Committee) that outlines star levels of 0 to 10 stars in half (0.5) star increments for all Energy Loads and all NatHERS Climate Zones (Appendix D).

Steering Committee

The Select Council on Climate Change, Energy Efficiency Working Group (E2WG), is the NatHERS Steering Committee and is responsible for oversight, strategic direction, policy and decision making for NatHERS. E2WG comprises officials from Commonwealth, State and Territory agencies with responsibility for energy efficiency policy.

Thermal comfort

Used to describe a range of environmental conditions (air temperature, the radiant temperature of surrounding surfaces, humidity and air movement) in which a human is likely to feel comfortable. The exact conditions which make a building comfortable vary, depending on human adaptation to the climate.

The Chenath engine calculates the combined effect of air and radiant temperatures, allows for the impact of humidity and calculates the air speed in each dwelling zone from cross ventilation and ceiling fans. It allows for adaptation to climate by varying the cooling thermostat temperature between Climates Zones. It selects heating and cooling thermostat temperatures which have been determined by research to be comfortable for the majority of people.

Thermal Performance (energy efficiency)

The performance of the building fabric of a dwelling as determined by the predicted heating and cooling loads when subjected to a standard test occupancy pattern in a reference climate. The lower the loads, the higher the thermal performance and energy star rating.

Universal certificate

A certificate with a common format and content which describes the key thermal performance features of the building fabric, the energy rating (stars) and energy loads, details of the assessor and any accreditation they hold, the building address, and information regarding regulatory requirements either in addition to or which qualify the requirements of the rating.

Website

The NatHERS website is www.nathers.gov.au.

Acronyms

Acronym/ Abbreviation	Long title/meaning
AAF	Area Adjustment Factor
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEE	Department of Climate Change and Energy Efficiency
E2WG	Energy Efficiency Working Group
EOI	Expression of interest
MJ	Megajoules
NatHERS	Nationwide House Energy Rating Scheme
NCC	National Construction Code
SHGC	Solar Heat Gain Coefficient
U-value	Thermal transmittance measured in watts per square metre per kelvin (W/m^2K)

Related documents

The following documents are available on request from the National Administrator or on the NatHERS website:

Document	Section referenced in Protocol
Area Adjustment Factor equation and documentation	2.5
Climate Zones borders	2.3.1
Climate Zones files	2.3.1
Standard set of base dwelling designs and accompanying material	3.1.5
Results spreadsheet	3.1.5
Principles for Ratings in Regulation Mode	3.2.1

Appendix B – Benchmark tool settings

The Benchmark Software is the combination of the Chenath Engine and AccuRate user interface. For current versions please contact the National Administrator.

This appendix outlines the internal sensible and latent heat loads and cooling thermostat settings for the Benchmark Software Tool AccuRate and is also provided for the information of developers of Software Tools that do not use the Chenath Engine.

All air contains some moisture in gaseous form. When air is cooled, some of this moisture will condense e.g. as air in the atmosphere cools it will rain, or will drip from an in wall air-conditioning unit. A significant amount of heat must be removed from the air simply to condense the water vapour. In humid climates this can be as much as a third of the total energy needed for cooling.

Moisture is present in the air and is also generated by activities in the house e.g. cooking, showering and even breathing and sweating will add some moisture to the air inside a house. To represent the moisture added to the air from human activity inside a house, the Chenath engine applies a latent heat gain depending on the nature of the dwelling zone e.g. kitchens have latent heat gains from cooking, and living rooms and bedrooms from human occupancy.

The loads, hours of operation and thermostat settings in AccuRate are a conservative representation of dwelling occupancy for comparative testing only. The actual use of any particular dwelling will vary from hour to hour, day to day, and year to year according to many factors such as occupant number and behaviour (influenced by age, lifestyle, occupation, wealth, and health). The dwelling operational details are not designed to reflect a particular household, but instead are designed to allow a consistent and reasonable comparison between buildings on the basis of the potential to be comfortable in each space according to its designed function and Climate Zone.

Appendix B.1 – Internal Sensible and Latent Heat Loads

The heat loads in Tables 1 to 4 are for a 160 m^2 dwelling with two adults and two children, with a floor area split of 80 m^2 for all the living areas and 80 m^2 for all the bedroom areas.

The loads shown are for the one hour period up to the time stated, i.e. a time of 1:00 am indicates the period between midnight and 1:00 am.

Table 1 - Internal sensible and latent heat loads - for living spaces, that include a kitchen

Time	Sensible heat load (Watts)				Latent heat load (Watts)
	Appliances and cooking	Lighting	People	Total	
1:00 am	100	0	0	100	0
2:00 am	100	0	0	100	0
3:00 am	100	0	0	100	0
4:00 am	100	0	0	100	0
5:00 am	100	0	0	100	0
6:00 am	100	0	0	100	0
7:00 am	100	0	0	100	0
8:00 am	400	180	280	860	400
9:00 am	100	180	280	560	200
10:00 am	100	0	140	240	100
11:00 am	100	0	140	240	100
Noon	100	0	140	240	100
1:00 pm	100	0	140	240	100
2:00 pm	100	0	140	240	100
3:00 pm	100	0	140	240	100
4:00 pm	100	0	140	240	100
5:00 pm	100	0	140	240	100
6:00 pm	100	300	210	610	150
7:00 pm	1100	300	210	1610	750
8:00 pm	250	300	210	760	150
9:00 pm	250	300	210	760	150
10:00 pm	250	300	210	760	150
11:00 pm	100	0	0	100	0
Midnight	100	0	0	100	0

Table 2 - Internal sensible and latent heat loads - for living spaces that do not include a kitchen

Time	Sensible heat load (Watts)			Latent heat load (Watts)
	Lighting	People	Total	
1:00 am	0	0	0	0
2:00 am	0	0	0	0
3:00 am	0	0	0	0
4:00 am	0	0	0	0
5:00 am	0	0	0	0
6:00 am	0	0	0	0
7:00 am	0	0	0	0
8:00 am	180	280	460	140
9:00 am	180	280	460	140
10:00 am	0	140	140	70

11:00 am	0	140	140	70
Noon	0	140	140	70
1:00 pm	0	140	140	70
2:00 pm	0	140	140	70
3:00 pm	0	140	140	70
4:00 pm	0	140	140	70
5:00 pm	0	140	140	70
6:00 pm	300	210	510	105
7:00 pm	300	210	510	105
8:00 pm	300	210	510	105
9:00 pm	300	210	510	105
10:00 pm	300	210	510	105
11:00 pm	0	0	0	0
Midnight	0	0	0	0

Table 3 - Internal sensible and latent heat loads - for bedroom spaces

Time	Sensible heat load (Watts)			Latent Heat load (Watts)
	Lighting	People	Total	
1:00 am	0	200	200	100
2:00 am	0	200	200	100
3:00 am	0	200	200	100
4:00 am	0	200	200	100
5:00 am	0	200	200	100
6:00 am	0	200	200	100
7:00 am	0	200	200	100
8:00 am	0	0	0	0
9:00 am	0	0	0	0
10:00 am	0	0	0	0
11:00 am	0	0	0	0
Noon	0	0	0	0
1:00 pm	0	0	0	0
2:00 pm	0	0	0	0
3:00 pm	0	0	0	0
4:00 pm	0	0	0	0
5:00 pm	0	0	0	0
6:00 pm	0	0	0	0
7:00 pm	0	0	0	0
8:00 pm	100	0	100	0
9:00 pm	100	0	100	0
10:00 pm	100	0	100	0
11:00 pm	100	200	300	100
Midnight	0	200	200	100

Appendix B.2 – Cooling Thermostat Settings

NatHERS requires that for an energy assessment, all conditioned spaces must be maintained within a certain range of thermal comfort. The upper temperature limit for thermal comfort in each Climate Zone is indicated in Table 4. These temperature settings represent an assumed thermostat trigger point that would require the operation of artificial cooling appliance (air conditioner) in these spaces.

Table 4 - Cooling Thermostat Settings

Climate Zone	All conditioned spaces (°C)
1	26.5
2	27.0
3	27.0
4	26.0
5	26.5
6	26.5
7	26.0
8	26.0
9	26.0
10	25.5
11	25.0
12	25.0
13	25.0
14	24.0
15	25.0
16	25.0
17	25.5
18	24.5
19	27.0
20	25.0
21	24.0
22	23.0
23	22.5
24	24.0
25	23.0
26	23.0
27	25.0
28	24.5
29	26.0
30	27.5
31	26.5
32	26.5
33	27.0
34	26.5
35	26.0

Climate Zone	All conditioned spaces (°C)
36	26.0
37	27.0
38	27.0
39	27.0
40	28.0
41	27.5
42	28.0
43	27.0
44	26.0
45	26.0
46	26.5
47	24.5
48	25.0
49	24.5
50	25.0
51	25.5
52	25.0
53	24.5
54	25.0
55	24.0
56	24.5
57	23.5
58	23.5
59	23.0
60	24.0
61	23.5
62	24.0
63	23.0
64	23.0
65	23.0
66	23.5
67	23.0
68	23.5
69	22.5

Appendix B.3 – Heating Thermostat Settings

In Regulation Mode the schedule of minimum thermostat settings is as follows:

- For **living spaces** (including kitchens and other spaces typically used during the waking hours): a heating thermostat setting of 20° Celsius (C).
- For **bedroom spaces** (including bathrooms and dressing rooms, or other spaces closely associated with bedrooms): a heating thermostat setting of 18°C from 0700 to 0900 and from 1600 to 2400; and a heating thermostat setting of 15°C from 2400 to 0700.

Appendix B.4 – Indoor and Outdoor Adjustable Shading Settings

In Regulation Mode the schedule of indoor and outdoor adjustable settings are as follows:

Indoor adjustable shading

- Closed at 1800, open at 0700; and
- Closed between 0700 and 1800 if all the following three conditions satisfied:
    - Outdoor temperature exceeds Cooling thermostat setting + 2.5°C;
    - Incident solar irradiance on glazing exceeds 200 W/m^2, and
    - Outdoor blind non-exist or cannot be drawn.

Outdoor adjustable shading

- Closed if outdoor temperature exceeds T, where:
    - *T* = Cooling thermostat setting - 0.5°C, except
        - If Cooling thermostat setting - 0.5°C > 26.0°C, *T* = 26.0°C
        - If Cooling thermostat setting - 0.5°C < 24.0°C, *T* = Cooling thermostat setting
- Closed when incident solar irradiance on glazing exceeds 75 W/m2.

Appendix C – NatHERS Climate Zones Data

There are currently 69 weather data stations in Australia with sufficient hourly weather data which is representative of average conditions in a location to allow the performance of a building to be simulated. Locations are allocated to a Climate Zone on the basis of the correlation between their average monthly climate data and that of the weather data station. *Note* – it is proposed to increase the number of climate zones to 80.

The National Administrator can provide climate files for 69 Climate Zones described in Table 5 below. The climate files contain hourly data for meteorological variables of temperature, humidity, wind speed and solar radiation for a representative meteorological year.

Table 5 - NatHERS Climate Zones

Climate Zone No.	Location	Latitude	Longitude
1	Darwin Airport	12.4 S	130.9 E
2	Port Hedland	20.4 S	118.6 E
3	Longreach	23.4 S	144.3 E
4	Carnarvon	24.9 S	113.7 E
5	Townsville	19.3 S	146.8 E
6	Alice Springs	23.8 S	133.9 E
7	Rockhampton	23.4 S	150.5 E
8	Moree	29.5 S	149.9 E
9	Amberley	27.6 S	152.7 E
10	Brisbane	27.4 S	153.1 E
11	Coffs Harbour	30.3 S	153.1 E
12	Geraldton	28.8 S	114.7 E
13	Perth	31.9 S	115.9 E
14	Armidale	30.5 S	151.7 E
15	Williamtown	32.8 S	151.8 E
16	Adelaide	34.9 S	138.6 E
17	Sydney	33.9 S	151.2 E
18	Nowra	35.0 S	150.5 E
19	Charleville	26.4 S	146.3 E
20	Wagga	35.2 S	147.5 E
21	Melbourne	37.8 S	145.0 E
22	East Sale	38.1 S	147.1 E
23	Launceston	41.4 S	147.1 E
24	Canberra Airport	35.3 S	149.2 E
25	Cabramurra	35.9 S	148.4 E
26	Hobart	42.8 S	147.5 E
27	Mildura	34.2 S	142.1 E
28	Richmond (NSW)	33.6 S	150.8 E
29	Weipa	12.7 S	141.9 E
30	Wyndham	15.5 S	128.1 E

Climate Zone No.	Location	Latitude	Longitude
31	Willis Island	16.3 S	150.0 E
32	Cairns	16.9 S	145.8 E
33	Broome	18.0 S	122.2 E
34	Learmonth	22.2 S	114.1 E
35	Mackay	21.1 S	149.2 E
36	Gladstone	23.9 S	151.3 E
37	Halls Creek	18.2 S	127.7 E
38	Tennant Creek	19.6 S	134.1 E
39	Mt Isa	20.7 S	139.5 E
40	Newman	23.4 S	119.7 E
41	Giles	25.0 S	128.3 E
42	Meekatharra	26.6 S	118.5 E
43	Oodnadatta	27.6 S	135.5 E
44	Kalgoorlie	30.8 S	121.5 E
45	Woomera	31.2 S	136.8 E
46	Cobar	31.5 S	145.8 E
47	Bickley	32.0 S	116.1 E
48	Dubbo Airport	32.2 S	148.6 E
49	Katanning	33.7 S	117.6 E
50	Oakey	27.4 S	151.7 E
51	Forrest	30.8 S	128.1 E
52	Swanbourne	32.0 S	115.8 E
53	Ceduna	32.1 S	133.7 E
54	Mandurah	32.5 S	115.7 E
55	Esperance	33.8 S	121.9 E
56	Mascot	33.9 S	151.2 E
57	Manjimup	34.2 S	116.1 E
58	Albany	35.0 S	117.8 E
59	Mt Lofty	35.0 S	138.7 E
60	Tullamarine (Melbourne Airport)	37.7 S	144.9 E
61	Mt Gambier	37.8 S	140.8 E
62	Moorabbin	38.0 S	145.1 E
63	Warrnambool	38.3 S	142.4 E
64	Cape Otway	38.9 S	143.5 E
65	Orange Air Port	33.4 S	149.1 E
66	Ballarat	37.5 S	143.8 E
67	Low Head	41.1 S	146.8 E
68	Launceston Airport	41.5 S	147.2 E
69	Thredbo Valley	36.5 S	148.3 E

Appendix D – Star Band Criteria

Within NatHERS, unique Star Bands are set for each Climate Zone to allow fair comparisons of buildings despite extreme regional variability in weather conditions across Australia. Table 6 shows the maximum Energy Loads (thermal) corresponding to these Star Bands (shown in half star [0.5] increments) in each Climate Zone.

Table 6 - NatHERS Star Band Criteria (Energy Loads [thermal] in MJ/m^2.annum)

Climate Zone	Location	Energy Rating (stars)																			
		0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
1	Darwin	853	773	706	648	598	555	516	480	446	413	381	349	317	285	253	222	192	164	140	119
2	Port Hedland	643	569	507	455	411	373	340	310	284	260	237	215	194	172	151	131	111	93	76	62
3	Longreach	654	550	465	396	340	294	257	226	200	178	159	141	124	107	90	74	58	43	29	18
4	Carnarvon	209	181	157	137	120	105	93	82	73	66	59	53	47	41	36	31	27	22	18	14
5	Townsville	337	309	283	259	238	218	200	183	168	153	140	127	114	103	92	81	71	61	52	44
6	Alice Springs	681	562	464	385	321	269	228	196	170	148	130	113	99	84	70	56	43	29	17	7
7	Rockhampton	344	295	255	222	194	171	152	136	122	110	99	90	80	71	63	54	46	38	31	24
8	Moree	597	481	388	315	258	214	180	155	135	119	106	94	83	71	60	47	35	24	14	7
9	Amberley	407	334	275	226	187	157	132	113	97	85	75	67	59	52	45	38	31	24	18	12
10	Brisbane	245	203	167	139	116	97	83	71	62	55	48	43	38	34	30	25	21	17	13	10
11	Coffs Harbour	286	232	188	153	125	103	86	73	63	55	49	44	39	34	29	24	19	15	11	7
12	Geraldton	349	285	233	191	158	132	112	96	83	73	64	57	50	43	36	29	22	16	10	5
13	Perth	483	387	311	251	204	167	139	118	102	89	79	70	61	52	44	34	25	17	9	4
14	Armidale	801	661	545	451	375	314	266	227	195	169	147	128	110	93	76	60	43	27	13	1
15	Williamtown	429	349	284	232	191	159	133	114	98	86	76	67	58	50	42	34	26	19	12	6
16	Adelaide	584	480	394	325	270	227	192	165	143	125	109	96	83	70	58	46	33	22	11	3
17	Sydney East	286	230	184	148	120	98	81	68	58	50	44	39	35	30	26	22	17	13	9	6
18	Nowra	517	423	346	284	235	195	164	140	121	105	92	81	70	60	50	40	30	20	12	5
19	Charleville	525	434	359	298	249	209	177	151	131	114	100	87	76	66	56	45	35	26	17	9
20	Wagga	804	663	548	455	380	321	273	235	204	178	156	137	118	100	82	64	47	30	15	3
21	Melbourne	676	559	462	384	321	271	230	198	171	149	131	114	98	83	68	54	39	25	13	2
22	East Sale	791	653	541	449	376	317	269	231	201	175	153	133	115	98	80	63	46	30	15	2
23	Launceston	895	740	615	513	431	366	314	272	237	208	183	160	138	117	95	74	53	33	15	1

Climate Zone	Location	Energy Rating (stars)																			
		0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
24	Canberra	957	792	657	547	458	387	330	284	247	216	189	165	142	120	99	77	56	35	17	2
25	Cabramurra	1666	1404	1188	1012	870	753	658	580	513	454	401	352	303	255	208	160	114	71	33	1
26	Hobart	876	723	598	498	417	354	303	262	229	202	177	155	134	113	92	71	51	31	14	0
27	Mildura	660	541	444	367	305	256	218	187	163	143	126	110	96	81	67	53	38	25	13	3
28	Richmond (NSW)	555	450	365	298	245	203	171	146	127	112	99	87	77	66	55	44	34	23	14	7
29	Weipa	830	743	671	611	560	517	479	445	414	384	355	326	296	266	237	207	179	153	130	111
30	Wyndham	1229	1071	943	839	754	685	626	576	530	488	447	406	364	321	278	234	192	154	121	95
31	Willis Island	427	391	359	330	305	282	261	242	224	207	191	176	160	146	132	118	105	93	81	71
32	Cairns	330	302	276	253	232	214	197	181	167	153	140	128	117	105	94	84	74	64	56	48
33	Broome	732	652	585	531	486	448	416	387	360	335	310	285	260	234	208	182	157	134	115	99
34	Learmouth	511	439	379	330	290	256	228	204	184	166	149	134	119	104	89	74	60	47	35	25
35	Mackay	275	248	224	202	183	165	150	136	123	112	102	92	83	75	68	60	53	47	40	34
36	Gladstone	220	191	167	146	129	114	101	90	81	73	66	59	53	48	42	37	32	28	23	19
37	Halls Creek	755	649	563	492	434	387	348	315	286	259	235	211	187	162	138	114	90	69	50	34
38	Tennant Creek	631	545	473	414	366	325	291	262	236	213	191	170	150	129	109	89	70	52	36	22
39	Mt Isa	656	560	481	417	363	320	284	253	227	205	184	164	145	126	108	90	72	55	40	28
40	Newman	631	527	442	373	318	273	237	207	183	162	144	127	111	95	80	64	49	35	22	11
41	Giles	517	429	357	298	252	215	185	161	142	126	111	98	86	73	61	49	36	25	15	7
42	Meekatharra	437	358	293	241	200	167	141	120	104	91	79	70	60	52	43	34	25	17	10	4
43	Oodnadatta	596	495	412	344	289	244	208	179	155	135	118	103	90	77	64	51	39	27	16	7
44	Kalgoorlie	490	396	320	259	211	173	144	122	105	91	80	70	61	52	43	34	25	17	9	3
45	Woomera	552	446	362	295	243	203	172	148	130	115	102	90	79	67	55	43	31	20	10	3
46	Cobar	580	469	379	308	253	210	176	151	131	115	101	89	78	67	55	44	32	21	11	4
47	Bickley	595	485	397	325	269	224	189	161	140	122	107	94	82	70	58	46	34	22	12	4
48	Dubbo	627	513	421	347	288	241	205	176	153	134	118	103	90	76	63	49	36	23	12	3
49	Katanning	664	537	436	354	290	241	202	172	149	130	114	100	87	74	61	48	34	22	11	2
50	Oakey	485	391	315	256	210	174	147	126	110	98	87	78	69	60	50	41	31	22	14	8
51	Forrest	498	401	324	262	213	175	146	124	107	93	82	72	63	53	44	35	25	16	8	2
52	Swanbourne	284	231	187	152	124	102	84	71	60	51	45	39	34	29	25	20	15	11	7	3
53	Ceduna	499	406	331	271	223	186	157	134	116	101	89	78	68	58	47	37	27	17	9	2
54	Mandurah	412	332	269	218	179	148	125	107	93	82	73	65	57	49	41	33	25	17	10	5

Climate Zone	Location	Energy Rating (stars)																			
		0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
55	Esperance	430	351	286	233	191	158	132	111	95	82	71	62	54	46	38	30	22	14	7	1
56	Mascot	352	284	230	186	151	125	104	88	75	66	58	51	45	39	32	26	20	14	9	5
57	Manjimup	687	565	465	384	318	266	224	191	164	143	124	108	93	79	65	51	38	24	12	2
58	Albany	558	457	374	307	253	210	176	149	127	110	95	83	71	60	50	39	29	19	9	1
59	Mt Lofty	1173	987	833	706	603	518	448	391	342	301	264	230	198	166	136	105	76	48	22	1
60	Tullamarine	797	663	552	462	388	328	280	241	209	182	158	138	118	100	82	64	47	30	15	2
61	Mt Gambier	849	702	582	484	405	341	290	250	216	189	165	144	124	105	86	67	48	31	15	1
62	Moorabbin	742	615	511	426	357	301	256	220	190	165	144	125	108	91	75	58	43	27	13	1
63	Warrnambool	867	716	593	493	413	349	298	258	224	197	173	151	130	110	90	70	51	32	15	2
64	Cape Otway	708	593	497	418	353	301	257	222	193	168	146	127	109	92	76	59	43	28	14	2
65	Orange	1156	964	807	679	575	492	424	369	324	285	250	219	189	159	130	101	72	46	22	2
66	Ballarat	1045	874	734	618	525	448	386	335	293	257	225	197	169	143	117	91	66	42	20	2
67	Low Head	668	554	460	384	322	273	233	201	175	153	133	116	100	85	69	54	39	24	11	0
68	Launceston Air	1048	867	719	600	505	428	367	318	278	245	215	188	162	137	112	86	61	38	17	0
69	Thredbo	1471	1238	1045	888	759	655	569	499	439	387	341	298	257	216	176	136	98	61	28	1