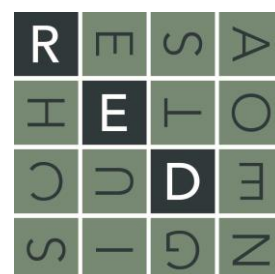


Technical Note and Assessor Handbook - Analysis for Whole of Home

Department of Industry, Science, Energy and Resources

Issue 3 – 15/10/2021





Disclaimer

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Introduction

NatHERS is introducing a Whole of Home (WoH) energy assessment option for new homes in Australia. This reflects the endorsement by Energy Ministers in February 2019 of the Trajectory for Low Energy Buildings (new buildings). This is a national plan that aims to achieve zero energy and zero carbon-ready commercial and residential buildings in Australia. It represents a key initiative to address Australia's 40 per cent energy productivity improvement target by 2030 under the National Energy Productivity Plan.

The WoH assessment builds on the existing NatHERS Thermal assessment that is widely used as a pathway for verification of compliance for the energy performance requirements under the National Construction Code (NCC). It is proposed that from 2022, there will be two energy performance requirements for residential buildings under the NCC. These are Thermal performance and Whole of Home performance. NatHERS assessments will provide a compliance verification pathway for both of these requirements.

When undertaking an assessment for compliance purposes, NatHERS Assessors must adhere to the requirements laid out in the NatHERS Technical Note. The setting of standard assessment requirements assists in maintaining consistency of assessments across different Assessors.

Adjunct to the Technical Note, is the NatHERS Assessor Handbook which has more of an educational intent, with information that further explains or clarifies the requirements of the NatHERS Technical Note. The Handbook is intended to help Assessors by describing how assessments are to be conducted, including the mandatory aspects of the process, as well as also providing other guidance and recommended practices.

These two documents, the NatHERS Technical Note and the Assessor Handbook, are the key supporting documents for Accredited NatHERS Assessors.

With the introduction of WoH assessments, both of these documents will need to be expanded to incorporate the new WoH aspects of a NatHERS Assessment. It is proposed that NatHERS Thermal and WoH content be integrated into one Technical note and one Assessor Handbook, primarily because it is seen as most likely that the whole NatHERS assessment process, Thermal and WoH will be conducted by the same assessor or assessor business, as an integrated process.

It is seen as highly unlikely that a NatHERS WoH assessment would be undertaken as a stand-alone assessment for NCC compliance purposes. It may be more likely that a whole-of-home elemental assessment be undertaken in conjunction with a NatHERS Thermal star rating. However, there will be more flexibility and potential efficiency benefits to undertaking a NatHERS WoH assessment for a project when a NatHERS Thermal assessment has been undertaken.

1.1 About this document

This report provides an introduction to the proposed new NatHERS WoH energy assessment methodologies, with the aim of identifying the contents that will need to be integrated into the NatHERS Technical Note and Assessor Handbook

The WoH energy calculation methods build on the NatHERS Thermal assessment by adding in consideration of regulated household equipment including: heating and cooling, hot water, lighting, swimming pool and spa pumps, and on-site energy production and storage. This allows calculation of household energy to be compared against the household energy budget proposed to be introduced in the NCC 2022.

For Class 1 buildings, the energy use budget is defined as 70 per cent of the annual energy usage of a set of benchmark appliances including:

- a 3-star ducted heat pump, rated under the *Greenhouse and Energy Minimum Standards (Air Conditioners up to 65kW) Determination 2019* (2019 GEMS Determination), heating all spaces that are determined to have a heating load
- a 3-star ducted heat pump, rated under the 2019 GEMS Determination, cooling all spaces that are determined to have a cooling load
- a 5-star instantaneous gas water heater, rated under the *Greenhouse and Energy Minimum Standards (Gas Water Heaters) Determination 2017* (2017 GEMS Determination), providing all domestic hot water: and
- a lighting power density of 4 W/m².

The provisions for Class 2 sole-occupancy units (SOUs) and Class 4 parts of buildings are based on 100 per cent of the energy usage of the benchmark appliances in the Class 1 provisions.

A new version of AccuRate, AccuRate Whole of Home, will act as the Benchmark Tool for NatHERS WoH assessments. Aspects of the Benchmark Tool are still under development at the time of this report. While the Benchmark Tool provides the standard other tools must meet, there will be multiple tools with different interfaces that Assessors will be able to use to conduct a NatHERS WoH assessment, and it is important that the Technical Note sets out the generic requirements irrespective of the tool being used. The Assessor Handbook provides broader guidance to the Assessor on the same topics as covered in the Technical Note and, like the Technical Note, the Assessor Handbook must maintain tool neutrality.

Within this document there is firstly an overview of the need for the new content in the Technical Note and Assessor Handbook, and then secondly a detailed breakdown of the proposed sections to be included in the two documents. The proposed content of the new sections of the Technical Note and Assessor Handbook are presented in tabular format. The rules proposed to be covered in the Technical Note are presented along side the broader guidance to be covered in the Assessor Handbook.

2 Technical Note and Assessor Handbook Overview

2.1 Technical Note

There is the need for new content in the NatHERS Technical Note in order to set out requirements for Accredited Assessors to follow when conducting NatHERS WoH Assessments. This will help to ensure consistency of assessments for regulatory compliance purposes.

The new Technical Note will build on the existing structure of the Thermal Technical Note, June 2019. The introductory material on Thermal Assessments will be expanded to include WoH considerations. Existing sections relating to building thermal performance models in NatHERS software will be retained. The Section on 'Finalising an Assessment' will be expanded to incorporate the WoH considerations.

In addition, the focus of the WoH assessment means the new Technical Note will include individual sections providing the rules around each of the household energy services for which assessors must input data for the assessment: heating and cooling, hot water, pools and spas, and onsite renewable energy. Additionally, the WoH software will calculate energy consumption for lighting, cooking equipment and plug-in appliances. Initially there will be no need for input from Assessors for lighting or plug-in loads, but this may be developed further in the future. Additional data entry for cooking equipment will be developed in the future.

As per the existing Technical Note, the expanded Technical Note is intended to be a dynamic document, evolving as the NatHERS program continues to evolve. This allows continual improvement of the new assessment process to be refined and improved over time.

2.2 Assessor Handbook

The new Assessor Handbook will provide the background to the Technical Note rules and act as a repository for supporting information and further understanding.

The ease of use of the existing Thermal Assessor Handbook is largely due to the flow of relevant content mirroring the Technical Note. The same approach will be taken for the new, expanded Assessor Handbook. Thus, chapters and section names in the Assessor Handbook will continue to mirror those in the Technical Note.

2.3 Proposed Headings for Technical Note and Assessor Handbook

Figure 1 presents the proposed new structure for the Technical Note and Assessor Handbook:

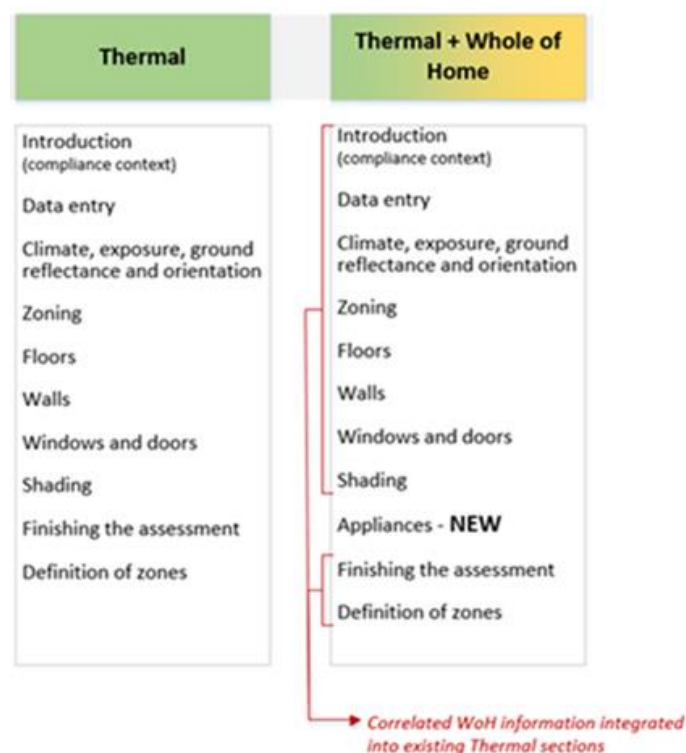


Figure 1 Proposed new structure for the Technical Note and Assessor Handbook

The new Appliances Section would include:

- Heating appliances
- Cooling appliances
- Hot water systems
- Lighting
- Pool and spa equipment
- On-site renewable energy and storage
- Plug-in loads
- Cooking equipment

3 Sections in detail

The following sections provide an outline of the new material that will be required in the Technical Note and Assessor Handbook. Sections of the existing Handbook that relate only to the NatHERS Thermal Assessment, are not included in this paper. It is possible there may be minor adjustments required in places throughout these existing sections, but these are not covered here. A separate review of the existing Thermal Technical Note is being conducted as part of the integration with proposed changes to energy efficiency provisions in the NCC 2022.

3.1 Introduction

The Introduction in the Technical Note will expand to outline the framework of the WoH assessment. The main stipulation being that both Thermal and WoH assessments undertaken for regulatory compliance are completed in a consistent way by Assessors accredited with a NatHERS approved Assessor Accrediting Organisation (AAO).

The sections listed in bold below are the same as those in the existing Thermal Technical Note, however, they will be amended to reflect the placement of the WoH assessment in relation to the current NatHERS thermal performance assessment. Sections not in bold will be developed to provide the background understanding of the WoH assessment.

| Introductory Content | |
|--|--|
| NatHERS Technical Note | Assessor Handbook |
| Background The NatHERS thermal performance assessment is being expanding to include the energy efficiency of regulated energy services of heating, cooling, hot water, lighting, pool/spa pumps and on-site renewable energy and storage. Therefore, the Technical Note is being expanded to include the requirements that must be followed when conducting a WoH assessment. Also include summary of new Technical Note structure. | Background Much of the Assessor Handbook Introduction is relevant to the new WoH assessment. The WoH assessment framework will be introduced as well as expanding other parts to consider the WoH. The headings highlighted in bold in the Technical Note column, left, are headings in the existing Technical Note. In large part these will be simply expanded to cover WoH assessments. The Technical Note and Assessor Handbook headings do not necessarily align in this section. |
| Purpose Extend the existing <i>Purpose</i> to include WoH assessments and Assessor requirements and expectations under NatHERS in relation to accreditation of Assessors by AAOs and use of NatHERS accredited software tools. | |
| Regulatory requirements This section should not require significant changes | |
| Status of this Technical Note This section should not require significant changes | |
| Updates This section should not require significant changes | |
| Feedback | |

| Introductory Content | |
|--|-------------------|
| NatHERS Technical Note | Assessor Handbook |
| This section should not require significant changes | |
| Disclaimer This section should not require significant changes | |

3.2 Before you start

A significant difference between a Thermal and WoH assessment is the minimum required documentation. In addition to plans and drawings required for the NatHERS Thermal assessment, the WoH assessment requires specifications for heating and cooling appliances, hot water system, pool and spa pumping, and onsite renewable energy systems, so this information can be input into the WoH assessment model. Where specifications have yet to be decided or have not been provided after reasonable attempt to attain this information, the WoH assessment can still be undertaken, by applying provisional values for respective inputs as required.

| Before You Start | |
|---|--|
| Technical Note | Assessor Handbook |
| Software tools: State that NatHERS accredited WoH software tools to be used for WoH assessments. | Software tools: Background on Whole of Home accredited Software Tools (Note that NatHERS accredited WoH software providers are yet to be confirmed). |
| Documentation Required: Minimum documentation required for a WoH assessment would typically include, for each appliance: <ul style="list-style-type: none"> • Type • Brand • Model • Efficiency level (where relevant) | Documentation Required: Documentation Required – rules to be set regarding what minimum documentation required. How appliances should be specified, guidance on reasonable efforts to obtain information as part of the required documentation. Provisional or default settings – where appliances have yet to be specified, an explanation for how default settings have been chosen e.g., If no heating or cooling are specified for a conditioned room, the NatHERS Methodology requires the default reverse-cycle room air conditioner to be specified. The HSPF and TCSPF are specified but vary depending on the ZERL climate zones (cold, average, hot). . Refer to each appliance section for details. Include examples of appliance specification with required information. |
| Dwelling ratings: If using NatHERS to demonstrate compliance with NCC PR1 (thermal performance H6P1) and PR2 (whole-of-home performance H6P2) two ratings must be modelled. A NatHERS Whole of Home rating cannot be modelled without a NatHERS thermal performance assessment and rating. Each | Dwelling ratings: Individual ratings (Thermal and WoH) are required for each dwelling. Each Class 2 SOU will require its own WoH assessment, in addition to the Thermal Performance assessment. |

| Before You Start | |
|--|---|
| Technical Note | Assessor Handbook |
| Class 2 SOU will require its own WoH assessment (J1P3), in addition to the Thermal Performance assessment (J1P2). | |
| Modelling of Alterations and Additions NatHERS WoH accredited software tools are used to assess an entire dwelling. Guidelines on how to assess additions and extensions to an existing dwelling, in relation to the NatHERS Thermal assessment and NCC Performance Solution. | Modelling of Alterations and Additions Modelling alterations and additions – rules to be determined on how to assess alterations and extensions as WoH. |
| Document Retention: Retain design, assessment and supporting documentation in line with the jurisdictions' requirements and for auditing and quality assurance. | Document Retention: Design documentation and WoH appliance specifications should both be kept together for the purposes of auditing and quality assurance. |
| | Assessment Goals: This section will need to be expanded to include appliances and efficiency discussion. |
| | Principles of thermal performance: Mirroring the section on principles of thermal performance from the existing Assessor Handbook. Discussions on, for example: energy efficiency, on site energy production and storage, hourly power data and trading energy with the grid. |

3.3 Data Entry

Like for a NatHERS Thermal assessment, information used as inputs into the NatHERS WoH software tool must be noted on the design documentation drawings or detailed in an attached schedule or specification.

Basic project information will carry over from the Thermal assessment. Otherwise, data entry content will be similar to the existing Technical Note, as it is largely focused with process rather than content.

| Data Entry | |
|--|---|
| Technical Note | Assessor Handbook |
| The new Technical Note will provide rules similar to the existing Technical Note for inputting elements that have yet to be specified. These will be based on stipulated (or tested) worst case scenarios or agreed common practice. Provisional inputs (e.g. where heating or cooling appliances have yet to be specified, but a conditioned space will have a heating and/or cooling load) will be applied and recorded in the NatHERS Certificate "Additional notes". | A summary of WoH data entry recommended procedures, similar to that in the existing Assessment Handbook will provide an overview of the data entry process. Details of data inputs will follow in the relevant section. |

3.4 Postcode Selection

The postcode, as entered in the NatHERS Thermal assessment project details, triggers several onboard tool assumptions in relationship to heating and cooling efficiencies, hot water and renewable energy calculations. This is in addition to the fact that the climate zone for the NatHERS Thermal assessment is based on postcode selection

A new section called “*Postcode selection*” will be incorporated into this section and expanded in the Assessor Handbook.

| Post Code Selection | |
|--|--|
| Technical Note | Assessor Handbook |
| WoH assessments use the same postcode as used by the NatHERS Thermal assessment, based on the existing Thermal Technical Note (2019) rules. No additional action required of the Assessor. | <p>This will be a new section to the Assessor Handbook. There are a number of circumstances where postcode affects the modelling outcome. Assessors should understand the importance of postcode location to these outputs e.g.:</p> <ul style="list-style-type: none">• The NatHERS climate zone is used to determine the Zoned Energy Rating Label climate zone for reverse cycle air conditioners.• Water heater climate zone (AN/NZ4234) is derived from postcode.• Various inputs to Solar PV calculations are dependent on postcode (e.g. latitude and longitude). |

3.5 Zoning

Zoning is undertaken as part of the NatHERS Thermal Assessment. The Thermal Performance simulation generates heating and cooling demands for each zone. As part of the WoH assessment the assessor must assign heating and cooling appliances to individual zones. When the WoH methods are applied to the heating and cooling energy calculation, there are different underlying assumptions about occupancy times and thermostat settings, compared to the NatHERS Thermal Assessment, however these are built into the software and there is no need for input from the Assessor.

| Zoning | |
|--|--|
| Technical Note | Assessor Handbook |
| No additional guidelines are required as Thermal zoning rules carry through to the WoH assessment. Different occupancy assumptions and thermostat settings applied as part of the WoH calculations for heating and cooling are applied automatically within the software and do not require input from the assessor. | <p>Include background information explaining the following adjustments to occupancy and thermostat assumptions:</p> <ul style="list-style-type: none">• Night-time zones will not be heated overnight, whereas the NatHERS Thermal assessment assumes heating overnight. Note that different, generally lower, thermostat settings are used for cooling.• “All-Day” and “Work-Day” combined profile is applied to the WoH assessment to better reflect “as lived-in” occupancy reflecting ABS data. |

| Zoning | |
|----------------|---|
| Technical Note | Assessor Handbook |
| | <ul style="list-style-type: none"> • "Work Day" profile assume no occupants are home between 9:00am and 5:00pm. • Explanation of the 60:40 weighting of profiles in order to create a single whole of home performance rating. <p>Because there are these differences in settings, WoH heating and cooling loads calculated as part of the WoH assessment will differ from the thermal performance heating and cooling loads. This is to be detailed in the Heating and Cooling sections that follow.</p> |

3.6 Heating

All conditioned zones are to have a heating appliance assigned to provide the heating for the modelled WoH heating load. If any rooms in the conditioned zones will not have heating equipment installed when the house is built, the default system is specified.

Heating appliances are diverse in their energy source, efficiency and energy rating labelling. Despite this the proposed WoH methods are such that many of the considerations are embedded into the software. For each conditioned zone the Assessor inputs heating appliance type and efficiency level, where relevant.

Therefore, the rules and guidance in the Technical Note are relatively concise, whereas the explanation in the Assessor Handbook will need be more expansive. The Assessor will be expected to have an understanding of the broad range of heating and cooling appliance types, where to source efficiency information from, and the assumptions underpinning the WoH calculations. The Assessor Handbook will be a useful repository for collating the information used to underpin the WoH methods.

| Heating Systems | |
|--|--|
| Technical Note | Assessor Handbook |
| <p>Assigning of Heating Appliances: For each zone the heating appliance type to be assigned as one of the following:</p> <ul style="list-style-type: none"> • Reverse cycle air conditioner (heat pump) – individual head • Reverse cycle air conditioner (heat pump) - ducted • Electric resistance heaters • Gas ducted heater • In-slab electric heating • Gas space/room heater • Slow combustion wood heater • Other (gas hydronic, heat pump hydronic) • If no heating appliance is assigned to a zone with a heating load then heating will be assumed to be delivered by MEPS level reverse cycle air conditioner (heat pump) with a climate appropriate Heating | <p>Assigning of Heating Appliances:</p> <ul style="list-style-type: none"> • Assigning heating appliances to zones – all zones (except NatHERS designated unconditioned zones) to be heated irrespective of the size of the load). • Guidance on how to allocate conditioned rooms to a specific heating zone. • Background to types of heating appliances. • Summary of energy sources (electricity, gas and wood plus other uncommon sources). • Whole of home heating systems, e.g., ducted gas or heat pump. • NatHERS designated unconditioned zones do not have a heating appliance attributed to them as part of the WoH assessment process. |

| Heating Systems | |
|--|---|
| Technical Note | Assessor Handbook |
| <p>Seasonal Performance Factor (HSPF) applied, irrespective of what types of appliances might be installed elsewhere in the dwelling.</p> <p>Rules around how different rooms are assigned to a heating zone (multiple zones are possible).</p> | |
| <p>Heating system efficiency: Heating appliance efficiency entered:</p> <ul style="list-style-type: none"> For reverse cycle air conditioners (heat pumps) this may be <ul style="list-style-type: none"> Star rating using the Zoned Energy Rating Label (ZERL), or Heating Seasonal Performance Factor (HSPF), or Energy Rating Label star rating or annual coefficient of performance (ACOP) for older systems rated under the 2013 GEMS Determination Gas heaters: <ul style="list-style-type: none"> Gas space/room heater - Gas Star Rating (based on Australian Gas Association - Space Heating Appliances) Gas ducted heater - Gas Star Rating (based on Australian Gas Association - Indirect Fired Air Heaters) Slow combustion wood heaters: <ul style="list-style-type: none"> Efficiency rating value as complied by the Australian Home Heating Association. Other systems, eg gas hydronic heating | <p>Heating system efficiency: Guidance about where to find the different energy efficiency information for different heater types. Including accessing government and industry websites and data lists. This includes how to access information on:</p> <p>MEPS/ Energy Rating Labels Industry star ratings for Gas appliances – Reverse cycle air conditioners (heat pumps) — review of GEMS 2019 Determination and climate zone energy rating labels, along with ongoing GEMS 2013 Determination, also EER, TCSPF, COP and HSPF Other electrical resistance heaters Wood heaters</p> |
| <p>Heating Appliance Capacity: Appliance capacity for heating does not need to be entered by the Assessor. The software will assume that the specified heating appliance will have the capacity to meet the required heating load. . The tools are likely to provide some feedback regarding the minimum required output capacity, and possibly recommended sizing. They will also undertake a reality check on the efficiency specified for reverse-cycle air conditioners, as the maximum efficiency available in the market is linked to output capacity. The approach to addressing capacity is still under development. The final approach will explained in this section of the Technical Note.</p> | <p>Heating Appliance Capacity:</p> <ul style="list-style-type: none"> Explanation of heating appliance capacity and the need for correct sizing. Assistance with sizing of systems. . |

| Heating Systems | |
|---|--|
| Technical Note | Assessor Handbook |
| | |
| Multiple Heating Appliances: Rule on selecting the main heating source if more than one heating appliance is specified in a conditioned zone (TBC). | Multiple Heating Appliances: Discussion around the assigning of multiple heating appliances to an individual conditioned zone (TBC). |
| | Other Heating System Topics to cover: <ul style="list-style-type: none"> • Occupancy profile for WoH and how this affects heating and cooling loads. • How to deal with Class 2 central heating systems |

3.7 Cooling

Cooling appliances utilise electricity as their energy source and therefore have a limited choice of appliance types, compared to heating. Air-conditioning is generally by either refrigerative air conditioning (heat pump) or evaporative cooler. Like heating, the proposed WoH methods are such that many of the considerations for air-conditioning are embedded into the software. The Assessor also inputs data for every conditioned zone regarding system type, efficiency, size and to which zones the system is associated. Default values are assigned if the cooling appliance has yet to be specified or if no cooling is to be installed in a conditioned room..

Therefore, the rules and guidance in the Technical Note are relatively concise, whereas the explanation in the Assessor Handbook will need be more expansive as the Assessor will be expected to understand a broad range of cooling appliance types and the assumptions underpinning the modelling. The Assessor Handbook will be a useful repository for collating the information used to underpin the proposed methodologies.

| Cooling Systems | |
|---|---|
| Technical Note | Assessor Handbook |
| Assigning of Cooling Appliances: For each zone the cooling appliance type to be assigned as one of the following: <ul style="list-style-type: none"> • Refrigerative air-conditioner (heat pump) – individual head • Refrigerative air-conditioner (heat pump) – ducted • Evaporative cooler If no cooling appliance is assigned to a zone with a cooling load then cooling will be assumed to be delivered by MEPS level refrigerative air-conditioner (heat pump) with a climate appropriate Total Cooling Seasonal Performance Factor (TCSPF) applied, irrespective of what types of appliances might be installed elsewhere in the dwelling. | Assigning of Cooling Appliances: <ul style="list-style-type: none"> • Assigning cooling appliances to zones – all zones (except NatHERS designated unconditioned zones) to be cooled irrespective of the size of the load). • Guidance on how to allocate conditioned rooms to a specific heating zone. • Background to types of cooling appliances. • Whole of home cooling systems, i.e. ducted refrigerative air-conditioner (heat pump). • NatHERS designated unconditioned zones do not have a cooling appliance attributed to them as part of the WoH assessment process. • Ceiling fans are accounted for in the thermal assessment and do not form part of the WoH assessment. |
| Cooling System Efficiency: Cooling appliance efficiency entered (EER):- | Cooling System Efficiency: |

| Cooling Systems | |
|---|--|
| Technical Note | Assessor Handbook |
| <ul style="list-style-type: none"> For refrigerative air conditioning (heat pump) this may be: <ul style="list-style-type: none"> Zoned Energy Rating Label (ZERL), or Total Cooling Seasonal Performance Factor (TCSPF), or Energy Rating Label star rating or Annual Energy Efficiency Ratio (AEER) for older systems rated under the 2013 GEMS Determination. Evaporative coolers <p>Provisional values applied for assumed operating efficiency. Rules around how different rooms are assigned to a cooling zone (multiple zones are possible).</p> | <p>Guidance about where to find the different energy efficiency information for different cooler types. Including accessing government and industry websites and data lists. This includes how to access information on:</p> <ul style="list-style-type: none"> Review of energy efficiency labelling for refrigerative air conditioning (heat pumps) Explanation of evaporative coolers and provisional values applied. |
| <p>Cooling Appliance Capacity</p> <p>Appliance capacity for cooling does not need to be entered by the Assessor</p> <p>The approach to addressing capacity is still under development, but is likely to be similar to the approach taken for heating. The final approach will be outlined in this section of the Technical Note.</p> | <p>Cooling Appliance Capacity</p> <ul style="list-style-type: none"> Explanation of cooling appliance capacity and the need for correct sizing. Assistance with sizing of systems. <p>Background to why refrigerative air-conditioner (heat pump) with a <i>Deemed Default Heat Pump Performance Level</i> (efficiency equivalent to a minimum energy performance heat pump) has been selected as the default cooling appliance type.</p> |
| <p>Multiple Cooling Appliances</p> <p>Rule on selecting the main cooling source if more than one Cooling appliance is specified in a conditioned zone (TBC)</p> | <p>Multiple Cooling Appliances:</p> <p>Discussion around the assigning of multiple cooling appliances to an individual conditioned zone. (TBC)</p> |
| | <p>Other Cooling System Topics to Cover:</p> <ul style="list-style-type: none"> Occupancy profile for WoH and how this affects heating and cooling loads. How to deal with Class 2 central air-conditioning systems |

3.8 Lighting

The lighting module for NatHERS WoH utilises modelling of an average lighting level across the home for the whole year. This is spread out on an hourly basis to match expected seasonal behaviour. The annual lighting energy use is based on the size of the dwelling.

| Lighting | |
|---|---|
| Technical Note | Assessor Handbook |
| Currently there are no lighting inputs required by the Assessor for lighting. The NatHERS Software will include an allowance for lighting energy. | <p>Provide an explanation of the assumptions behind the lighting component of the WoH energy assessment, including:</p> <ul style="list-style-type: none"> being based on the 5W/m² allowance |

| Lighting | |
|--|--|
| Technical Note | Assessor Handbook |
| Note: future versions of the WoH calculations may allow Assessors to input specific lighting efficiencies. | <ul style="list-style-type: none"> total installed lighting power (kW) is based on the total internal floor area of the house assumptions around average 1.6 lighting hours of use per day, and hourly lighting factors relating to time of day and season. |

3.9 Hot Water

Hot water energy consumption is derived from the number of occupants (based on floor area), the location, the type of hot water system, and the system efficiency.

| Hot Water | |
|--|---|
| Technical Note | Assessor Handbook |
| <p>Hot Water System Selection: Assessor to enter the type of hot water appliance from the selections below:</p> <ul style="list-style-type: none"> Solid Fuel Off peak electric Continuous electric Electric boosted solar thermal, including systems on a peak or off-peak tariff Gas boosted solar thermal Heat pump, including systems on a peak or off-peak tariff Gas Storage Gas instantaneous Smart solar diverter <p>Information on applying off-peak or peak tariffs for use with electric storage, heat pump and solar electric water heaters (under development). Rules for when a hot water system type is not specified.(TBC)</p> | <p>Hot Water System Selection: Description of each system type to help ensure that the systems are understood by Assessors and correct appliance is selected. Where no hot water system is specified, explanation of the rules for entering a default system.(TBC)</p> |
| <p>Hot Water System Efficiency: Selection of efficiency rating as appropriate for system type:</p> <ul style="list-style-type: none"> Electric or gas boosted solar thermal or heat pump – based on STCs for the system in specific water heating zone Note regarding STC sizing small/medium/large households Gas storage – 4.0/4.5/5.0 stars Gas instantaneous 4.0/4.5/5.0/5.5/6.0/6.5/7.0 stars <p>Note: where a rating for a gas system is provided in 0.1 star increments, but the software only accepts 0.5 star increments, the assessor should round down to the nearest half a star.</p> | <p>Hot Water System Efficiency: Information will be included on the gas labelling scheme, and also on how Assessors can obtain the gas rating and the STCs allocated for solar and heat pump water heaters. Provide a description of the STC system for solar hot water and heat pump systems and the star rating system for Gas systems. Where a system type is specified but an exact model or efficiency rating is not specified, then there will need to be provisions for assigning an efficiency to the system. (TBC) Discussion of the water heater climates zone and how this is used in combination with the efficiency. Discussion of AS/NZ4234.</p> |

| Hot Water | |
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| Technical Note | Assessor Handbook |
| Background to Hot Water Systems – See Assessor Handbook | Background to Hot Water Systems: Description of how hot water consumption relates to occupancy. Provide a background to hot water calculations: <ul style="list-style-type: none"> • Explanation of the STC climate zones and how they influence the efficiency calculations • Explanation of how STCs will reduce over time and the impact this will have on assessment outcomes. • Efficiency coefficients for the different systems type and climate zone combinations. Noting that different coefficients will be used for different water heating options, efficiency levels and water heating zones. • How hourly energy use is calculated for different system types factoring in seasonal differences and for the different climate zones. |
| Class 2 Dwellings: <ul style="list-style-type: none"> • Once developed, instructions for the Assessor on what to do in the case of a class 2 building with common hot water heating system (TBC) | Class 2 Dwellings: Once developed, explanation on how to enter centralised hot water system for class 2 SOU. (TBC) |
| | Other Hot Water Topics: <ul style="list-style-type: none"> • Interstate idiosyncrasies for electric hot water tariffs – assigning peak versus off-peak (e.g. Tasmania) |

3.10 Pool and Spa Equipment

Pool energy use is assumed to be primarily driven by the size of the pool and the type of equipment used. Additional information regarding the cleaning technology and efficiency rating provides a more detailed calculation. Pool heating is not currently included in the NatHERS WoH assessment, but is likely to be added in future iterations. Shared pools in a Class 2 building are also not included in a NatHERS WoH assessment. Spa pump and heating methods will be developed in the future.

| Pool and Spa Equipment | |
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| Technical Note | Assessor Handbook |
| Introduction to Pool Energy Use Pool pumping energy is to be included in the WoH calculation. Pool heating energy will be included in the future. | Introduction to Pool Energy Use <ul style="list-style-type: none"> • Provide background to pool pumping energy demand |
| Pool Volume: When there is a pool proposed, the volume (litres) or area (m ²) to be entered. | Pool Volume: Guidance on calculating pool volume based on area, or volume if known. |
| Pool Pump Type: A pool pump type is to be selected: <ul style="list-style-type: none"> • Single speed | Pool Pump Type: Provide a background to pool pumping energy demand. |

| Pool and Spa Equipment | |
|--|---|
| Technical Note | Assessor Handbook |
| <ul style="list-style-type: none"> • Dual speed (future option) • Multi speed/variable speed (future option) | <ul style="list-style-type: none"> • Pool Pump types including some notes on identification of types <ul style="list-style-type: none"> • Single Speed • Dual Speed • Multi Speed • Calculations of Pump Operating Power based on size, and power adjustment factor • How hourly energy use of the pool pump is determined to include the energy in the overall WoH energy profile. • Guidance on which pumps associated with a pool or spa are to be included in the pumping calculations |
| Pump efficiency: Pump efficiency Star rating – if known (In future this may include ratings from the GEMS (Swimming Pool Pump-units) Determination 2020) | Pump efficiency: Guidance on how to find information about pool pump efficiencies. (In future this may include ratings from the GEMS (Swimming Pool Pump-units) Determination 2020) Background on default pump efficiency if unknown, or yet to be specified. |
| Pool Cleaner: A pool cleaner type is to be selected: <ul style="list-style-type: none"> • Pressure cleaner operated by main filtration pump • Pressure cleaner operated by booster pump • Robotic cleaner | Pool Cleaner: Provide a background to pool pumping energy demand: <ul style="list-style-type: none"> Description of filter and pump types <ul style="list-style-type: none"> ○ Single, dual or multi speed ○ High volume, low volume, booster pump or robotic type cleaners How cleaning energy is determined and how hourly energy use of the pool cleaner is determined to include the energy in the overall WoH energy profile. Background on default assumption if pool cleaner type has not been specified |
| Shared Pools in a Class 2 Dwelling: Shared pools in Class 2 developments are not included in the WoH assessment for individual Class 2 dwellings. | Shared Pools in a Class 2 Dwelling: Expanded discussion on shared pools in Class 2 dwellings. |
| Pool Heating Type Future development. Will be included in Technical Note once method is finalised. | Pool Heating Type Future development. Will be included in Assessor Handbook once method is finalised. |
| Spa technologies (pump and heating) Future development. Will be included in Technical Note once method is finalised. | Spa technologies (pump and heating) Future development. Will be included in Assessor Handbook once method is finalised. |

3.11 On-site Energy Generation and Storage

On-site energy systems considered in the NatHERS WoH assessment are currently limited to Solar Photovoltaic (PV) systems. This may change in the future. The on-site storage module is still under development as of the time of this report, but is intended to be included in the WoH assessment process to coincide with the NCC 2022. Consideration of Shading of PV systems is also still under development and may be included to coincide with NCC 2022.

| On-site Energy and Storage | |
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| Technical Note | Assessor Handbook |
| Introduction to solar photovoltaic systems (Solar PV) How the Solar PV assessment is used as part of the WoH rating. Default values | Introduction to Solar photovoltaic systems (Solar PV) How the Solar PV assessment is used as part of the WoH rating. Default values |
| PV System Size Assessor to enter the rated size of PV installation Where PV installation is shown in documentation but the system is yet to be specified – rules on the standard assumptions to be applied. | PV System Size Guidance on sizing of PV systems. Typical Panel Wattages and sizes. Where PV installation yet to be specified, guidelines on the standard assumptions to be applied. |
| PV System Orientation and Slope Assessor to enter orientation of system Rules on inputting systems that occur on multiple orientations and or slopes. | PV System Orientation and Slope Provide guidance on estimating orientation and slope of PV systems. Provide guidance on inputting systems that occur on multiple orientation and or slope. |
| Inverter Size Assessor to input Inverter output size | Inverter Size Guidance on sizing of inverters. |
| Phases <ul style="list-style-type: none"> Number of phases the PV array is connected (Options = 1 (default), 2 or 3) | Phases Guidance on phases |
| Inputting of Shading Effects: Input of shading effects: – Assessor technique to be confirmed. Current proposal - For each potential overshadowing object the assessor needs to collect and input the following three data points, relative to the centre of the PV array: <ul style="list-style-type: none"> Elevation angle of the top of the object (degrees) Azimuth of the left-hand edge of the object (degrees) Azimuth of the right-hand edge of the object (degrees). A simpler method will be considered. | Inputting of Shading Effects: Providing some background on shading of PV Systems such as: <ul style="list-style-type: none"> Shading is a site-specific phenomenon dependant on location, size and opacity of objects in the area surrounding the PV array, and can significantly affect system output. The impact of shading is also dependant on the type of array, if there are micro-inverters or DC optimisers used, which both reduce the impact of shading. Assistance on estimating the effect of objects in the surrounding environment and inputting that information into the WoH software. |
| Background to PV Systems: See Assessor Handbook | Background to PV Systems: |

| On-site Energy and Storage | |
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| Technical Note | Assessor Handbook |
| | <p>Providing some background on PV systems such as:</p> <ul style="list-style-type: none"> • Geographical location and its influence on PV output • Orientation and inclination and their influence on PV output • Relationship between PV output and demand for energy in the home • Relationship between PV output and typical grid demand for electricity – discussion about trading energy with the grid and the need for hourly energy assessment. • Discussion of the other system variables that impact PV output • Inverters/micro inverters and their import/export limits |
| <p>On-Site Battery Storage System Type</p> <p>There are a set of default performance parameters assigned to a battery system and the battery control system. However, the assessor is able to enter the following information if known:</p> <ul style="list-style-type: none"> • Battery Type • Storage capacity kWh • Max depth of discharge rate (%) (default value applied based on battery type) • Max C-rate (decimal) (default value applied based on battery type) • Round trip efficiency (%) (default value applied based on battery type) • Initial battery charge will be assumed at 50% (default value applied based on battery type) <p>If battery type not specified, Lithium-Ion type is applied as default.</p> | <p>On-Site Battery Storage System Type</p> <p>Provide some background on Battery Storage Systems such as:</p> <ul style="list-style-type: none"> • Battery Types • Battery capacity • Maximum depth of Discharge • Charge Efficiency • Discharge Efficiency • Battery C-rate <p>Grid interactivity and control systems for Batteries / household PV systems.</p> <p>Guidance on understanding the default values used for battery storage systems and the influence of parameters that can be input when they are known.</p> |
| <p>On-Site Energy Generation and Storage Systems in a Class 2 Building</p> <p>PV systems on Class 2 buildings are not included in the WoH energy assessments of individual Class 2 SOUs</p> | <p>On-Site Energy Generation and Storage Systems in a Class 2 Building</p> <p>Discussion around class 2 buildings with common on-site energy production and storage systems</p> <p>PV systems on Class 2 buildings are not included in the WoH energy assessments of individual Class 2 SOUs</p> |

3.12 Plug-in Loads

Energy consumption from plug-in loads around the home, is included in the Whole of Home energy calculations. Accounting for plug-in loads is important in the context of households moving towards Net Zero Energy and in the context of on-site energy generation and storage. At this stage of the

development of the WoH calculations, there is no capability for assessors to input information about plug-in loads.

| Plug-in Loads | |
|---|--|
| Technical Note | Assessor Handbook |
| The NatHERS software will automatically apply a stock average load and load profile for plug-in appliances based on the number of occupants. There is no need for Assessor input. | <p>Provide background information on the scope and reasons behind plug-in loads that are incorporated into the NatHERS WoH calculations.</p> <p>Items covered include:</p> <ul style="list-style-type: none"> • Whitegoods • Audio visual equipment • Small appliances • Computers and peripherals • Electronics • Standby power <p>Accounting for plug-in loads on an hourly basis and the context of on-site energy generation and storage</p> |

A module for cooking equipment will be included in the future and information about this will be included in the Technical Note and Assessor Handbook.

3.13 Finishing the Assessment

When used as a compliance route for NCC 2022, it is assumed that a NatHERS WoH assessment will only be done in conjunction with a NatHERS Thermal assessment. A NatHERS Thermal assessment can still be conducted as a stand-alone assessment without the WoH assessment.

It is intended that there will be two separate ratings with two separate metrics, for the Thermal and WoH Assessments, but that these results will be presented on the one NatHERS Certificate.

| Finishing the Assessment | |
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| Technical Note | Assessor Handbook |
| <p>Stamping Requirements:</p> <p>Stamping requirements will follow the current process for NatHERS Thermal assessments:</p> <ul style="list-style-type: none"> • Assessors must ensure that all information used in producing the assessment, is included in the drawings and or specifications being supplied for Building Approval purposes. • Ensure provisional values are noted in the 'additional notes' section to appear on the NatHERS Certificate. • Confirm that all of the requirements of the Technical Note have been met. <p>AAO stamps must be added if applicable in accordance with Assessor's AAO requirements.</p> | <p>Stamping Requirements:</p> <p>Provide more detailed information and guidance relating to the certification process:</p> <ul style="list-style-type: none"> • Documentation requirements • NatHERS Stamping requirements • QR Code requirements • AAO Stamping requirements • NatHERS Certificate requirements |

| Finishing the Assessment | |
|---|--|
| Technical Note | Assessor Handbook |
| <p>NatHERS Certificate requirements:</p> <ul style="list-style-type: none"> The Assessor must supply the client with the NatHERS Certificate containing the Thermal Rating and WoH Rating | |
| <p>Class 2 Dwelling Requirements:</p> <ul style="list-style-type: none"> For Class 2 dwellings, each individual dwelling must meet a minimum standard for thermal and whole-of-home provisions. There is not an average dwelling rating for WoH, instead the lowest WoH rating for the apartment block will be communicated on the summary certificate and stamp. The average rating for the thermal assessment is retained. For Class 2 dwellings each individual dwelling must have its own Certificate with an individual Thermal and WoH rating. For Class 2 developments a summary certificate must be provided for each building/lot separately. | <p>Class 2 Dwelling Requirements: Explanation and guidance around the Class 2 dwelling certification requirements.</p> |
| | <p>Additional Guidance:</p> <p><i>Analysing and Interpreting Results:</i> The Assessor Handbook will provide more guidance to the Assessor on analysing and interpreting the results of a WoH assessment in order to provide feedback to the clients and designers.</p> <p>As well as the headline WoH result, the NatHERS Software will be able to provide a breakdown of WoH energy into the various components. This will allow Assessors to provide more detailed feedback and to interrogate the different aspects of household energy usage in search of potential improvements.</p> <p><i>Relationship Between Thermal Star Rating and WoH result:</i> It will be important to include discussion of the relationship between the NatHERS Thermal Star Rating and the WoH Rating for a dwelling. The process of providing feedback and suggesting potential improvements to the ratings will integrally involve both the Thermal and WoH assessments. Any changes to the Thermal NatHERS model will impact on the heating and cooling demand and therefore on the WoH assessment. The NatHERS Thermal rating will directly impact the WoH rating through the heating and cooling loads, but the WoH rating</p> |

| Finishing the Assessment | |
|--------------------------|--|
| Technical Note | Assessor Handbook |
| | <p>will not impact the NatHERS Thermal Star Rating in reverse.</p> <p><i>Tips for making improvements:</i> The current Thermal Assessor Handbook provides a series of potential strategies for making improvements to a Thermal Rating. The same approach will be applied to the WoH rating.</p> |

3.14 Glossary, Acronyms and Abbreviations

AccuRate Whole of Home (WoH) – Is the NatHERS Benchmark tool for Whole of Home Assessments. It is a version of the existing CSIRO AccuRate tool with Whole of Home modules added on.

Assessor Accrediting Organisation (AAO) – Are professional organisations with responsibility for accrediting assessors under NatHERS, and ensuring that assessors deliver reliable and consistent energy ratings.

Australian Building Codes Board (ABCB) – Is a standards writing body responsible for the National Construction Code, among other certification schemes, and regulatory reform in the Australian construction industry. The ABCB is a joint initiative of the Commonwealth and State and Territory Governments, together with the building and plumbing industries.

Coefficient of Performance (COP) – is a measure of the energy performance of a heating appliance. It is the efficient ratio of the amount of heating delivered to the electrical input power. ACOP (annualised COP) factors in some additional electrical energy input for standby power and is seen as a more accurate reflection of performance.

Cooling Appliance – a system which delivers cooling to a house, which may be either a single room based system, or a ducted, multi-room system or whole of house system.

Energy Efficiency Rating (EER) - is a measure of the energy performance of a cooling appliance. It is the efficient ratio of the amount of heat removed, to the electrical input power. AEER (annualised EER) factors in some additional electrical energy input for standby power and is seen as a more accurate reflection of performance.

Greenhouse and Energy Minimum Standards (GEMS) – Is the national framework for product energy efficiency in Australia and includes the MEPS and energy rating labelling requirements.

Heat Pump – an appliance used to provide either warm or cool air, or water, to a building. Heat pumps may be used to generate warm or cool air for delivery through air conditioning systems, or used to generate warm or cool water for hydronic heating and cooling systems. Heat pumps are also used to generate hot water for domestic hot water usage and pool and spa heating.

Heating Appliance - a system which delivers heating to a house, which may be either a single room based system, or a ducted, multi-room or whole of house system.

Heating Seasonal Performance Factor (HSPF) – A new performance measure for heating efficiency of Heat Pumps that replaces ACOP for appliances registered in Australia after 1 April 2020.

HSPF factors in climatic conditions to better reflect the efficiency of Heat Pumps based on the climate in which they are operating.

Minimum Energy Performance Standards (MEPS) – these standards specify the minimum performance that appliances, lighting and electrical equipment must meet or exceed before they can be offered for sale or used for commercial purposes in Australia. Relevant to the NatHERS Whole of Home assessment, MEPS covers: heat pump air conditioning systems, lighting, electric storage hot water heaters, gas storage hot water heaters, and instantaneous gas water heaters.

NatHERS Thermal – The existing NatHERS performance assessment that assesses the thermal performance (heating and cooling energy required to maintain comfort) of residential dwellings (class 1, 2 and 4) in Australia. Typically known simply as a NatHERS Assessment, the term NatHERS Thermal has been applied to distinguish between this and the proposed new NatHERS Whole of Home (WoH) Assessment.

NatHERS Whole of Home (WoH) – extends the consideration of household energy in a NatHERS Assessment, from thermal performance, to estimate a home's energy consumption based on the sources of energy and amount of energy predicted to be required for heating and cooling, hot water systems, lighting and pool and spa pumps. Also taken into consideration is energy produced on-site through renewable means (PV) and impact of plug loads.

National Construction Code (NCC) – is Australia's primary set of technical design and construction provisions for buildings. Energy Efficiency of buildings is one area covered by the NCC. The NCC refers to NatHERS as a method for demonstrating compliance of new Class 1, 2 or 4 dwellings, with the energy efficiency provisions of the code.

National Energy Productivity Plan (NEPP) – is a package of measures intended to improve Australia's energy productivity by 40% between 2014 and 2030. Relevant to NatHERS, the NEPP includes a focus on energy efficiency measures that support better energy use in buildings.

Photovoltaics (PV) – is the conversion of light into electricity using semiconducting materials. An on-site, household PV system employs a number of solar panels comprising a number of cells which generate electrical power, which may then be used directly by the household, stored on site for later use, or exported to the local electricity grid.

Refrigerative Air-Conditioner (heat pump) – an appliance used to supply cool air to building. This may be via a 'split system' in a single room, or via a whole of house ducted system. The cooling is supplied via a heat pump with a refrigerative circuit that extracts heat from the conditioned zone.

Reverse Cycle Air-Conditioner (heat pump) – an appliance used to supply warm or cool air to a building. This may be via a 'split system' in a single room, or via a whole of house ducted system. The warm or cool air is supplied via a heat pump with a reversible refrigerative circuit that extracts heat from the conditioned zone to provide cooling, or from the external environment to provide heating.

Small Scale Technology Certificates (STC) – small scale renewable energy systems including PV systems, Solar Hot Water and Heat Pump hot water systems, are eligible for Small Scale Technology Certificates. The number of Certificates that a system is eligible for, is based on the size of the system, its geographical location and the installation date of the system. STC's are used

in the NatHERS WoH assessment as a means of inputting the size of heat pump and solar hot water systems where used.

Total Cooling Seasonal Performance Factor (TCSPF) - A new performance measure for cooling efficiency of Heat Pumps that replaces AEER for appliances registered in Australia after 1 April 2020. TCSPF factors in climatic conditions to better reflect the efficiency of Heat Pumps based on the climate in which they are operating.