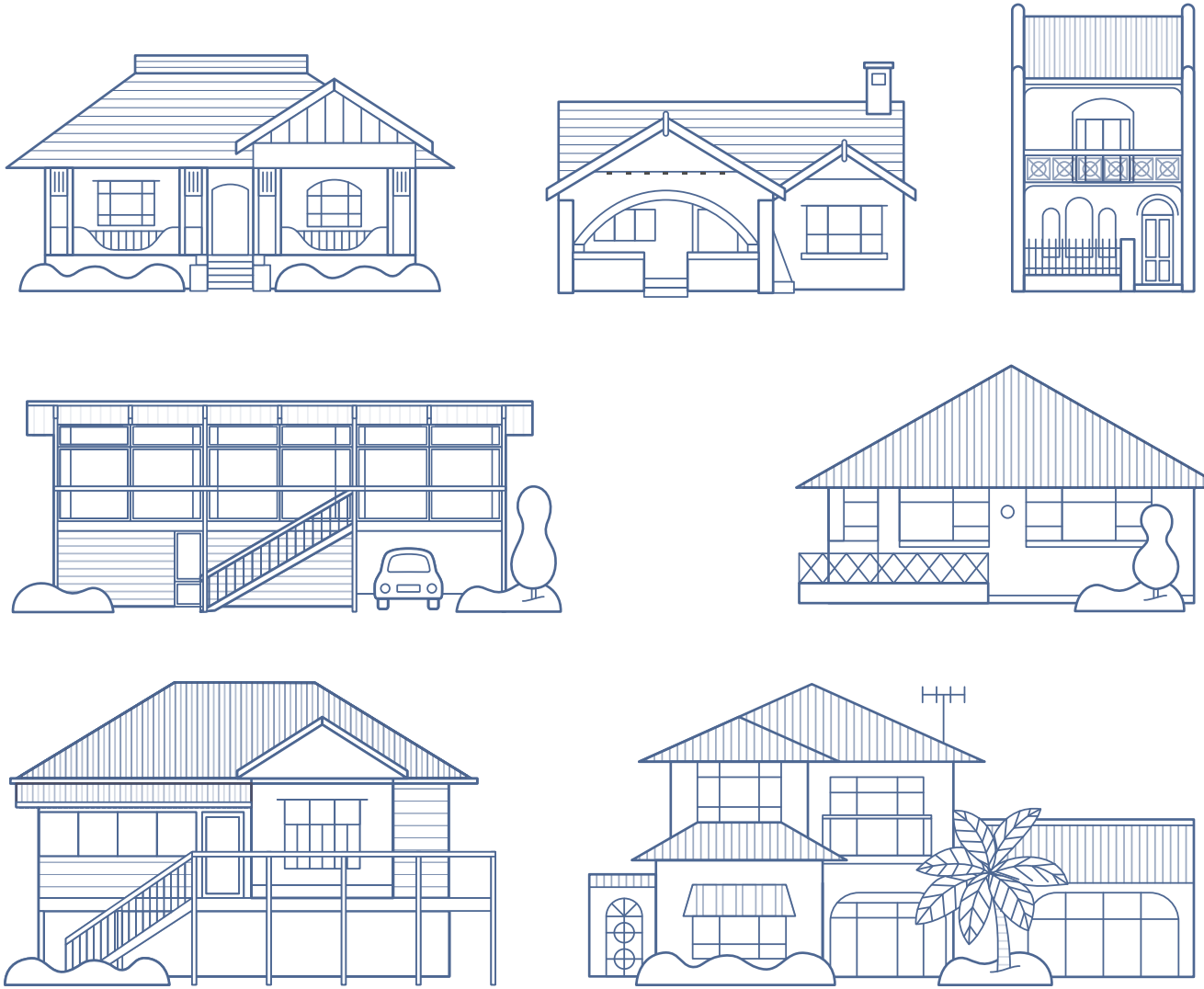
Department of Climate Change,
Energy, the Environment and Water

Better Homes, Brighter Futures

A new baseline for understanding and improving the energy performance of older homes in New South Wales



NSW GOVERNMENT

Published by NSW Department of Climate Change, Energy, the Environment and Water

https://www.energy.nsw.gov.au/

Better Homes, Brighter Futures

Reference number: DOC25/1016847

This document was produced by UTS Institute for Sustainable Futures and designed by Parallel Lines

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Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

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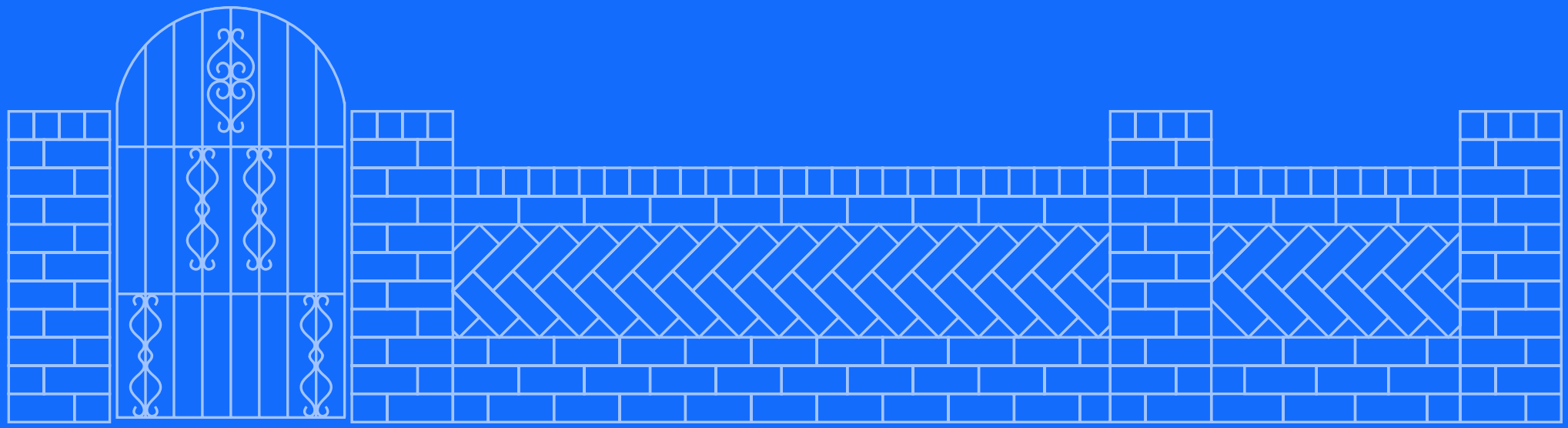
1 Why understanding older homes matters



Information on the real-life energy performance of older homes in NSW has been a missing piece of the puzzle for policy makers and researchers, until now.

Before the introduction of the NSW Building Sustainability Index (BASIX) in 2004, there was nothing to regulate how efficiently NSW homes used energy or how thermally comfortable they were designed to be.

This comprehensive study sent energy assessors to over 1,000 homes in NSW, carefully selected to be representative of older homes across NSW.

We now much better understand the extent and nature of the challenge of upgrading older housing, providing the foundation for effective solutions that will help NSW reach the goal of net zero emissions by 2050.

Photo: Katherine Griffiths Photography

Who is this guide for?

This is a guide for anyone who wants to better understand the energy performance of older houses in New South Wales

Policy makers and program designers

can use these findings to design smarter policies and programs that target the right homes, address underperformance, and deliver meaningful outcomes.

Researchers and advocates

can use this evidence about real housing conditions, householder perspectives and retrofit potential to target further research and make informed arguments for change.

Real estate analysts and valuers

can incorporate these insights on risks and opportunities across different markets and housing types into pricing, analysis, campaigns and customer service.

Media, communications and engagement teams

can use these insights to craft messages that empower households to make practical changes that reduce energy costs and improve comfort and health.

Finance, insurance and risk specialists

can use this data to assess, price and design products and develop offerings that reflect the real nature, risks and upgrade potential of older homes.

Supply chain businesses and related industries

can use these insights to assess demand across different regions and building types and align products and services with the needs of older homes.

Why focus on energy performance in older homes?

Most homes were built before minimum performance standards

Since 2004, all new homes in NSW have been designed and built to meet minimum energy performance requirements under the NSW Building Sustainability Index (BASIX). However, our homes last a long time, and the majority, 61% of all dwellings across NSW, were built before 2004. This equates to just over 2 million dwellings.

Older homes are less comfortable and less energy efficient

Older homes typically have poor energy performance, meaning they are harder to keep comfortable during hot and cold weather. Residents need to use, and pay for, more energy to keep comfortable, or risk their wellbeing if they can't afford to.

Improving older homes is a priority

Improving the energy performance of older homes is an effective way to reduce household energy bills, improve occupant comfort and health outcomes, and help achieve the NSW Net Zero greenhouse gas emissions targets by 2050.

We haven't known enough about older homes

Until now, there has been limited information about the energy performance of homes built before the introduction of BASIX, or even about characteristics of these older homes, such as their size, how they were constructed, and how they are heated and cooled. This information is crucial for design of good policy to support upgrades to improve their performance.

★★☆☆☆☆☆☆☆☆

2.1 / 10

Mean NatHERS thermal performance rating for in-scope older homes

★★★★★★★☆☆☆

7 / 10

Minimum NatHERS thermal performance rating for homes built in 2025

61%

of homes in NSW were built before BASIX was introduced

About the Baseline Project

The Residential Energy Performance Baseline Project was an 18-month long research project to build an evidence base showing how homes built before BASIX perform in terms of energy use, comfort, costs and emissions.

A representative sample of more than 1,000 houses

This project sheds light on the energy performance of NSW's 2 million-plus older dwellings, and creates a solid baseline to measure change against.

The project assessed and analysed 1,091 homes, carefully selected to be representative of older housing in NSW.

The homes were single dwellings, including townhouses, built prior to 2004 (Class 1 as defined by the National Construction Code).

Apartments were not included due to the added complexity and cost of achieving a representative sample.

Best practice energy performance analysis

A first for NSW, this is the most comprehensive study of existing homes to date.

In-home energy assessments were conducted by accredited Scorecard assessors between July 2023 and June 2024 to gather real-life data on older homes in NSW.

The assessors visited each house to collect information about the property that affects energy performance, including building materials, orientation, shading, glazing, heating, cooling, hot water systems, lighting, solar PV and pools.

What the Baseline Report delivers

A clearer picture of older homes

Detailed insights into how older homes across NSW perform, grounded in real data on building features, appliances and lived experience.

A rich set of place-based findings

Localised data that highlights how climate, building types and social factors influence energy use in older housing across different locations.

A starting point for further inquiry

A ‘point in time’ snapshot of data that can guide decisions, inspire further research and be a reference point for measuring change.

An evidence base for decision makers

Robust evidence to support governments and others to make informed decisions about policies and other actions, and to evaluate their impact.

Data with relevance across sectors

Data that is not only useful to policy makers and researchers, but to people working across housing, real estate, construction and finance.

A foundation for coordinated action

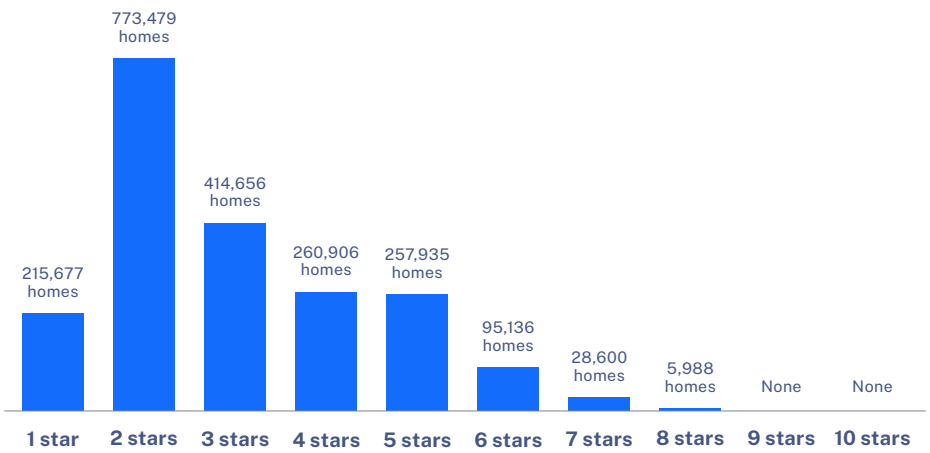
A shared foundation for government, industry and communities to work together to improve outcomes for people living in older housing.

Key findings from the Baseline Report

Older homes in New South Wales have very low energy performance ratings

Scorecard star rating

Excluding PV

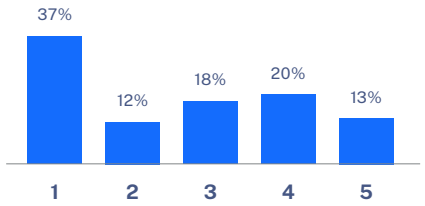


Data about energy performance: p.33

These older homes are also very difficult to keep comfortable in hot and cold weather

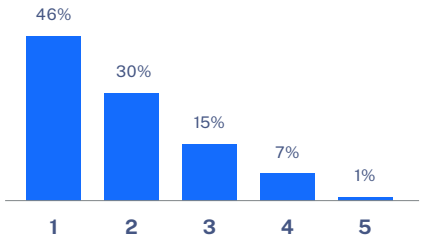
Hot weather ratings

Percentage of in-scope homes that got each rating (5 is the best rating)



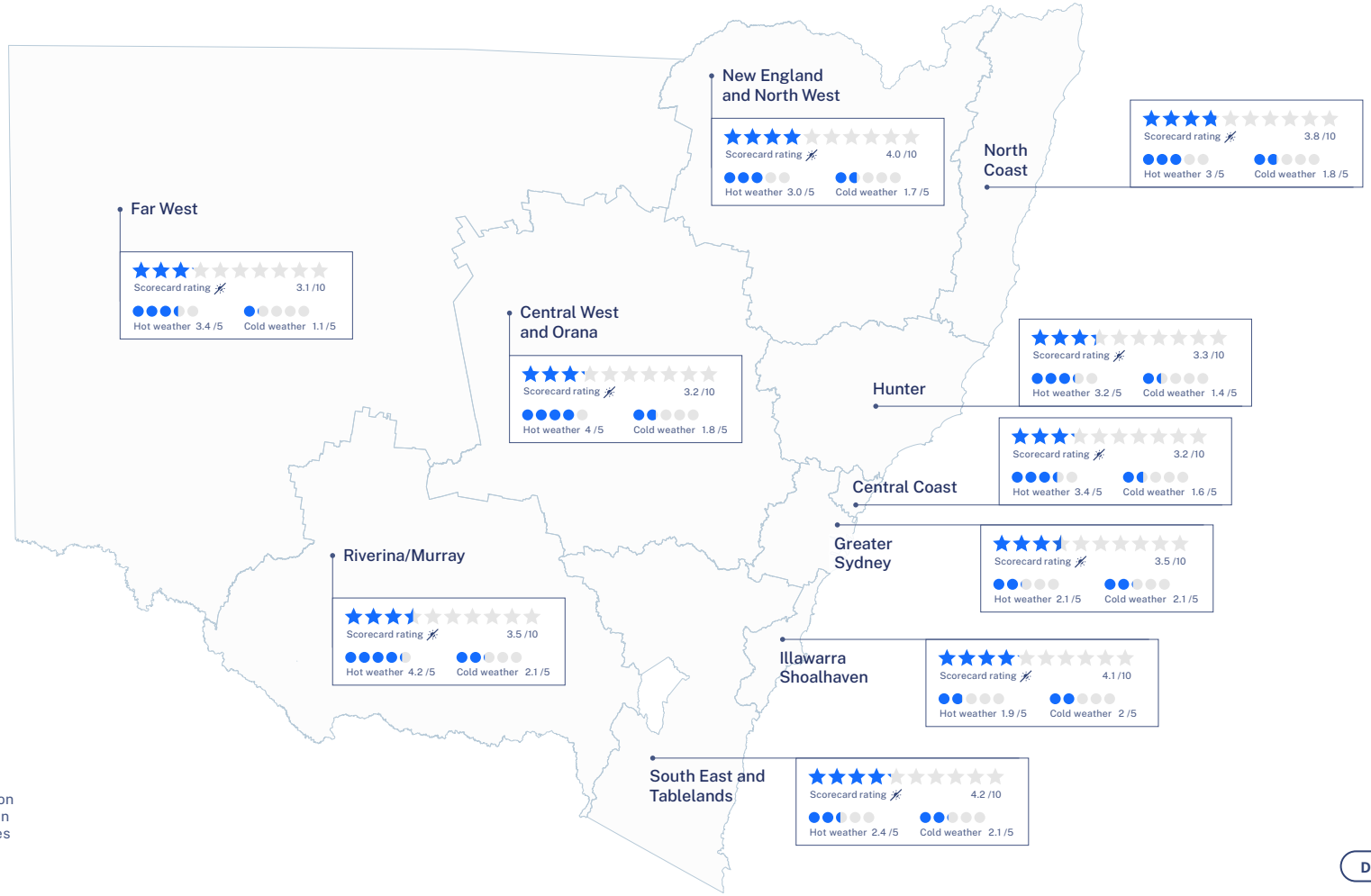
Cold weather ratings

Percentage of in-scope homes that got each rating (5 is the best rating)



Data about hot/cold weather ratings: p.37

The Baseline Report provides rich detail about how houses perform across New South Wales



Information for each region shows the estimated mean ratings for in-scope homes

Excluding PV

Data about regions and climates: p.31

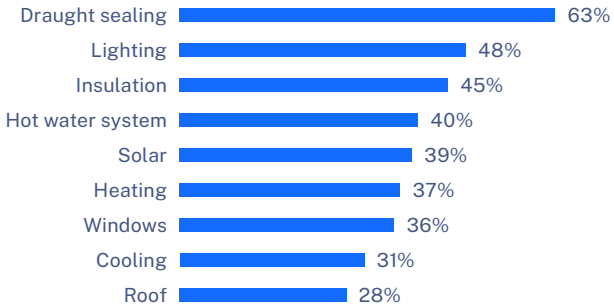
Householder's experiences of energy assessments were overwhelmingly positive

How likely householders are to recommend an assessment

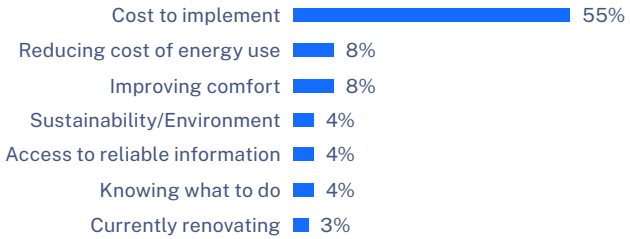
Views on energy assessments: p.51

They are also receptive to making changes to their homes, especially when the upfront costs are low

Upgrades that householders are likely to consider



What affects their decision undertake an upgrade



Views on upgrades: p.49

The Baseline Report models a range of upgrade options with different costs and benefits

	Average Scorecard rating improvement	Average cost to perform for a single home	Yearly bill savings for the average household
1 Basic thermal upgrades	+ 0.5 stars	$3,400	$115
2 Extensive thermal upgrades	+ 1 stars	$24,000	$235
3 Upgrading fixed appliances	+ 2 stars	$3,600	$370
4 Comprehensive upgrade of thermal and fixed appliances	+ 3 stars	$50,000	$470

Upgrade option details: p.27

The report identifies widely recommended upgrades that residents said they would be likely to adopt

Upgrading insulation
90% 45%

Upgrading heating
92% 37%

Sealing draughts
52% 63%

Upgrade windows
84% 36%

Upgrading roof colour
77% 28%

Upgrading hot water
57% 40%

Upgrading cooling
46% 31%

Replacing lights
22% 48%

Upgrades to consider: p.53

In-scope homes that the upgrade is recommended for

Householders likely to undertake the upgrade

What comes next?

The NSW Government's Consumer Energy Strategy will make it easier for NSW households and communities to be part of the energy transition and share in the benefits

Guidance for homes and businesses

New resources will help households and businesses save money and benefit from energy saving technologies, informed by these findings on upgrade potential and participant experiences.

Data-driven policies and programs

New energy policies and programs will be developed to meet market needs, especially in regional areas of NSW, with their design and delivery informed by this study.

Disclosure of home energy ratings

Policy encouraging and eventually requiring disclosure of energy ratings when homes are sold or leased will help households understand their home's energy performance and how to improve it.

Targets for existing homes

Targets to measure improvements in the energy performance of existing NSW homes will be developed and monitored, using the baseline data and information on upgrade potential.

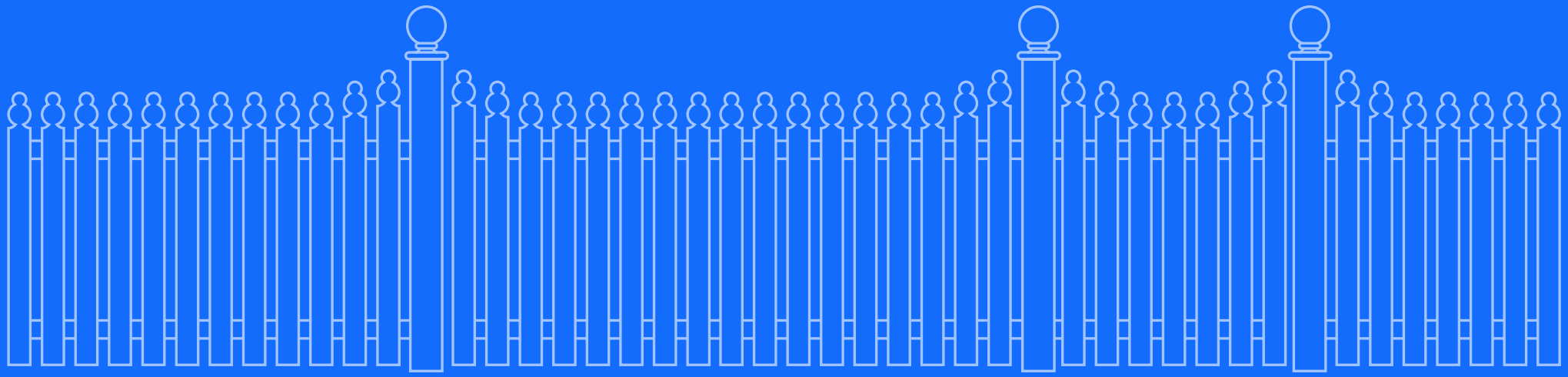
Data integration

Opportunities to better bring together housing and energy data will inform future data portal development by the NSW Department of Climate Change, Energy, the Environment and Water.

Collaboration

Collaboration with industry partners on place-based initiatives will help to build collective impact. Initiatives will be informed by the localised data collected through this baseline study.

2 What we've learned about pre-BASIX homes



What this research covers

Homes included in the scope

The Baseline Project focused on residential dwellings in New South Wales built before the introduction of BASIX in 2004.

Included in the scope was everything from fibro cottages in coastal towns to brick veneer homes in outer suburbs and older terrace houses in inner-city areas, each with distinct features, challenges and upgrade potential.

Both detached and semi-detached housing was in scope, across a range of tenure types, including social housing.

Apartments were not in the scope, as including them would have significantly increased the challenges and cost of collecting a representative sample.

There are only around 50 homes in Climate Zone 8 (Alpine), so this zone was excluded.

What is BASIX?

The NSW Government's Building Sustainability Index (BASIX) establishes minimum standards for all new dwellings, and alterations and additions to existing dwellings, in NSW.

BASIX sets percentage reduction targets for greenhouse gas emissions and water use. Targets vary with dwelling type and geographical location.

BASIX also sets a minimum level for building envelope thermal performance and covers a wide range of fixed equipment such as heating and cooling appliances, lighting and hot water.

In New South Wales, BASIX replaces the NCC energy efficiency requirements.

For more about BASIX, see the NSW Government Planning Portal

How the research was undertaken

About the research team

This project was funded by the NSW Department of Climate Change, Energy, the Environment and Water and delivered jointly by coordinating partner Instinct and Reason and research partner University of Wollongong.

The coordinating partner's team of social and market researchers and recruiters worked intensively over the project duration, sampling and recruiting participant households and energy assessors, coordinating over 1,000 assessments, and administering and analysing multiple surveys with participant households and energy assessors.

The research partner's team of statistical and building energy experts provided ongoing advice, adapted the project methodology to retain sample integrity in response to data collection challenges, and delivered the final data analysis.

Where we conducted research

Sample design

A robust baseline needs to accurately represent all in-scope housing in NSW, so achieving a statistically representative sample was a key consideration.

The sample was designed to gather energy performance data from enough in-scope homes to provide a statistically robust baseline. The aim was to ensure that all older homes had an approximately equal chance of being selected to participate in the project. All address were stratified according to climate zone, and grouped into 2,336 Primary Sampling Units (PSUs) based on localities/suburbs.

The sample of dwellings was determined by selecting 175 PSUs, with a target of recruiting 8-9 assessments per PSU. Practically, this aspect of the sample design allowed for assessments of multiple dwellings in a selected area.

There are trade-offs in any sample design. The clustering increased the standard error of estimates, but allowed a larger total sample size for the same project budget. The 175 PSUs (out of 2,336) were selected with a probability proportionate to the estimated number of in-scope dwellings.

Sampling of social housing required a different, less randomised approach. The sampling approach assumed Class 1 social housing dwellings built prior to 2004 to be around 5% of the NSW housing stock, with a similar distribution across climate zones to other housing.

How we signed up the homes

Over 70% of participating dwellings were recruited through field work, with online panels augmenting the sample as needed. Households were signed up using randomised doorknocking within each PSU, with postcard invitations left for those not home. In some low density areas, the entire postcode or homes within a 5km radius were eligible.

Invited households were able to sign up online or call a dedicated recruiter for more information. Where it fit the sampling approach, a small number of additional households who heard about the study and expressed interest were included.

Social housing dwellings were recruited through expressions of interest, facilitated by Community Housing Providers and the NSW Land and Housing Corporation (now known as Homes NSW).

How we assessed the homes

We assessed 1,014 privately owned and 77 social housing properties. Each home was inspected by an accredited energy assessor who used the Residential Efficiency Scorecard to assess its energy performance. Designed for existing homes, Scorecard provides hot and cold weather ratings, which are measures of thermal comfort, and a 'whole of home' rating that also factors in fixed energy appliances and on-site energy generation and storage.

Scorecard was the clear assessment tool of choice because NatHERS for existing homes was only released after the study, in 2025. Scorecard is endorsed by NatHERS and similar to NatHERS for existing homes, but there are some differences in assessment method and what the stars represent.

This report focuses on Scorecard star ratings. As an additional part of the analysis, Scorecard star ratings from the assessments were converted to NatHERS thermal star ratings. Selected results are also shown using NatHERS to enable easy comparison.

How we surveyed households

Households were surveyed before the assessment, immediately after, and once their assessment certificate with upgrade recommendations had arrived.

Surveys asked about expectations, experiences of the assessment, and intention to make upgrades or recommend an assessment to others.

What is NatHERS?

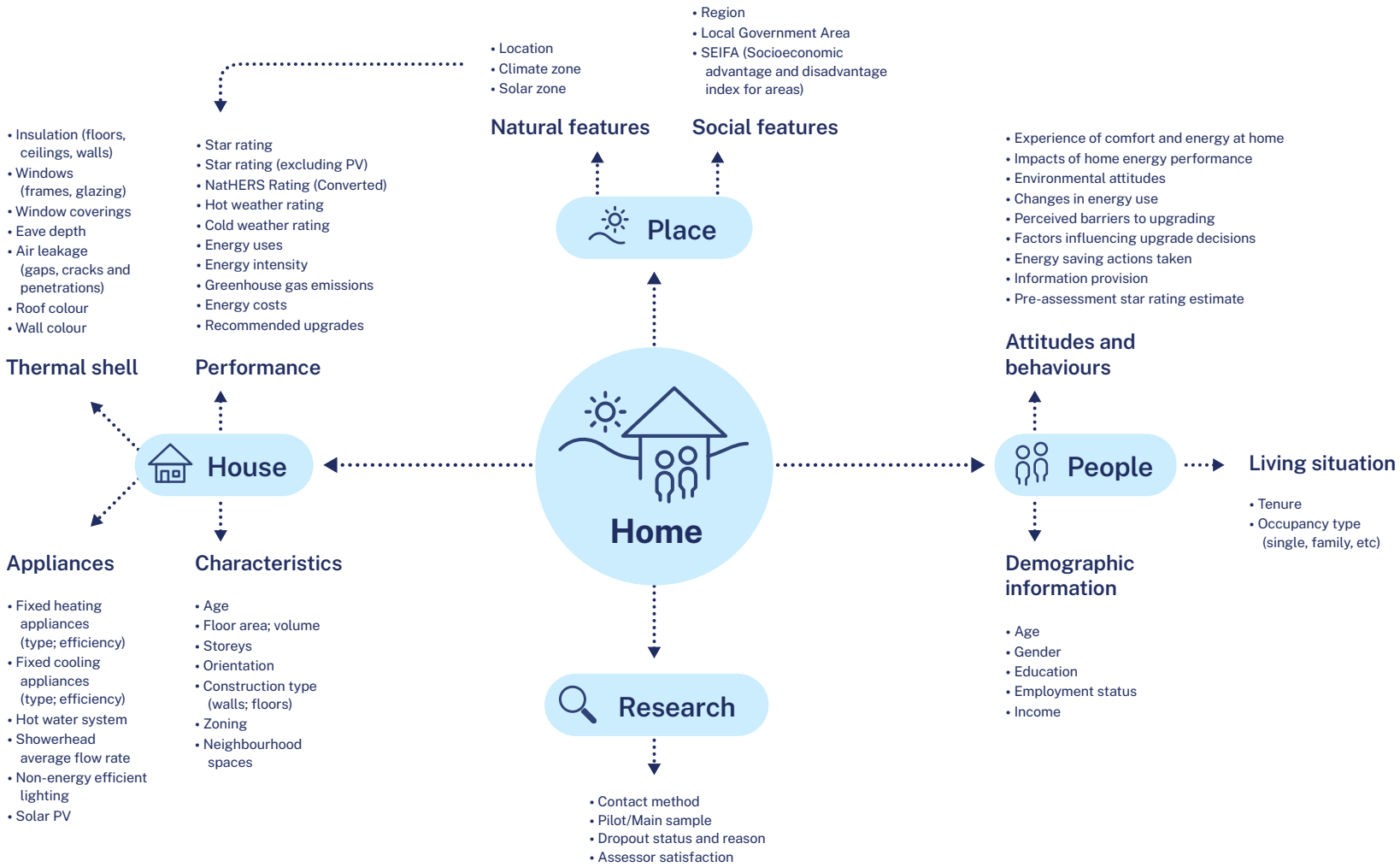
The Nationwide House Energy Rating Scheme (NatHERS) was first developed as a thermal comfort rating of up to 10 stars. It is used in regulation to define minimum energy performance standards for new homes.

It was later expanded to include a 'whole of home' rating covering fixed energy appliances and on-site energy generation, expressed as a score out of 100, where 100 is a net zero home.

NatHERS was originally developed for new homes but a NatHERS rating for existing homes was introduced in 2025.

For more about the scheme, see the official NatHERS website

Data gathered about each home



How we assessed energy performance

The Scorecard uses all the characteristics of a home, including thermal shell, appliances, and some of the climate attributes of the place it is located, to build a picture of energy performance. Some of the key ways this is expressed include:

Star rating: Home energy performance including the impact of any solar PV systems (1–10 stars)

Star rating excluding PV: Home energy performance with solar PV excluded (1–10 stars)

Hot/Cold weather rating: Ease of keeping a house cool in hot weather without air conditioning or warm in cold weather without heating (1–5 points)

Energy consumption: Energy use from fixed household appliances (absolute kWh/year)

Emissions: Greenhouse gas emissions based on fuel mix and emissions intensity (kg/CO2-e)

Annual energy costs: Energy costs for use of fixed appliances with and without PV ($/year)

How we analysed results in context

Once we had all the energy performance results, we used statistical analysis methods to see how different contextual factors (such as the ones listed below) relate to the energy performance of NSW homes.

Property: dwelling typology, construction typology, tenure, age, floor area, sector

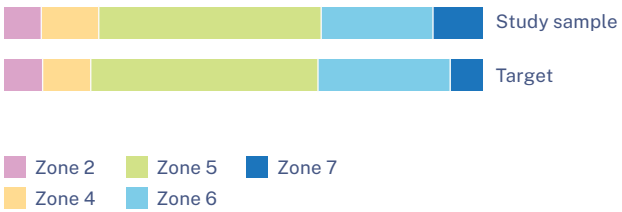
Location: climate zones, planning regions, remoteness categories

Household: income, socioeconomic indexes for areas, living situation, bedrooms

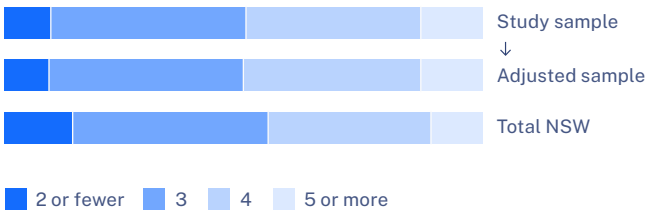
Person responding to the survey: gender, age, cultural and linguistic diversity, education, employment

How representative was the study sample?

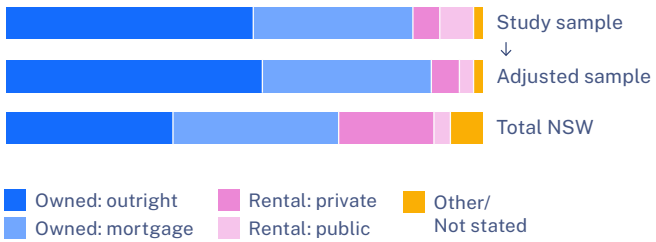
Climate Zone



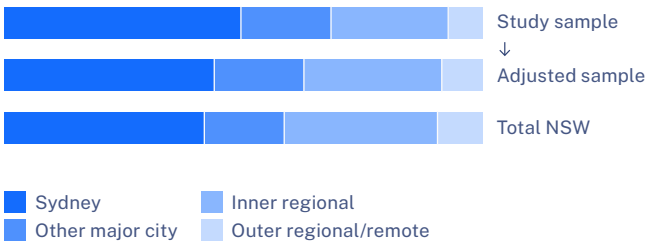
House Size (Number of bedrooms)



Tenure



Remoteness



The study achieved a sample that matches well to the overall older housing stock in NSW

Starting with climate

The study sample was designed to enable analysis based on the National Construction Code (NCC) climate zones in NSW. The sampling frame was all addresses in NSW, stratified into the five climate zones covered in the study. Included homes were spread across climate zones proportionate to the estimated number of older homes in these zones.

Homes, not occupants

The study was designed to achieve a representative sample of older homes, not their occupants. The housing matches well to the overall housing stock in NSW, while the households won't necessarily match to the NSW population. For example, retirees were over represented in the surveys and renters were underrepresented—likely due to factors such as how much time and commitment these groups have.

Statistical weighting

A weighting process was developed to adjust the achieved sample to have the same geographic profile as the target sample. Results are based on data that have been subject to weighting

Transparency

All sampling approaches have some inaccuracy. Transparency and data quality were key priorities for the study. The Baseline Technical Report (See page 56) contains more detail on the sampling and weighting methodology and the results of the quality assessment.

Challenges and limitations

Hesitation from households is a challenge

Hesitation from households was a challenge to recruitment for a number of reasons.

In particular, there is declining trust in the community for unsolicited approaches of any kind. This is especially common when sharing of personal data and physical presence in a home are required. Trust issues were particularly pronounced among culturally and linguistically diverse populations and the elderly.

Qualified assessors are hard to find

Only 20 assessors were available to participate in the project at commencement, and only 13 by completion. Geographically, assessors were based in larger towns and cities, and there were no assessors based between Newcastle and Tweed Heads. Significant travel was required to service the north coast of NSW, as well as remote regions.

Moving from Scorecard to NatHERS

At the commencement of the Baseline project, Scorecard was the only NatHERS-endorsed assessment tool for the energy performance of existing homes. After the project had started, it was announced that NatHERS would be expanded to include existing homes. Stage 1 roll-out commenced in July 2025. Previously, NatHERS only covered new homes and major renovations.

Scorecard and NatHERS provide similar information about energy performance, but the ratings are not easily directly comparable.

Extra analysis was commissioned to create a conversion from the Baseline Scorecard Star ratings to NatHERS star ratings at the end of the project. While this conversion has limitations, it provides a means of comparing baseline data to future NatHERS Existing Homes data as it becomes available.

Why we've excluded the effect of solar PV

Solar PV can mask the underlying energy performance of older homes

The Scorecard rating is based on energy costs, drawing on statewide average costs for different energy sources and the net impact of solar PV.

The analysis found that solar PV has a key influence on a home's star rating. This is useful for understanding the likely energy costs of living in a home with solar PV, but can mask insights about the energy performance of the house itself, such as its thermal shell or fixed appliances.

Energy cost savings from PV can also be highly dependent on tariffs and user behaviour, so assessing the benefit from solar is challenging.

While data on solar PV is easy to obtain, data on other energy performance features of older homes is rare. We don't want the baseline study to simply be an analysis of solar PV benefits, but to provide deeper insights into older homes in NSW. Accordingly, we have adjusted the data to focus on star ratings excluding solar PV.

Distribution of Scorecard star ratings (1–10) across in-scope homes when solar PV is included and excluded

You can tell when the charts in this guide include or exclude PV by looking for these symbols:

Including PV

Excluding PV

RESEARCH FINDINGS:

Scope of the opportunity

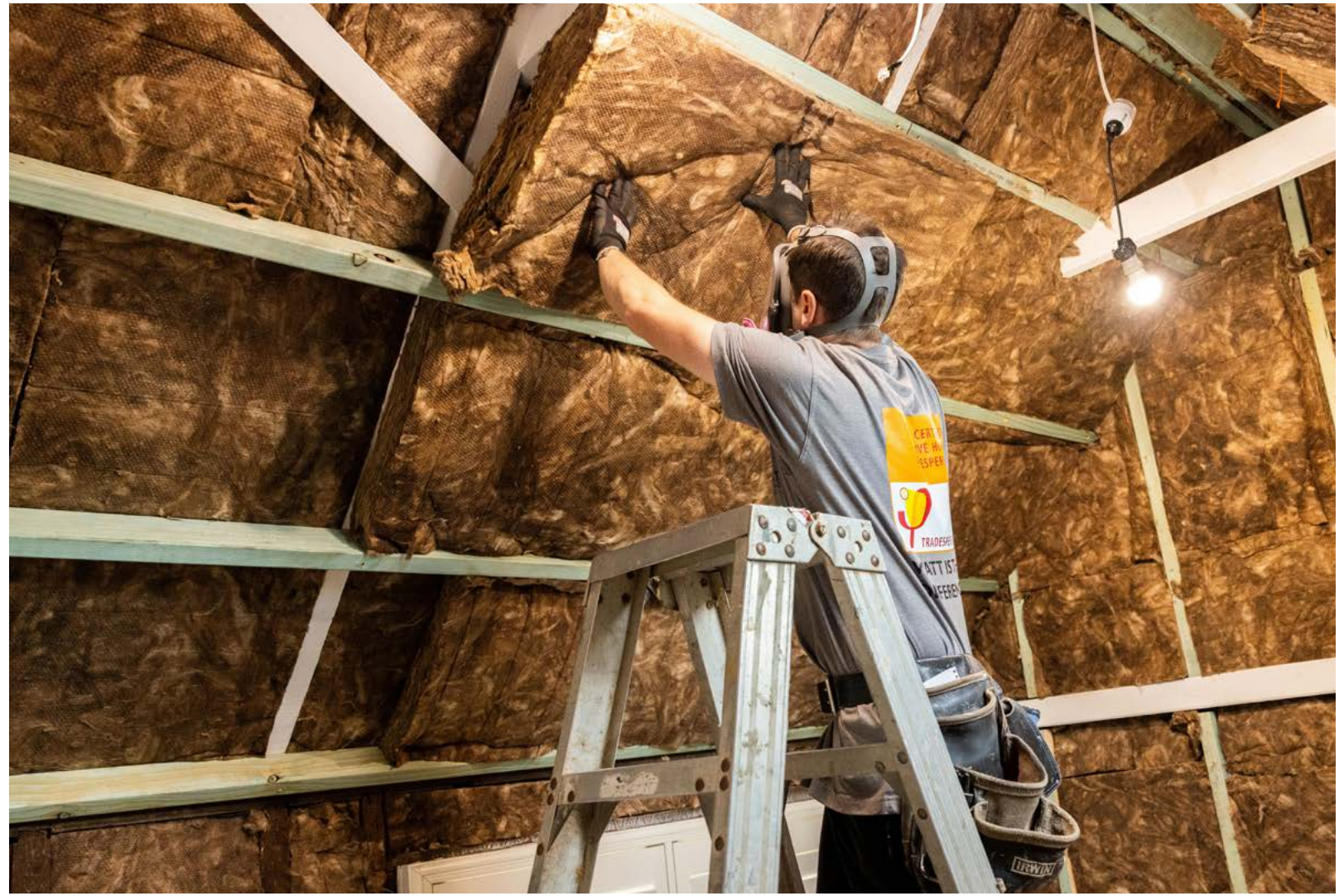


Photo: Katherine Griffiths Photography

Upgrading older homes can deliver major benefits

Bring thermal comfort up to modern standards

2.1 /10 stars
Mean NatHERS energy performance for in-scope homes

6 /10 stars
Minimum NatHERS energy performance for homes built in Australia 2010–2022

7 /10 stars
Minimum NatHERS energy performance for homes built in NSW after 2023

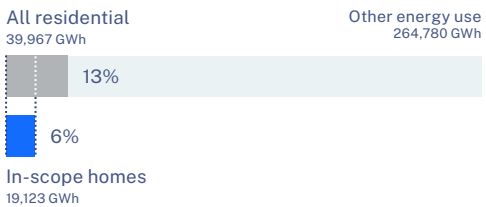
Although NSW uses the BASIX thermal performance standard, NatHERS provides a more useful benchmark for changing minimum standards over time. Homes built in NSW between 2010–2022 were achieving 5.5–6 NatHERS stars on average

Significantly reduce our energy consumption

39%
reduction in residential energy consumption with best-case upgrades

7,540 GWh
statewide annual energy savings from best-case upgrades

Residential energy consumption in NSW*



Energy consumption data:
NSW State of the Environment

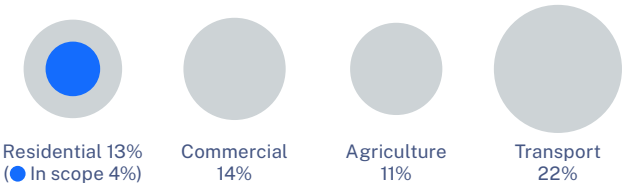
* Based on 2022–23 annual energy consumption (in-scope home energy use includes estimated consumption including non-fixed appliances)

Reduce greenhouse gas emissions from housing

13%
of emissions in NSW come from residential buildings †

4%
of NSW's emissions come from in-scope homes †

How do housing emissions compare to other sectors in NSW?



GHG data: NSW
Snapshot Climate

† Based on 2022–23 annual greenhouse gas emissions (in-scope home emissions include estimated emissions from non-fixed appliances)

Comparing upgrade packages for in-scope homes

There are important things to know about these packages on page 30

	Average Scorecard rating improvement	Average cost to perform for a single home	Yearly bill savings for the average household	Cost to perform for all in-scope homes in NSW	Total reduction in yearly energy consumption for all in-scope homes in NSW	Total household savings on energy bills over ten years
1 Basic thermal upgrades	+ 0.5 stars	$3,400	$115	$7 billion	5% (1,030 GWh)	$2.3 billion
2 Extensive thermal upgrades	+ 1 stars	$24,000	$235	$50 billion	10% (1,850 GWh)	$4.8 billion
3 Upgrading fixed appliances	+ 2 stars	$3,600	$370	$7 billion	33% (6,370 GWh)	$7.6 billion
4 Comprehensive upgrade of thermal and fixed appliances	+ 3 stars	$50,000	$470	$100 billion	39% (7,540 GWh)	$10 billion

1 Basic thermal upgrades

- Sealing air leakage
- Ceiling insulation
- Showerhead upgrade

+ 0.5 stars
Average Scorecard rating improvement

+ 1 point
Hot weather rating

+ 1 point
Hot weather rating

$7 billion
Cost to perform for all in-scope homes in NSW

$3,400
Estimated cost to perform for a single home

$115
Estimated yearly bill savings for a typical household

$230 million
Total yearly household energy bills savings

This basic package contains low-cost retrofits that would provide comfort and energy bill improvements for almost all older homes:

- Reducing air leakage by sealing gaps and cracks, and installing weatherstrips on external doors.
- Increasing the ceiling insulation by R3.0. This would take the average older home's ceiling insulation to R5.0.
- Upgrading to a 3 star WELS (9L/min) showerhead. This simple and effective improvement should be included any time upgrades are undertaken for a home.
- In the small proportion of homes that have halogen or incandescent lights, upgrading them to LED.

High-end cost estimates could be almost four times higher.

2 Extensive thermal upgrades

Basic thermal upgrades plus:

- Floor and wall insulation
- Heavy drapes
- Light coloured roof

+ 1 star
Average Scorecard rating improvement

+ 3 points
Hot weather rating

+ 3 points
Hot weather rating

$50 billion
Cost to perform for all in-scope homes in NSW

$24,000
Estimated cost to perform for a single home

$235
Estimated yearly bill savings for a typical household

$480 million
Total yearly household energy bills savings

This package includes the basic thermal upgrades package plus:

- Retrofitting R2.0 wall insulation.
- Installing R2.0 floor insulation. Typical older homes having no wall or floor insulation.
- Installing or upgrading internal window coverings to heavy drapes or honeycomb blinds.
- Painting the roof to a lighter colour. This may not be possible on all roof types, but was a very commonly recommended upgrade in the study.

Use of high-end cost estimates would double the cost. Compared to the basic thermal upgrades, this provides roughly double the energy bill savings and star rating improvement, but at over 7 times the cost. However, it does make a substantial improvement to thermal shell ratings.

3 Upgrading fixed appliances

- Energy efficient reverse-cycle air conditioner
- Heat pump hot water system
- Showerhead upgrade

+ 2 stars
Average Scorecard rating improvement

No change
Hot weather rating

No change
Hot weather rating

$7 billion
Cost to perform for all in-scope homes in NSW

$3,600
Estimated cost to perform for a single home

$370
Estimated yearly bill savings for a typical household

$760 million
Total yearly household energy bills savings

This package focuses on upgrading key fixed appliances to the most energy efficient option:

- Upgrading from a typical electric reverse cycle air conditioner (<3/5 rating on Scorecard scale) to the most energy efficient model available (5/5).
- Replacing an off-peak electric hot water system with a heat pump.
- Upgrading the showerhead to a 3 star WELS (9L/min).

The estimated cost includes installation, plus NSW subsidies for heat pump hot water system installation available in 2024, and excludes meter upgrade costs if required. A high-end estimate would double the cost.

Compared to the basic upgrade, this provides almost four times the benefit in terms of bill savings and star rating improvement, at a similar cost.

However, it does not improve the thermal shell ratings, and hence thermal comfort, of the home at all. Calculations assume households can use their heating and cooling more often for the same energy consumption and cost.

4 Comprehensive upgrade of thermal and fixed appliances

Extensive thermal upgrades and **Upgrading fixed appliances** plus:

- External shutters
- Double glazed uPVC windows

+ 3 stars
Average Scorecard rating improvement

+ 4 points
Hot weather rating

+ 3 points
Hot weather rating

$100 billion
Cost to perform for all in-scope homes in NSW

$50,000
Estimated cost to perform for a single home

$470
Estimated yearly bill savings for a typical household

$1 billion
Total yearly household energy bills savings

This package models all reasonable potential upgrades within the Scorecard tool suite of recommendations, other than PV.

This includes all the extensive thermal shell upgrades, fixed appliance upgrades, along with:

- Upgrading windows and glazing, including retrofitting uPVC or timber framed windows with double glazing and low-e coating.
- Installing external shutters on windows.

Window retrofits were costed at around $20,000, for targeted upgrades, not all windows in the house. Using high-end cost estimates would increases the price by up to 50%.

Retrofitting double glazing is typically one of the most expensive energy performance improvements, best done when windows are already being replaced.

Compared to the basic upgrade, this provides roughly six times the benefit in terms of energy bill savings and star rating improvement, but at over 15 times the cost.

However, it does increase hot and cold thermal shell ratings to the maximum 5/5.

Comparing upgrade options: Important things to know

How we chose upgrade packages

We modelled six common housing archetypes drawn from the baseline data, covering 71% of older homes (see page 53). For each, 12 different upgrade scenarios were tested using the Scorecard tool. The analysis quoted above is based on a 145m² home. The four upgrade packages in this report represent a range of approaches for increasing comfort and energy performance.

The modelling didn't cover all climates

Upgrade packages were modelled in Climate Zone 5, which has the largest proportion of homes in NSW. Energy performance improvement and bill impacts would vary across climate zones.

Upgrade costs can be highly variable

Costs to perform the upgrades were determined using a combination of existing literature* and data from online renovation aggregation sites such as hipages. High, medium and low cost estimates were determined, and compared to similar upgrade packages from modelling done by Climateworks in 2023. The low cost estimate was the closest match, so this is the one quoted in the analysis. Cost estimates are based on information available in 2024, including available rebates and subsidies for energy efficiency appliances, for example, heat pump hot water systems. Installation and labour costs are considered in the costing, however these can be highly variable.

There are other benefits we didn't model

There are many potentially significant benefits to households and communities from upgrading home energy performance, beyond reduction in energy bill costs. This upgrade comparison does not consider the significant thermal comfort, health, peak demand reduction and other co-benefits that can significantly improve the energy upgrade value proposition.

*References

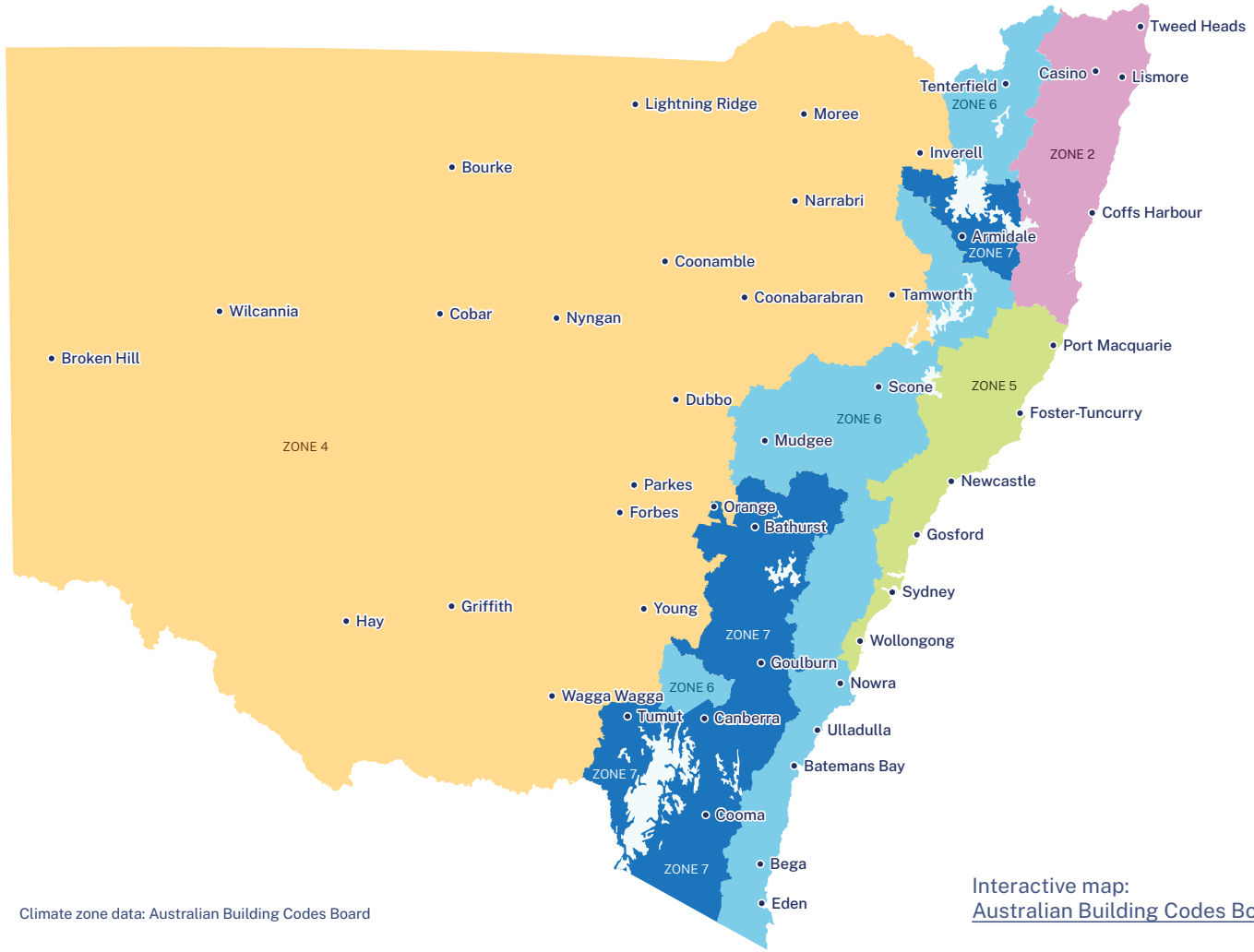
1. Kokogiannakis G, Liu J. 2024. Net Zero Energy Low Rise Unit Buildings—Project Overview and Key Findings Report. A report prepared for Homes NSW.
2. Daly, D, Tibbs, M., Harada, T., Waitt, G., and Cooper, P.,. Guide to Implementing Low Carbon Retrofits for Social Housing, 2019.
3. Song, Yiwen. "Cost on Retrofitting." Australia: CSIRO, 2024.
4. Climateworks Centre. (2023). Climate-ready homes: Building the case for a renovation wave in Australia.

RESEARCH FINDINGS:

Regions and climates

Photo: Phillip Wittke

Climate zones in New South Wales and the ACT



Climate zone data: Australian Building Codes Board

Interactive map:
Australian Building Codes Board

6 of the 8 climate zones defined by the National Construction Code of Australia are found in New South Wales:

- **Zone 2:** Warm humid summer, mild winter (169,000 in-scope homes)
- **Zone 4:** Hot dry summer, cool winter (207,000 in-scope homes)
- **Zone 5:** Warm temperate (922,000 in-scope homes)
- **Zone 6:** Mild temperate (599,000 in-scope homes)
- **Zone 7:** Cool temperate (154,000 in-scope homes)
- **Zone 8:** Alpine (53 in-scope homes)

(Zone 8 is not included in the research because there are so few homes in these alpine regions)

How in-scope homes perform across climate zones

Scorecard and NatHERS ratings
represent the mean estimate for each zone

Zone 2: Warm humid summer, mild winter

Scorecard rating Excluding PV 3.8/10

NatHERS rating (converted from star rating ex. PV) 1.8/10

Hot weather rating 2.9/5

Cold weather rating 1.9/5

Zone 4: Hot dry summer, cool winter

Scorecard rating Excluding PV 3.4/10

NatHERS rating (converted from star rating ex. PV) 1.6/10

Hot weather rating 4.1/5

Cold weather rating 1.7/5

Zone 5: Warm temperate

Scorecard rating Excluding PV 3.5/10

NatHERS rating (converted from star rating ex. PV) 2.1/10

Hot weather rating 2.6/5

Cold weather rating 2.1/5

Zone 6: Mild temperate

Scorecard rating Excluding PV 3.6/10

NatHERS rating (converted from star rating ex. PV) 2.3/10

Hot weather rating 1.9/5

Cold weather rating 1.5/5

Zone 7: Cool temperate

Scorecard rating Excluding PV 3.7/10

NatHERS rating (converted from star rating ex. PV) 2.3/10

Hot weather rating 2.8/5

Cold weather rating 2.3/5

Statewide average (all climate zones)

Scorecard rating Excluding PV 3.5/10

NatHERS rating (converted from star rating ex. PV) 2.1/10

Hot weather rating 2.6/5

Cold weather rating 1.9/5

What we've learned about housing performance across climate zones

When the impact of solar PV energy generation is excluded, the average NSW Scorecard star rating is 3.5-stars.

Mean Scorecard star ratings across climate zones range from 3.4 to 3.8 stars, but the difference is not statistically significant.

When converted to a NatHERS thermal star rating, older homes in NSW have an average of 2.1 NatHERS stars. The current NCC minimum standard for new homes is 7 stars. There is a statistically significant difference for both means and distribution. Both climate zones and regional location are statistically related to NatHERS thermal star rating.

Across New South Wales, the average hot weather rating was 2.6 out of 5, with the highest rating of 4.1 in Zone 4 and the lowest rating of 1.9 in Zone 6. Those two zones were outliers, with other climate zones similar to the state average.

The average cold weather rating was 1.9 out of 5, with a smaller range of means across climate zones, from 2.3 in Zone 7 to 1.5 in Zone 6.

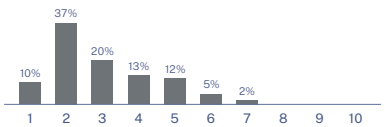
The differences between climate zone means for hot and cold weather ratings are statistically significant.

This means there is likely a strong link between location and ratings for hot and cold weather and NatHERS, but not Scorecard (ex. PV).

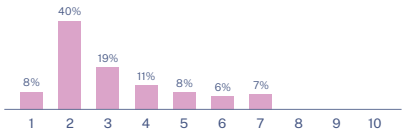
Distribution of Scorecard star ratings (1–10) for in-scope homes in different climate zones

Excluding PV

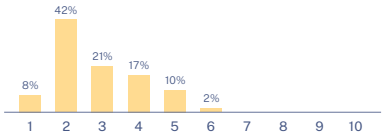
Statewide



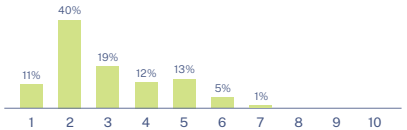
Climate Zone 2



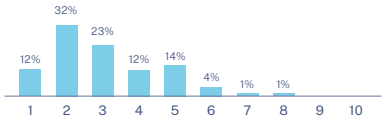
Climate Zone 4



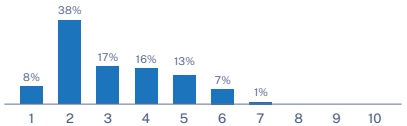
Climate Zone 5



Climate Zone 6



Climate Zone 7



A clear pattern in the frequency distribution of star ratings is evident across all climate zones, with 2 stars the most common Scorecard star rating for an older home in each climate zone.

Across NSW, 10% of homes receive the lowest possible rating of 1 star. Almost half achieve 2 star or less.

With solar PV is excluded, the highest rating a house can possibly get is 8 stars. This shows the scope for improvement available.

Only a handful of older homes in Zone 6 achieve this 8 star rating.

Key differences for each climate zone

As climate typically has a large impact on household energy use, differences that emerge between climate zones are often expected. The largest differences were in the warmest and coolest zones, which also had the lowest proportion of homes.

On average, dwellings are built with some level of adaptation to their climate, yielding better hot weather ratings in hotter climates, and better cold weather ratings in colder climates.

The study used statistical tests to understand differences between zones. Statistical differences in energy star ratings across climate zones disappear when solar PV is excluded, indicating that energy performance rating of the building stock is relatively consistent across the state.

Climate resilience of house performance will be of growing importance as climate-related extreme weather and disasters become more frequent and severe.

Appliance energy use and climate zones: p.45

2: Warm humid summer, mild winter

This warm climate requires less heating than other zones, with heating accounting for only 26% of energy usage compared with the state average of 38%. This is reflected in lower than average annual energy consumption (4.7 MWh compared with 7.2 MWh across NSW), energy costs and GHG emissions.

This zone has a similar energy star rating to the NSW average (ex. PV), but higher rating than state average including PV. This makes sense as this zone has higher than typical uptake of PV generation.

The hot weather rating of 2.9 is slightly above the state average, suggesting some level of climate appropriate design. However, the NatHERS thermal rating (1.8) is lower than state average (2.1), indicating a need to improve thermal performance of buildings in this zone.

4: Hot dry summer, cool winter

Compared to the NSW average of 2.6, this zone has a significantly higher hot weather rating of 4.1, showing older homes in this zone have some appropriate design features for the prevailing climate.

However the cool winters mean heating still accounts for 47% of energy usage. It is therefore quite significant that the mean NatHERS thermal rating is lowest in this zone (1.6).

Across other performance measures, this zone was similar to the state averages.

5: Warm temperate

The largest number of homes in NSW are in this zone, stretching roughly between Wollongong and Port Macquarie. Homes in this zone closely match the NSW average across all performance measures.

6: Mild temperate

This zone has the second largest population of homes in NSW. This zone is also similar across all performance measures to the NSW average.

7: Cool temperate

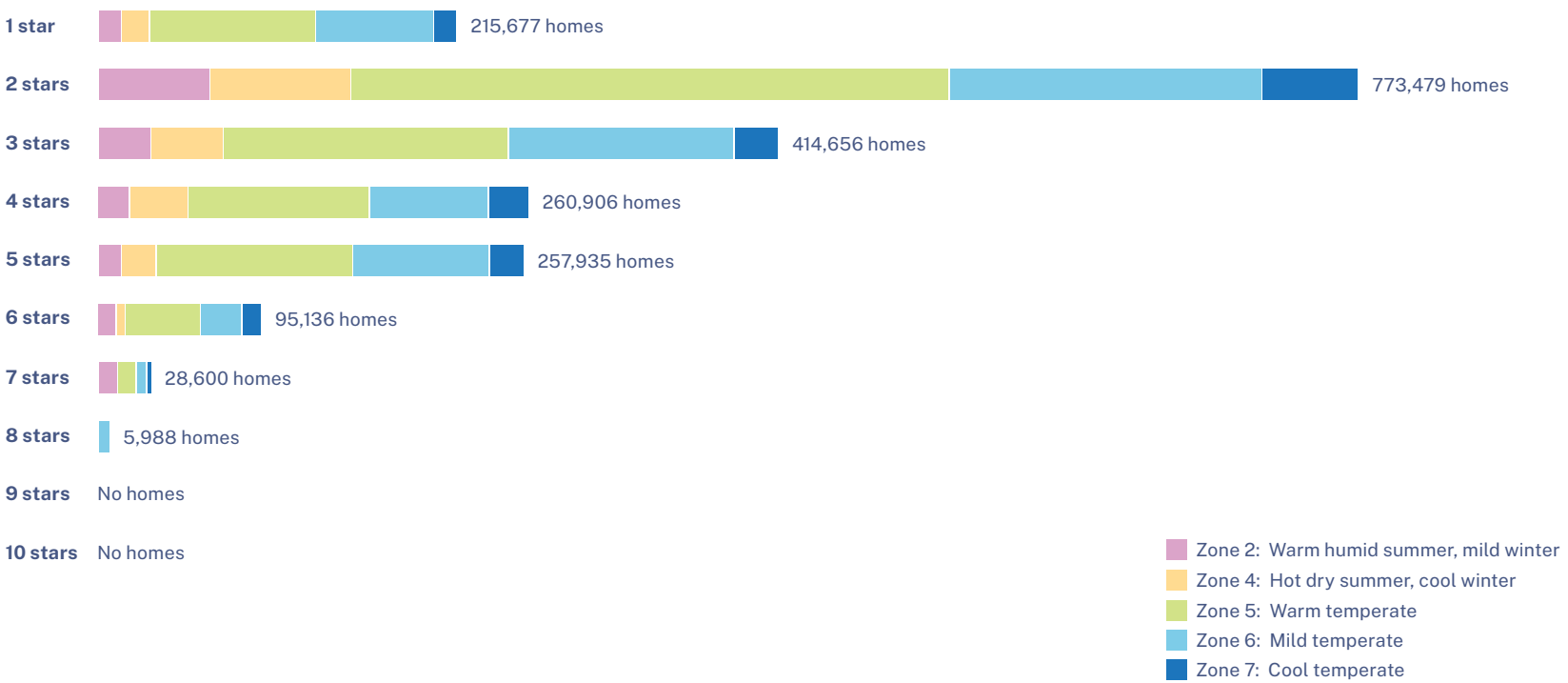
Other than the alpine regions, this is the coolest zone in NSW. The scorecard star rating is similar to the NSW average (ex. PV). This zone has a significantly lower PV generation rate, so if PV is included, the star rating is lower than the state average.

This zone has a higher cold weather rating of 2.3 than the NSW average of 1.9. However, as heating accounts for 67% of energy usage, there is obvious scope for improvement.

Compared to the NSW average, this zone has higher annual energy consumption (11.6 MWh compared with 7.2 MWh), higher GHG emissions, and higher energy costs.

Star ratings for in-scope homes across climate zones

Number of in-scope homes with each star rating, excluding PV



Most homes are in climate zones 5 and 6.

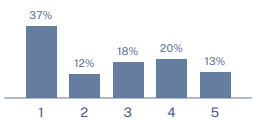
There are almost 1 million in-scope homes in NSW that receive the two lowest possible ratings for energy performance.

The majority of these homes are likely lacking even basic features that would improve comfort and minimise energy consumption.

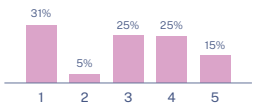
Upgrading these homes (in particular) represents a huge opportunity to both reduce energy consumption across the state, and improve comfort and reduce energy bills for the people that live in these homes.

Hot and cold weather performance of in-scope homes across climate zones

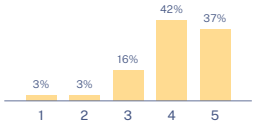
Distribution of hot weather ratings



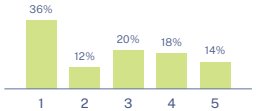
Statewide



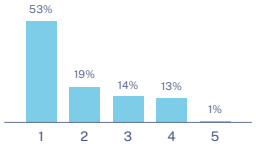
Zone 2: Warm humid summer, mild winter



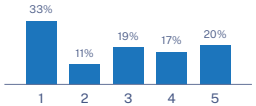
Zone 4: Hot dry summer, cool winter



Zone 5: Warm temperate

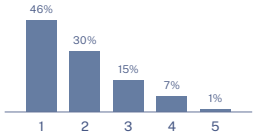


Zone 6: Mild temperate

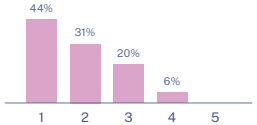


Zone 7: Cool temperate

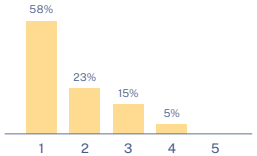
Distribution of cold weather ratings



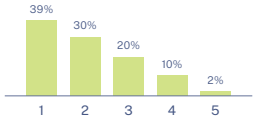
Statewide



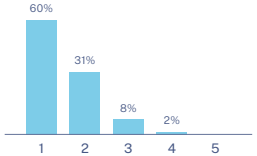
Zone 2: Warm humid summer, mild winter



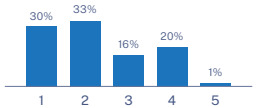
Zone 4: Hot dry summer, cool winter



Zone 5: Warm temperate



Zone 6: Mild temperate



Zone 7: Cool temperate

The hot and cold weather ratings provide insight into the home's performance in maintaining comfortable conditions for occupants.

In most NSW climates, 1 star is the most common hot and cold weather rating, meaning older homes are typically hard to keep comfortable.

There are two exceptions. Homes in Zone 4 are well constructed for hot weather, with over 75% easy or very easy to keep comfortable. Homes in Zone 7 are still hard to keep warm, but less so than other zones.

Smaller houses tend to have lower hot and cold weather ratings, meaning they are harder to keep comfortable. This is likely due to poorer quality thermal construction e.g. lower insulation levels.

Homes built with timber or fibre cement walls are more likely to perform poorly in both hot and cold weather. About a third of double brick or brick veneer homes, and 75% of timber frame or fibre cement homes, receive 1 star cold weather ratings.

No significant difference was found based on whether a home was owned or rented in the private market.

However, social housing is markedly less thermally comfortable. Almost three quarters of social housing dwellings (73%) have a 1 star cold weather rating, compared to 45% for owner-occupied homes.

Over half (54%) of social housing dwellings have a 1 star hot weather rating, compared to 36% for owner-occupied homes.

How in-scope homes compare across regions

	Mean Scorecard rating Excluding PV	Mean NatHERS rating (converted from star rating excluding PV)	Mean hot weather performance	Mean cold weather performance
Statewide average	3.6 / 10	2.1 / 10	2.6 / 5	1.9 / 5
Sydney: Northern	3.1 / 10	2.7 / 10	2.1 / 5	2.6 / 5
Sydney: Central	3.6 / 10	2.6 / 10	1.8 / 5	1.5 / 5
Sydney: Southern	3.5 / 10	2.6 / 10	1.9 / 5	2.2 / 5
Sydney: Eastern	3.8 / 10	2.9 / 10	2.6 / 5	2.5 / 5
Sydney: Western	3.4 / 10	2.7 / 10	1.8 / 5	1.5 / 5
Central Coast	3.2 / 10	1.0 / 10	3.4 / 5	1.6 / 5
Hunter	3.3 / 10	1.2 / 10	3.2 / 5	1.4 / 5
Illawarra / Shoalhaven	4.1 / 10	2.0 / 10	1.9 / 5	2.0 / 5
North Coast	3.8 / 10	1.6 / 10	3.0 / 5	1.8 / 5
Central West & Orana	3.2 / 10	1.4 / 10	4.0 / 5	1.8 / 5
Far West*	3.1 / 10	0.7 / 10	3.4 / 5	1.1 / 5
Riverina/Murray	3.5 / 10	2.5 / 10	4.2 / 5	2.1 / 5
South East & Tablelands	4.2 / 10	2.1/ 10	2.4 / 5	2.1 / 5
New England & North West*	4.0 / 10	1.8/ 10	3.0 / 5	1.7 / 5

* based on fewer than 50 homes

RESEARCH FINDINGS:

House types and features

Photo: Elias Bitar

How in-scope homes are built

The study collected details about how older homes are constructed, and the features and appliances in these homes.

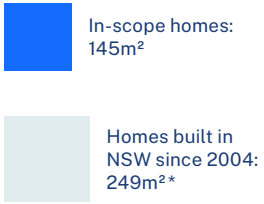
Older homes typically have a much smaller floor area than newer homes.

Timber floors that are largely enclosed in a sub-floor space are most common, present in almost half of older homes.

Most older homes are detached (freestanding), and brick veneer is the most common wall type. 12% are semi-detached (townhouse, terrace etc.), and these typically have double-brick walls.

House size has a major influence on energy performance. To a statistically significant degree, smaller houses are associated with improved energy performance ratings. This is because it costs less to heat or cool the smaller house volume, even though smaller homes typically have poorer thermal shell ratings, typically due to poorer thermal construction (for example, less insulation).

Mean floor area



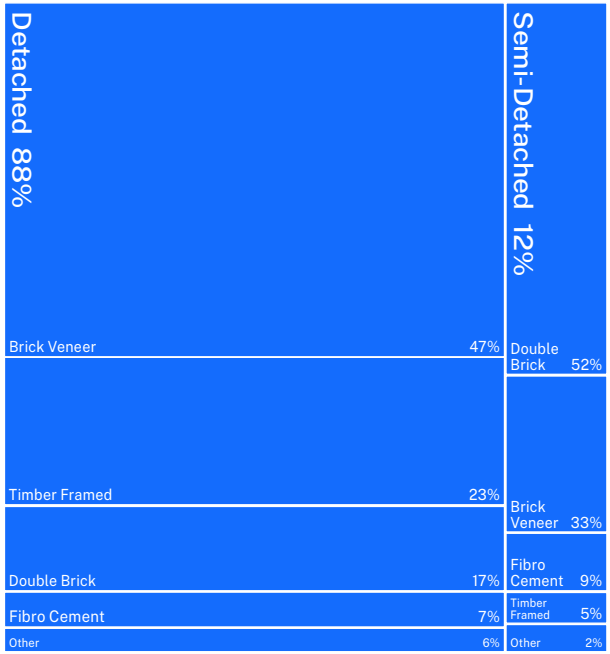
58%

Size of a typical in-scope home relative to a typical newer home

* Australian Bureau of Statistics

Floor types

Wall types



How well in-scope homes are protected from the elements

Insulation

	Average in-scope home	Typical new Australian home (since 2016)
Ceilings	**R 2.0**	R 4.0–4.9
Walls	**R 0.4**	R 2–2.9
Floors	**R 0.1**	R 1.0 or less

New home data: CSIRO Australian Housing Data

Insulation, particularly ceiling insulation, has a significant impact on energy performance. However, older homes essentially have little to no wall or floor insulation. The average home has a level of ceiling insulation that provides some benefit, but is lower than recommended for a new home. Roof colour can also impact how a house gains heat, particularly during summer. It is notable that more than half of older homes have dark roofs.

Roof colour

There is no noticeable difference in insulation levels based on location of a home in cities, or in regional or remote areas.

Homes in climate zones 6 and 7 have somewhat higher levels of ceiling insulation.

There are no obvious links between building age and insulation levels, although there is variation within the different age ranges.

There are no obvious links between construction type and insulation level, except that double brick walls have lower wall insulation, which is to be expected.

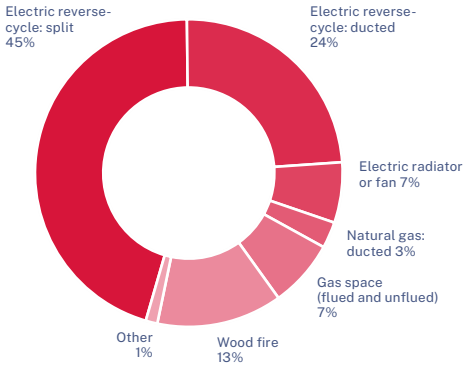
Double brick and brick veneer houses are much more likely to have dark roofs.

Privately rented properties have lower average ceiling and wall insulation than privately owned properties or social housing.

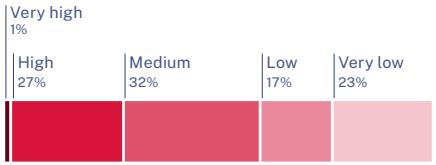
Almost three quarters of social housing properties had dark roofs, much higher than for other tenure types.

Heating in-scope homes

Fixed heating appliances



Efficiency of fixed heating appliances



Results normalised for age of appliance

On average, NSW homes have 1.5 fixed heaters. However almost half (44%) of social housing dwellings don't have any fixed heating.

Electric reverse cycle split system air conditioners are typically the most energy efficient appliance for heating appliance, so it is encouraging that they are the most common.

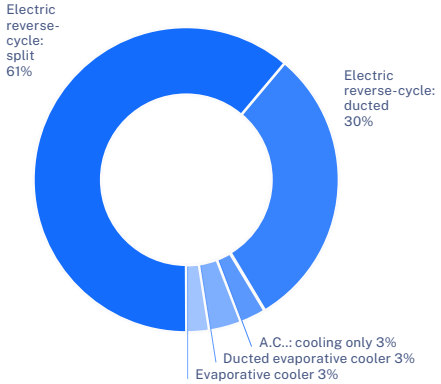
While only a small number of heaters are very highly efficient, over half are of medium efficiency or better.

Ducted reverse cycle air conditioning is most common in the Sydney region.

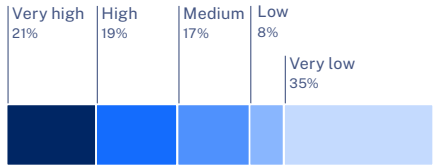
Wood fire heaters are common in climate zones 4 and 7 where they are used in over 30% of homes.

Cooling in-scope homes

Fixed cooling appliances



Efficiency of fixed cooling appliances



Results normalised for age of appliance

On average, NSW homes have 1.2 fixed cooling appliances. However, 61% of social housing dwellings and 24% of private rentals have no fixed cooling, compared with 11-12% of owner-occupied dwellings.

Electric reverse cycle split system air conditioners are typically the most energy efficient cooling appliance, and they are the most common in in-scope homes.

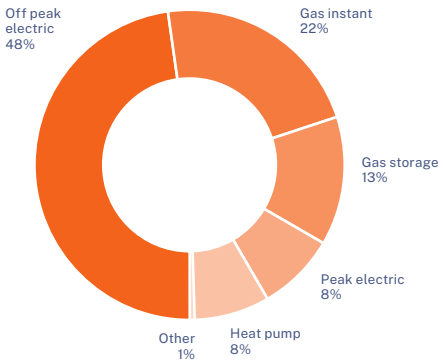
Evaporative coolers are common in the high heat and low humidity of climate zone 4.

There were no clear links between cooling types and property age or typology.

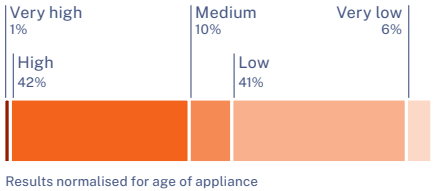
66% of in-scope homes have at least one ceiling fan present in the home.

Hot water

Hot water systems



Efficiency of hot water systems



Electric storage systems are the most common hot water system in NSW homes, whether connected to off-peak or peak electricity.

Over a third of homes have some form of gas hot water, much fewer have heat pump hot water systems. Gas hot water (instant or storage) is much more common in Sydney than other locations. Solar hot water is most common in climate zone 2.

There is some variation in hot water systems by house type. Semi-detached homes are more likely to have gas.

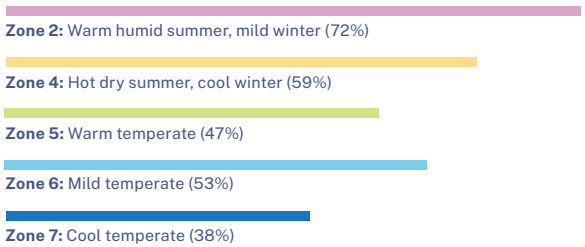
Notably, 20% of private rentals have peak electric hot water systems, and there are no heat pump systems present in either private or public rentals.

Solar PV

49% in-scope homes with solar PV

12% in-scope social housing homes with solar PV

Percentage of in-scope homes with Solar PV across climate zones



In each climate zone, the most common PV system is larger than 5kW. However, social housing properties with solar PV typically have smaller systems.

Detached houses are more likely to have solar PV, however up to a third of semi-detached houses also have solar PV. Half of homes owned with a mortgage and 60% owned outright have solar PV, but 91% of private rentals and 88% of social housing properties don't.

Pools and spas

20% in-scope homes with a pool or spa

34% energy used in these homes for pools and spas

10% energy use for pools and spas across all in-scope homes in NSW

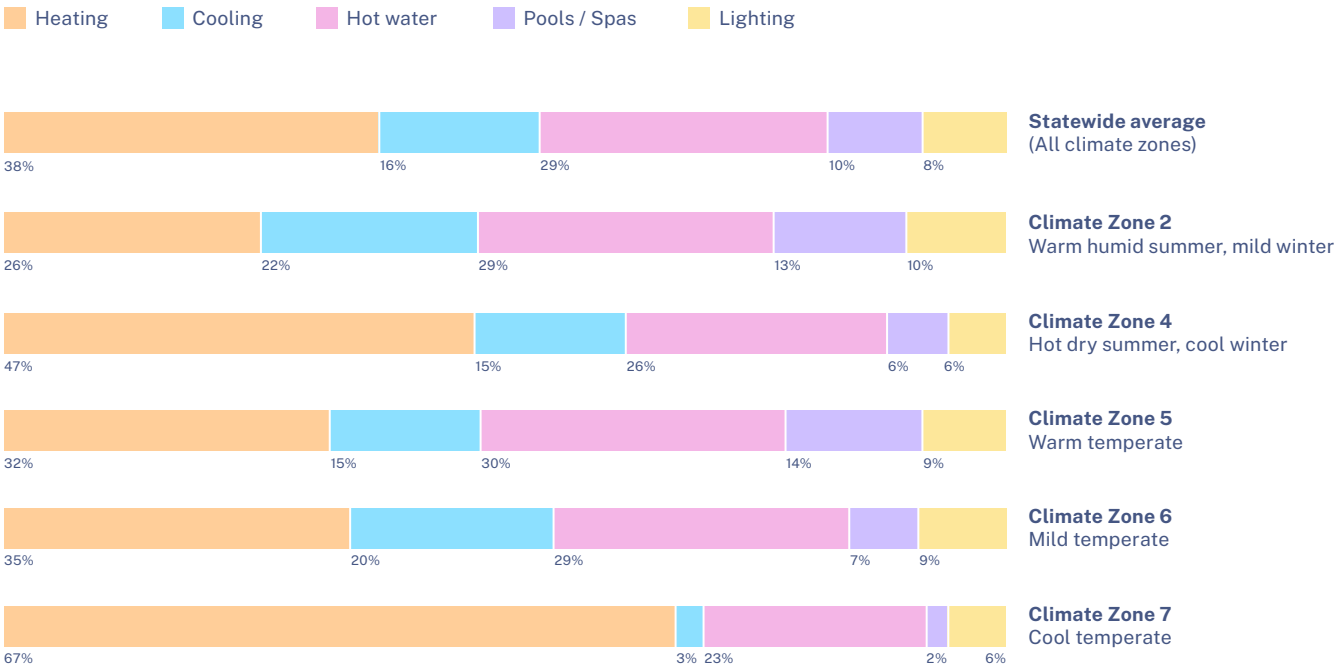
One in five NSW homes has a pool or spa (or both). On average, energy use from pool and spa equipment (pumps, heating systems) accounts for about a third of the home's energy use.

RESEARCH FINDINGS:

People and households

Photo: Katherine Griffiths Photography

How people use energy



On average across NSW, space heating is the largest contributor to energy costs, with understandable variation across climates, spanning from around a quarter to two-thirds of energy costs.

Cooling is a much smaller contributor to energy cost on average. Even in the warmest climate zone, heating contributes more to energy cost than cooling.

Hot water is the second largest contributor to energy cost in NSW, with lower variation across climates.

Energy performance is more about the house than the characteristics of the residents

The study investigated links between home energy performance and household characteristics.

Resident demographics don't play a part

We found no clear link to demographic factors such as gender, age, cultural and linguistic diversity, education or employment. It's important to note that demographic information was based only on the resident who responded to the survey, which could affect the findings if other household members had different characteristics.

None of the demographic characteristics analysed showed a statistically significant impact on differences in energy performance when PV is excluded. Male respondents were somewhat more likely to live in a 10 star rated home if PV was included.

Socioeconomic factors may have some impact

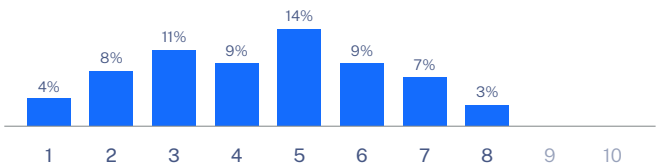
Some household socioeconomic factors appear to have an effect. We considered, socioeconomic index (SEIFA) for each location, living situation, size of the home (number of bedrooms) and income. Of these, all except income have a statistically significant impact on the energy performance of the dwellings. This is the case whether PV is included or excluded in the assessment.

SEIFA is a measure of relative socio-economic disadvantage, and households in the most disadvantaged 20% had higher mean energy ratings (3.9) compared with the least disadvantaged 20% (3.3).

It is possible that this is linked to smaller home size rather than disadvantage directly as smaller homes typically have better ratings. This was seen in the ratings difference related to number of bedrooms (4.4 for two or fewer bedrooms, compared with 2.7 for five or more), and the higher mean ratings (3.9) for households living alone, who presumably live in smaller homes.

Householders' estimates of their energy use prior to their assessment

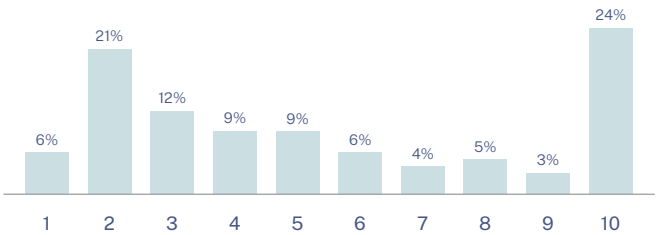
Householder estimates of the star rating of their home (1–10)



n = 1015 34% of people either responded not sure or preferred not to say

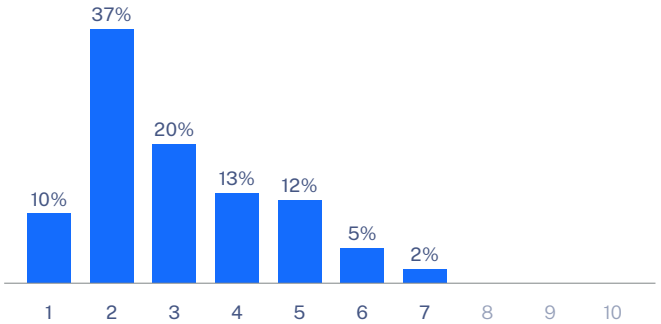
Before the assessment, 1,015 households were asked to estimate their home's rating. Many were optimistic, with over a third rating their home 5 star or above, though none rated their home 9 or 10 star. Over a third were unable to guess.

Assessed energy performance: Scorecard rating including solar PV



The actual ratings show that households didn't perceive solar PV impacts in the same way as the tool modelled them. PV gave many homes a boost in ratings that wasn't expected by households. Almost a quarter received the top 10 star rating.

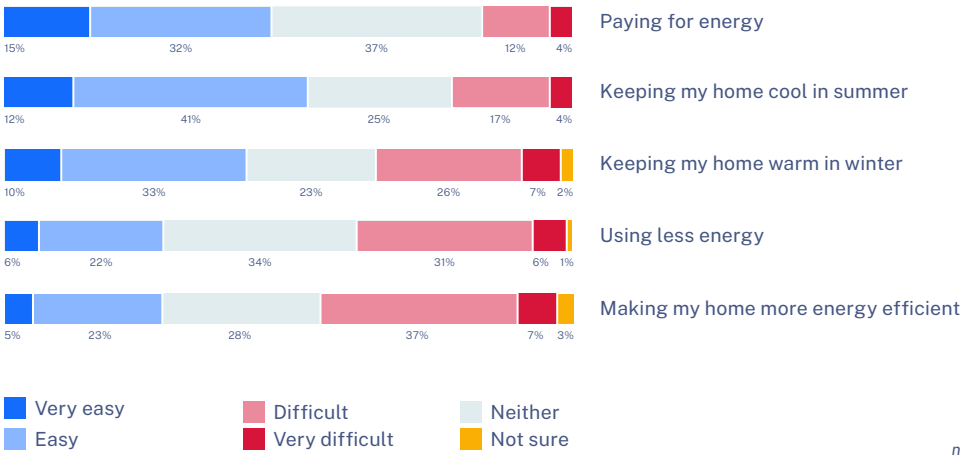
Assessed energy performance: Scorecard rating excluding solar PV



Ratings that exclude solar PV provide a very different picture. The underlying performance of the homes once the impacts of PV are excluded was lower than estimated. Almost half of households received a 1 or 2 star rating.

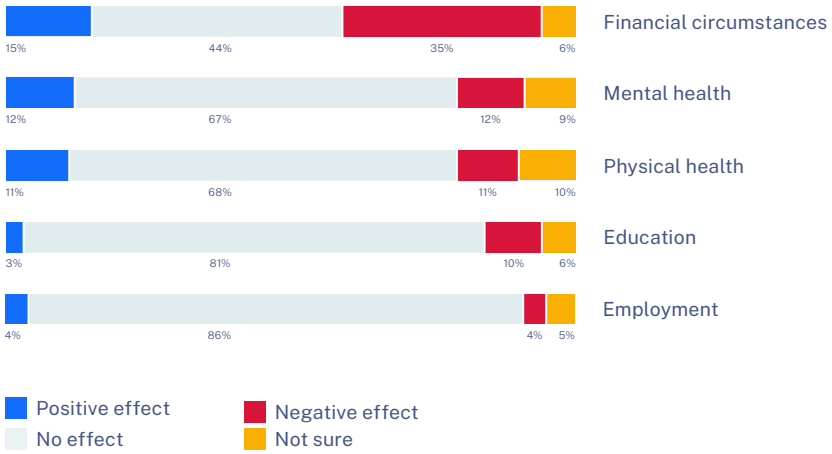
Householders views

How challenging it feels to be more comfortable and use less energy



n = 655

How householders feel the energy performance of their home affects aspects of their life



n = 655

Householders completed a follow-up survey after their energy assessment that asked about their experience in the home over the past year.

Using less energy is a challenge for 37% of households. It feels easier to keep cool during the warmer months than it does to warm up in winter.

16% of householders find it difficult or very difficult to pay for energy bills. After receiving their personalised home energy assessment and recommendations, 42% still found it difficult to make their home more energy efficient.

The geographical location of the house didn't impact this response.

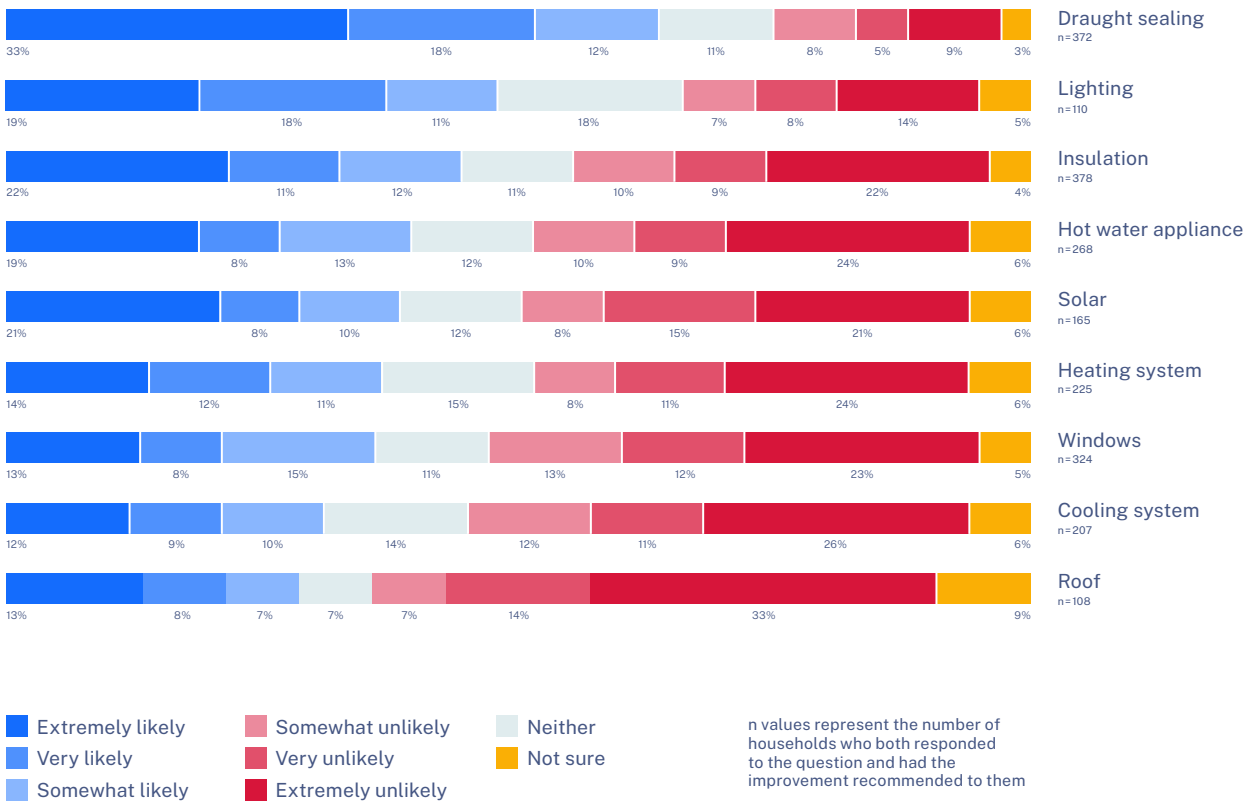
The same survey asked about the impact of home comfort and energy performance.

Householders feel the impact of energy use on their wallet, but most don't feel the energy performance of their home plays a big role in their health.

An impact on education or employment is even less likely to be reported. However, around one in ten report negative impacts on education and mental and physical health.

Perceptions of the home's energy performance are not significantly influenced by the geographical location of the home.

Which improvements householders feel they are most likely to make



n values represent the number of households who both responded to the question and had the improvement recommended to them

Household experience of the energy assessment was overwhelmingly positive. Most households (92%) felt it increased their control over their energy usage.

Similarly, most households felt confident that they had enough information to implement the recommendations (77%).

In general, NSW households are receptive to making changes to their homes. Households were provided tailored upgrade recommendations after their assessment. They were asked how likely they would be to make the changes suggested specifically for them in the next two years.

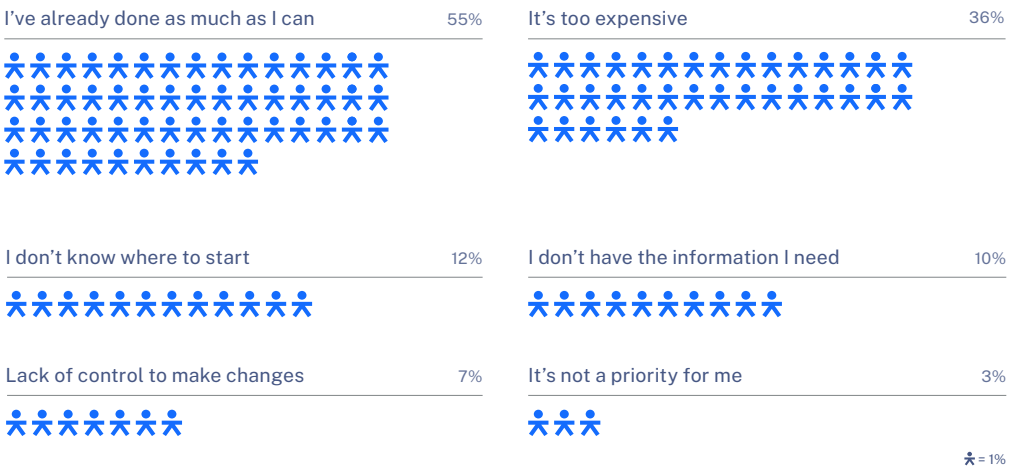
Draught-proofing improvements are the most likely to be undertaken (63%). Changes to the roof are least likely to be undertaken (28%).

Householders were also asked about the impact of energy efficiency upgrades and appliances on their energy use.

After the experience of the assessment and receiving the recommendations, improved understanding of the impact of draughts on energy performance was reported the most. About a quarter (26%) felt a high change in their awareness of this aspect.

There were also large changes in awareness of impacts of hot water (23%) and air conditioning (19%).

What householders see as the major barriers to reducing their energy use



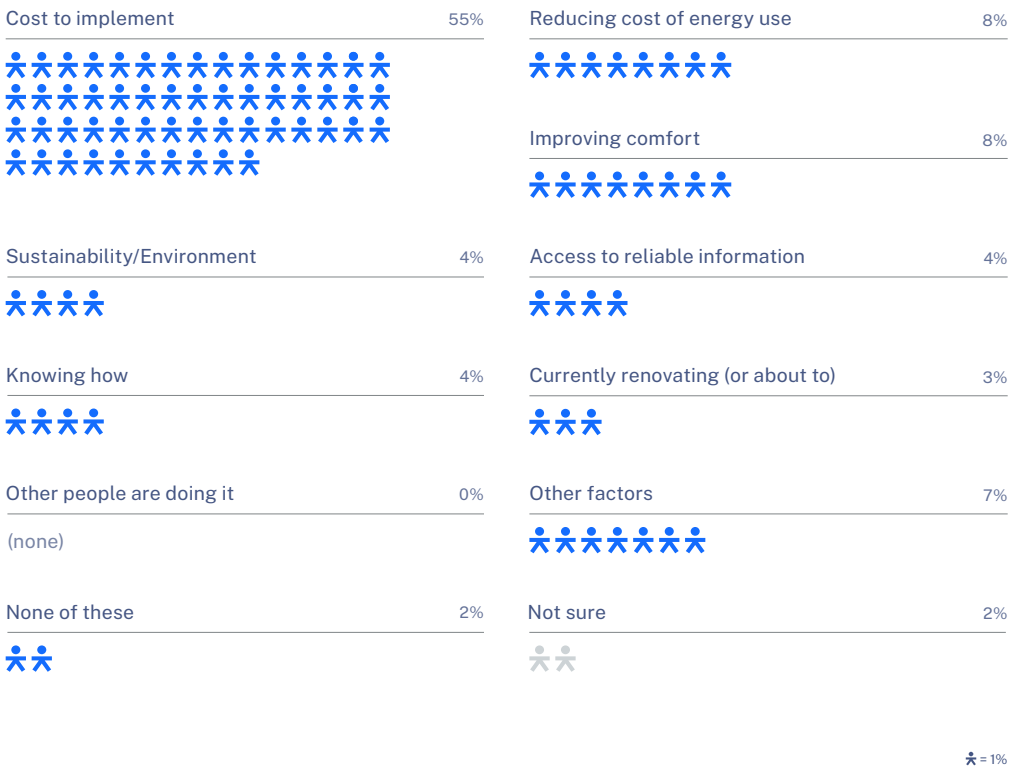
The follow-up survey also explored drivers and barriers for future action.

Over half of householders feel there is nothing they can do to reduce their energy use further, despite assessment findings showing most homes can make significant improvement. Cost is seen as the greatest barrier to reducing energy use.

Knowledge is also a barrier, with many unsure where to start and feeling there isn't information to help guide them.

When asked what would influence them to implement upgrades, over half said cost was most important. Reducing energy costs and improving comfort were often given as the second most important factor.

What they feel most affects their decision to implement recommended upgrades



How likely they are to recommend an energy assessment

Almost nine out of ten would definitely or likely recommend an assessment to someone else. Some households were recruited through referrals, and this was much more likely to occur after the referring household had been through the assessment. The high enthusiasm may have been influenced by the full assessment subsidy.

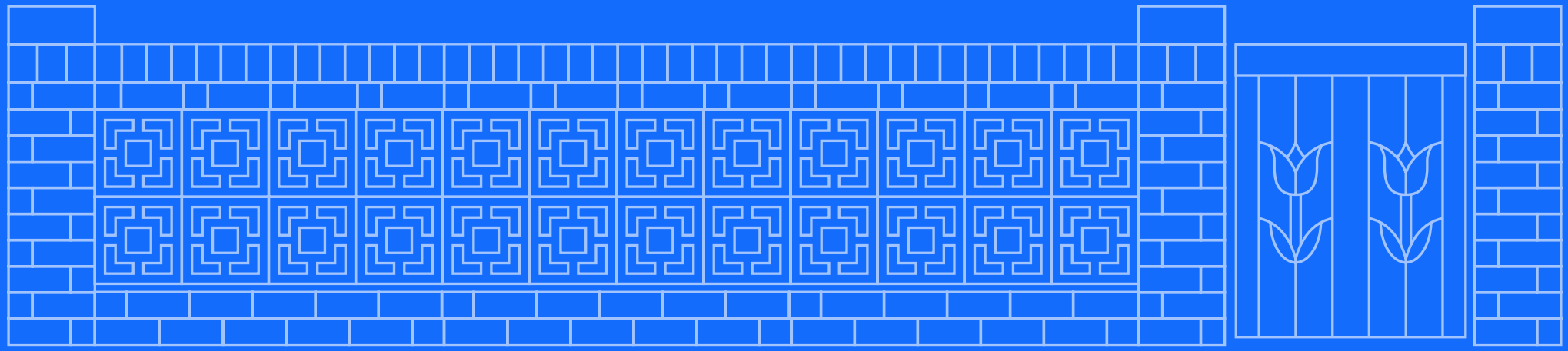
How much they would pay for an energy assessment

However, most households would be happy to pay for an assessment. There was significant variation in how much they'd pay, from less than $100 to more than $700. Households were told during recruitment that assessments were worth about $500, so it is notable that the vast majority of households thought it was worth less.

How likely star ratings are to affect their choice of house to move into

Just over half the households surveyed said they would probably or definitely consider the star rating when choosing a new home. This is an important finding that may inform the pathway towards disclosure of energy star ratings when homes are being sold and leased.

3 Using these findings to inform action



IMPROVING OLDER HOMES:

Upgrades to consider

Percentage of in-scope homes that the upgrade is recommended for

Percentage of householders 'likely' to undertake the upgrade (see p.48)

Basic

Replacing shower heads

Install water-efficient shower heads to reduce hot water use, lowering both energy and water bills without sacrificing comfort.

57% No data

Sealing draughts

Seal gaps around doors, windows, and vents to prevent heat loss and improve indoor comfort, reducing heating and cooling energy use.

52% 63%

Replacing inefficient lights

Swap halogen or incandescent bulbs for LEDs to cut lighting energy use by up to 80% and extend bulb lifespan. Most homes have done this, but it was recommended for those who hadn't.

22% 48%

Appliances

Upgrading heating

Replace old heaters with energy-efficient models like reverse-cycle air conditioners. This can significantly reduce energy use and improve comfort.

92% 37%

Upgrading hot water system

Install a high-efficiency heat pump or solar hot water system to significantly cut energy use for water heating, a major household energy cost.

57% 40%

Upgrading cooling

Switch to energy-efficient cooling systems like reverse-cycle air conditioners or ceiling fans to maintain comfort while using less electricity.

46% 31%

Installing solar PV (and battery)

Generate clean electricity with rooftop solar panels and store excess energy in a battery to reduce grid reliance and lower long-term energy costs.

No data 37%

Thermal

Upgrading insulation

Improve ceiling, wall, or underfloor insulation to maintain indoor temperatures year-round, reducing reliance on heating and cooling systems.

90% 45%

Upgrading windows

Install double glazing or high performance windows to reduce heat transfer, improve thermal comfort and lower energy bills. There are cheaper retrofit options for existing windows.

84% 36%

Upgrading roof colour

If renovating, choose a light-coloured or reflective roof to reduce heat absorption, keeping your home cooler in summer and lowering cooling energy needs. Some existing roofs can be repainted.

77% 28%

Improving window coverings

Install insulated blinds or curtains to reduce heat loss in winter and block heat in summer, improving comfort and reducing heating and cooling needs.

29% No data

IMPROVING OLDER HOMES:

Opportunities by key housing type

Older homes were narrowed down to six main types based on their construction (called 'archetypes' in the technical report). Each housing type was modelled to assess its energy performance and the upgrades it would need to meet today's standards.

These housing types indicate what the best upgrade opportunities are likely to be based on how a home is constructed. The priority upgrades are fairly consistent across each type, with some variations.

How we chose the house types

We started by identifying common types of pre-2004 homes in NSW. We grouped them based on their wall and floor construction, which affect how well they retain heat. Roof details were not included because they are not recorded in the Scorecard assessments.

We found twenty possible combinations and narrowed them down to six types, representing 71% of in-scope homes.

How we modelled the house types

We built detailed models from these housing types. All relevant building details such as insulation R values and types of fixed appliances were chosen based on the typical baseline data for that type, adjusted so that modelled energy performance was similar to the baseline average for each type.

We used a standard house floorplan for all models, with floor areas modified to match the baseline average for each type. Typical age is based on median age from the data.

1

Brick veneer walls / Timber enclosed floors

414,000 homes (21% of in-scope homes)

Scorecard rating (ex PV) 3.5 /10

NatHERS rating (converted) 2.1 /10

Hot weather rating 2.4 /5

Cold weather rating 1.8 /5

Air leakage: Leaky

The most common housing type, typically built in the 1980s of brick veneer construction which consists of an external brick facade and an internal plasterboard-lined timber frame. The timber floors enclose a ventilated subfloor space. The average floor area is 145m². Ratings for this housing type closely match the overall state average.

Priority upgrades: likely to include draught sealing, upgrades to ceiling and wall insulation, improvements to external window shading and internal window coverings, and upgrades to heating, cooling and hot water.

2

Brick veneer walls / Concrete slab floors

388,000 homes (17% of in-scope homes)

Scorecard star rating (ex PV) 3.3 /10

NatHERS rating (converted) 2.8 /10

Hot weather rating 3 /5

Cold weather rating 2.3 /5

Air leakage: Somewhat leaky

Likely to be typical of suburban construction in the 1990s, this housing type has brick facade over a timber or steel frame. The concrete slab floor provides thermal mass and reduce air leakage. The average floor area is 157m². This housing type rated higher than the state average for thermal performance, but lower for overall energy rating.

Priority upgrades: likely to include upgrades to ceiling and wall insulation and upgrades to heating, cooling and hot water. Improvements to window coverings are also likely to be valuable.

3

Double brick walls / Timber enclosed floors: Detached

196,000 homes (10% of in-scope homes)

Scorecard star rating (ex PV) 3.4 /10

NatHERS rating (converted) 2.2 /10

Hot weather rating 2.5 /5

Cold weather rating 2 /5

Air leakage: Very leaky

A typical house of this type was built between 1960 - 1980, with an average floor area of 152m². Double brick walls, possibly rendered, provide reasonable insulation, and timber floors enclose a ventilated subfloor area.

Priority upgrades: likely to be upgrades to ceiling insulation, heating, cooling and hot water. Window covering improvements are also likely to be valuable.

4

Timber framed walls / Timber enclosed floors

171,000 homes (10% of in-scope homes)

Scorecard star rating (ex PV) 3.6 /10

NatHERS rating (converted) 1.5 /10

Hot weather rating 2.3 /5

Cold weather rating 1.5 /5

Air leakage: Leaky

This timber-framed housing type is typically built in the 1980s, with weatherboard or fibre cement external cladding and a timber floor, likely on piers or stumps, with an enclosed subfloor cavity area. It has an average floor area of 137m². This housing type has low thermal mass, and lower thermal comfort ratings than the average NSW home.

Priority upgrades: likely to be upgrades to ceiling and wall insulation, heating, cooling and hot water, with window covering improvements likely to be valuable.

5

Timber framed walls / Timber open or elevated floors

210,000 homes (9% of in-scope homes)

Scorecard star rating (ex PV) 3.9 /10

NatHERS rating (converted) 1.2 /10

Hot weather rating 2.3 /5

Cold weather rating 1.2 /5

Air leakage: Leaky

This housing type is common in coastal or rural NSW, typically built in the 1990s. Timber floors are raised off the ground and are not enclosed. The timber frame is likely clad with weatherboard or fibre cement. The average floor area is only 125m². This housing type has low thermal comfort ratings, but the small floor area increases the star rating.

Priority upgrades: include insulation, and given the small footprint, improving hot water efficiency with a heat pump and water efficient showerhead.

6

Double brick walls / Timber enclosed floors: Semi-detached

63,000 homes (5% of in-scope homes)

Scorecard star rating (ex PV) 4.4 /10

NatHERS rating (converted) 2.8 /10

Hot weather rating 2.7 /5

Cold weather rating 2.3

Air leakage: Very leaky

The most common semi-detached housing type, typically built in the period between 1920-1940. The average footprint is smaller than detached homes at 109m². Double brick walls provide thermal mass, and timber enclosed floors suggest raised foundations with ventilated subfloors. This archetype has better than average energy and thermal ratings but is likely to be draughty.

Priority upgrades: include draught sealing, insulation upgrades and efficient appliances, particularly hot water.

Applying the research in your work

This guide gives a high level overview

This guide is for readers who want to understand the key findings of the Baseline study at a glance. We want you to benefit from this important information, no matter how busy you are.

There's more detail and data that you can use

There is an abundance of rich data and analysis behind this summary report which we encourage you to explore. See the next page for details on how to access the full report and supplementary data.

You can extend or expand this research

We invite you to make use of this research and build on it. The technical report outlines a number of substantive further analysis that can be done to extend the current work. Future research can use the baseline data to track changes in the NSW housing stock over time.

Driving behaviour change

Draw on the many valuable insights from householders about their experiences, priorities, challenges and willingness to consider different upgrade measures.

Encouraging upgrades

Understand the current energy performance of existing homes and the scope for improvement across different housing types and regions.

Developing new research

This comprehensive baseline information fills a gap in our understanding about existing homes. Use it to build knowledge and identify new research questions.

Identifying risks and policy challenges

Use the findings to design targeted, evidence-based policies and programs that advance government priorities and deliver benefits to the NSW population.

Understanding regional differences

Explore the baseline data and what it tells us about regional differences to identify the unique challenges and opportunities for your city, town or region.

Identifying market opportunities

Know the market for upgrades across different housing types and regions. Identify new business offerings or tailor current services to suit market needs.

Accessing the research outputs

This document was developed from the NSW Residential Energy Performance Baseline Project report, prepared by the University of Wollongong for the NSW Department of Climate Change, Energy, the Environment and Water (2024).

To access the research outputs, please contact:

sustainability@environment.nsw.gov.au

Further resources

NSW Climate and Energy Action website

The NSW Climate and Energy Action website provides easy-to-access information and opportunities to support households, businesses, or communities to make sustainable choices.

https://www.energy.nsw.gov.au/

Home energy ratings disclosure

Australian governments are working together to deliver energy ratings for existing homes, under the Nationwide House Energy Rating Scheme (NatHERS). This website provides information about this new scheme and how householders can benefit from home energy ratings.

https://www.nathers.gov.au/existinghomes/Disclosure

CSIRO Australian Housing Data

Multiple interactive dashboards summarising data from all NatHERS certificates generated for new dwellings across Australia since May 2016. Includes information on building energy ratings, design, construction, and appliances.

https://ahd.csiro.au/

Your Home

An independent guide to help Australians create homes that are more sustainable and cheaper to run, written by over 50 experts in design, construction and technology. It covers every aspect of building, renovating and updating, based on current technology.

https://www.yourhome.gov.au/

NSW GOVERNMENT