common capital

Title: Review of the ACT Energy Efficiency Rating Disclosure Scheme

Client:ACT Environment, Planning and Sustainable Development Directorate, Building Reform

FINAL REPORT

Title:	Review of the ACT Energy Efficiency Rating Disclosure Scheme
Client:	ACT Environment, Planning and Sustainable Development Directorate, Building Reform
Date:	24 March 2023
Principal supplier:	Common Capital Pty Ltd ABN 69 164 899 530

Executive Summary

This report covers the findings of the first major evaluation of the ACT Energy Efficiency Rating Disclosure Scheme, since its implementation in 1999. The scheme mandates that homes must disclose an energy efficiency rating (EER) that represents the efficiency of the building fabric at the point of sale and at the point of lease if a previous rating exists. The Environment, Planning and Sustainable Development (EPSDD) Building Reform team commissioned Common Capital to conduct an outcome and process evaluation and consider options and opportunities for the scheme moving forward in the context of the ACT Government's current climate and energy policies and the national Trajectory for Low Energy Buildings.

On balance the scheme has performed well. Over 25 years, ACT households, the property sector and energy efficiency suppliers have developed a high level of awareness and understanding of ratings and energy efficiency upgrade opportunities. It appears that the scheme has helped encourage a moderate improvement of 0.4 stars (from 2.5 to 2.9) in the average rating of houses that have been sold multiple times under the scheme. Homes with higher ratings were observed to sell for slightly more than otherwise equivalent homes, based on a statistical analysis of historical sales data. There is a high level of EER disclosure compliance with around 98% of homes for sale (varying by agent and postcode). However, disclosure compliance is considerably lower (around 33%) for rental properties, with significant variation across real estate agencies.

There are several areas that could be improved to align scheme operations with disclosure scheme best practices that have evolved since the scheme was introduced. These include:

- Increasing resourcing to strengthen auditing and compliance, in particular for rental disclosure and through increased onsite assessment audits.
- Independent publishing of ratings and rating information held by government similar to the Commercial Building Disclosure public register [1].

The current assessment tool is outdated but still usable. FirstRate4, the current legislated tool is no longer supported by NatHERS for accreditation and training and requires workarounds to run on current computer operating systems. However, the major existing ACT assessors are able to use existing training resources and virtual operating systems to successfully provide over 8,000 FirstRate4 assessments per year to vendors. Until a new tool is adopted, the ACT Government could make similar resources available to other assessors to remove barriers to entry and support ongoing disclosure compliance.

There is a strong case to expand the scheme to cover whole of home energy efficiency, and tools to replace FirstRate4 and enable this are likely to be available soon. The ACT Government policy context has changed. The ACT's electricity supply is now offset by 100% renewable energy; hence the focus has shifted to electrification of gas appliances to continue driving emissions reduction. The ACT Government and households have invested significantly in complementary policies and energy efficiency upgrades beyond building fabric, including solar and space and water heating. Under the current framework the options for households to improve their rating are limited to building fabric upgrades. Ideally, the scheme can adopt a whole of home tool that includes and rewards appliance upgrades that have and continue to be

delivered in the ACT. As part of the Trajectory there are new tools coming onto the market under a new NatHERS In Home framework. Existing tools that may be part of this framework have been designed for a voluntary scheme. They will require operational modifications to align with the operational requirements of a mandatory scheme.

EPSDD should actively work on a transition plan to expand the scheme to whole of home. In the short-term, the scheme should continue with FirstRate4 and only change once, when NatHERS accredited tool(s) are available for use in existing homes. This will avoid any market confusion and additional significant costs to assessors of multiple tool changes. Necessary legislative amendments will need to be made, while ensuring that features that have been key to the scheme's success are maintained. For example, the following actions should be considered in the transition plan:

- Change the assessment tools and the definition of the rating within the legislation, while maintaining the linkages of the EER with the contract for sale that have helped to drive high levels of disclosure compliance.
- Define clear funding, roles and responsibilities, and service level agreements with the organisation(s) responsible for audit and compliance of both disclosure and energy assessments.
- Fund the development and implementation of a major market and consumer education campaign to explain the new rating system to avoid breaking existing market engagement, literacy and trust built up over more than 130,000 disclosure communications over the past 25 years.
- Conduct detailed focus group and user experience (UX) design of rating certificates (regardless of which tool is chosen) with households, agents, and installers to make sure that the form of the rating and advice on how to improve the rating are compelling, understandable, and actionable.

The ACT has a critical role in the ongoing development of the National Framework for disclosure. They have the only mandatory disclosure scheme in the country, and they are likely the largest driver of uptake of the eventual NatHERS In Home scheme. Under that role, the EPSDD Building Reform team should actively engage with NatHERS to ensure that the tool, assessor training, accreditation and auditing frameworks of the NatHERS In Home scheme are suitable for the ACT.

Summary of opportunities

Retain mandatory disclosure in the ACT (section 3.1)

There was near unequivocal support amongst interviewees for retaining mandatory disclosure. Overall, the scheme represents a success story. There are some issues with the long-term use of FirstRate4 which, in time, can be resolved through the adoption of a new whole of home tool. There are also several areas that could be improved to align the scheme with disclosure best practices.

The ACT has committed to disclosure under the Trajectory for Low Energy Buildings. Retaining the current scheme which has broad market engagement and support and transitioning to a new framework when it is finalised will be much simpler than removing and then reintroducing disclosure.

Refocus the original scheme objectives by refining the language (section 1.1)

The original scheme objectives are still relevant in the current ACT and national policy contexts. However, the language can be refined to better focus these as ultimate outcomes and ensure they directly align with ACT goals to drive electrification, aligning with the Climate Change Strategy, Powering Canberra plan, and the ACT Wellbeing Framework.

The proposed refined ultimate outcomes are as follows:

- Decrease emissions from residential energy use in the ACT.
- Decrease residential energy costs (public and private).
- Improved health outcomes in the ACT through improved indoor air quality, improved thermal performance and improved access to space heating/cooling.

Develop a scheme data monitoring and collection plan and evaluation framework (section 1.2)

The EPSDD Building Reform team should identify key indicators to track (based on the program logic in section 1.1) and identify potential data sources and collection processes (including who is responsible for collection and maintenance of records). Continuous data collection and monitoring allows for timely identification and resolution of issues as they arise. A formal evaluation framework should also be developed that includes process, interim and outcome evaluations with targeted key evaluation questions that support compliance and continuous scheme improvement.

Independently publish ratings in a centralised database and attach EERs to the building file (section 1.3)

Best practice disclosure is complete and public disclosure. Publishing ratings that are lodged by assessors with Access Canberra, and making these available in a centralised public database would provide a helpful data source for scheme monitoring and evaluation. It could also help to improve compliance in the rental market and connect more renters with energy efficiency information about their home. Attaching EERs to the building file will also help to strengthen

compliance and will allow for the tracking of individual properties' improvement in rating over time.

Increase resourcing and strengthen auditing and compliance in line with best practices (section 2.1)

Best practice processes for auditing and compliance of mandatory disclosure schemes have evolved since the ACT scheme was first introduced. Standard best practices (e.g., NABERS audits for the Commercial Building Disclosure scheme) include two levels:

- Level 1 audit – applies to 100% of ratings – checking correct processes have been used and ensuring no data entry errors. For the ACT scheme this could involve checking assessors have used the legislated assessment tool and that the disclosed rating (in property advertising) matches the lodged EER report.
- Level 2 audit – applies to 5% of ratings – a panel of external auditors conduct a second onsite assessment for 5% of ratings. These ratings are selected randomly with some chosen based on identified or suspected risk.

Increased resourcing would likely be required for Access Canberra to align with best practices and ensure two level audits can continue to occur moving forward.

Continue with FirstRate4 in the short-term to avoid multiple disruptive changes (section 3.2)

FirstRate4 is still being used to successfully deliver energy assessments to most ACT homes. The software is no longer supported by NatHERS for accreditation and training and requires workarounds to run on current computer operating systems. However, the major existing ACT assessors can use existing training resources and virtual operating systems to successfully provide over 8,000 FirstRate 4 assessments per year to vendors. A new tool will need to be adopted eventually so that the scope can be expanded to consider fuel type and include whole of home and the scheme can help to drive electrification. However, all interviewees stated that the scheme should only change once. They agreed that multiple changes - e.g., adopting another tool in the short-term and transitioning to NatHERS In Home when it is finalised - would be too disruptive for the market and cause unnecessary confusion. The ACT Government could make existing FirstRate4 training resources and virtual operating systems available in the short-term to remove barriers to entry for new assessors and support ongoing compliance until a new tool can be adopted that is fit-for-purpose for rating existing homes in a mandatory scheme.

Align with NatHERS In Home scheme when accredited tools are ready for use in existing homes to better support refined scheme objectives (section 3.3)

Current whole of home rating tools are either not designed for use in existing homes or are not designed for a mandatory disclosure scheme. They consider fuel type and include appliances and solar PV, which would enable the ACT to drive electrification through the scheme, but they would need to be refined to ensure that the cost of delivery is reduced in line with current EER delivery costs. Assessors in the ACT complete the EER alongside the pest, building and compliance assessments. Using FirstRate4 they are able to complete three onsite assessments per day. They suggested that if they were using the currently available whole of

home tools, then they would only be able to complete one assessment per day, potentially tripling their cost of delivery.

The NatHERS In Home scheme is currently under development as part of the Draft National Framework for Disclosure of Residential Energy Efficiency Information. The scheme is being designed for jurisdictions to adopt for voluntary residential energy efficiency disclosure. The ACT Government should actively engage with NatHERS and the Residential Energy Efficiency Disclosure Initiative (REEDI) to ensure the eventual tool, assessor training, accreditation and auditing frameworks of the NatHERS In Home scheme are suitable for the ACT. As the only jurisdiction with a mandatory disclosure scheme, the ACT is likely to be the largest user of NatHERS In Home. As such, they should have a critical role in the ongoing development of the scheme and the National Framework.

Conduct detailed focus group and UX design with households, agents and installers on the form of the rating certificate (section 3.3)

Real estate agents reported that consumers find the current EER reports easy to understand. They also provide specific and actionable information that have not only increased market literacy of energy efficiency in the ACT but have also led to buyers upgrading their homes post purchase. It is critical that a similar form of rating certificate is provided when the scheme aligns with NatHERS In Home. EPSDD can engage with accredited NatHERS In Home tool providers to design a certificate which provides information similar to current EER reports, that is both easy to understand and actionable. UX design and focus group testing of certificates will ensure that the information provided to consumers will drive change and lead to maximum scheme impact on ACT policy goals.

Fund a major market and consumer education campaign to avoid breaking existing market engagement, literacy and trust (section 3.3)

One of the biggest successes of the scheme to date is the level of market engagement, literacy and trust that has been built amongst consumers and real estate agents in the ACT. This is one of the most difficult parts to build in a disclosure scheme and the ACT scheme has succeeded. There is a high level of understanding amongst both consumers and real estate agents as to what the ratings represent. They are able to distinguish between good, average and bad ratings and they have a reasonable understanding of the types of things that can be done to improve performance. Expanding the scope of ratings to include whole of home and possibly changing the form of the rating (e.g., from 0-6 stars to 0-10 stars or to a score out of 100) is likely to cause confusion in the market and risk breaking the high level of engagement and trust that has been built over the past 25 years. A major market and consumer education campaign will be required both prior to adopting a new tool and post adoption to ensure that consumer and real estate agent engagement and understanding are maintained. Further, that the scheme is able to deliver even greater emissions, energy and health outcomes for the ACT moving forward.

Table of contents

Background

The ACT has the world's longest running disclosure scheme

The ACT Energy Efficiency Rating Disclosure Scheme (the Scheme) aims to provide more transparent and easily digestible information on energy efficiency. In doing so, it supports consumers in the ACT to make more informed choices around improving the energy efficiency of their homes. The Scheme requires the seller of a dwelling to disclose the home's energy efficiency rating (EER) at the point of sale. For rental properties, a home's energy efficiency rating is only required to be disclosed when leasing if the property has an existing rating. An EER is a rating from 0 to 6 stars and should be disclosed in the advertising when a property is sold or leased. Approved assessors may only use approved software to generate the EER. Eligible software includes specific versions of AccuRate, BERS Professional and FirstRate. The exact software versions are shown in Figure 1 below.

Column 1 Licence	Column 2 Occupation Class	Column 3 Software Application	Column 4 Version
Building Assessor	Class A	a) AccuRate	Version 1.1.4.1 or Version 2.0.2.13
		b) BERS Professional	Version 4.2
		c) FirstRate 5	Version 5.1
		d) FirstRate 4	Version 4.05 or Version 4.06
Building Assessor	Class B	a) AccuRate	Version 1.1.4.1 or Version 2.0.2.13
		b) BERS Professional	Version 4.2
		c) FirstRate 5	Version 5.1

Figure 1: Approved software as detailed in the Construction Occupations (Licensing) (Building Assessor Licences Software Endorsements) Determination 2012

The software used to assess a dwelling's energy efficiency and generate a rating was developed under the Nationwide House Energy Rating Scheme (NatHERS) [1]. However, the Scheme uses a much earlier version of the software than the current NatHERS software. It has not been updated since 2009. The software only considers the building fabric of a home i.e., building materials and insulation. It does not account for solar panels, air leaks and home appliances such as lighting, hot water heating and heating, ventilation, and air conditioning (HVAC) systems [1] and therefore does not provide a comprehensive picture of a dwelling's ultimate energy efficiency.

The Scheme is established through multiple pieces of legislation. Relevant scheme legislation is outlined in Table 1 below.

Table 1: ACT Energy Efficiency Disclosure Scheme relevant legislation

Legislation	Description
Civil Law (Sale of Residential Property) Act 2003	This Act governs the sale of residential property in the ACT, including the mandate that an energy efficiency rating must be declared when residential homes are advertised or offered for sale in the ACT.
Residential Tenancies Act 1997	This Act governs residential tenancies and occupancy agreements in the ACT, including the mandate that an energy efficiency rating must be declared when leasing or advertising a residential property for lease (where the property already has an energy efficiency rating that is not false or misleading).
Construction Occupations (Licensing) Building Energy Efficiency Assessment Sale and Lease of Residential Premises Code of Practice 2020	This code of practice provides the types of EER statements allowed for the purposes of disclosure as required in the Civil Law Act and the Residential Tenancies Act 1997.
Construction Occupations (Licensing) Act 2004	This Act regulates individuals or corporations in construction occupations in the ACT, including building assessors who carry out the EER.
Construction Occupations (Licensing) Regulation 2004	This regulation prescribes when an entity or individual is eligible to be a licensed construction worker in the ACT, including building assessors who carry out the EER.

The ACT residential energy efficiency market and policy context have changed

In the time since the Scheme was established in 1999, the ACT Government, energy market, technologies and broader social and climate policies have changed significantly. The ACT's energy grid used to be carbon intensive, hence energy efficiency upgrades resulted in both energy savings and emissions savings. More recently, the ACT has achieved 100% renewable energy supply and has committed to achieving net zero emissions by 2045. As such, the ACT's climate policy goals have shifted from small incremental reductions in emissions growth, towards total decarbonisation. More ambitious climate goals and technology innovation mean

the greater priority has shifted to transitioning away from fossil fuels to reduce emissions and decreasing and smoothing electricity demand to provide grid reliability.

This transition to a zero-carbon energy system is resulting in new energy market challenges and technological opportunities which alter the value of various energy saving activities. Subsequently, policy challenges and opportunities have also evolved, and the same energy efficiency activities conducted in the early 2000s may no longer be relevant. For example, in the early 2000s, focus was placed on replacing inefficient electrical appliances with gas appliances (a lower emission fuel compared with coal-generated electricity). Since the ACT's grid is now fully decarbonised, important activities now include electrifying appliances, installing onsite generation and storage technology, purchasing Electric Vehicles (EV), and incorporating demand response activities.

The Scheme has never undergone a formal review

The Scheme, which started in 1999, has undergone some changes. However, it has never been reviewed against its key objectives in what is sometimes referred to as a "first principles review" – wherein policymakers consider whether the current objectives are still relevant and whether the Scheme continues to be the appropriate tool to deliver these objectives. This is the first comprehensive scheme review. Scheme objectives have been considered holistically to ensure they are fit-for-purpose in the Scheme's broader strategic context, including:

- The full suite of ACT Government policies and strategies. This includes the ACT Wellbeing Framework and the ACT Climate Change Strategy 2019-2025, as well as key programs such as Powering Canberra: Our Pathway to Electrification, the Energy Efficiency Improvement Scheme (EEIS), the Home Energy Support Program (HESP), the Sustainability Household Scheme (SHS) and the Next Gen Energy Storage Program.
- The ACT residential energy efficiency market and policy context which has changed substantially since the Scheme's inception in 1999.
- National commitments under the Trajectory for Low Energy Buildings and the National Framework for the Disclosure of Residential Energy Efficiency Information.

Whilst there has been no substantial review of the Scheme to assess how it is performing against its objectives, it is still the only operational mandatory residential energy efficiency disclosure scheme in the country. Other jurisdictions have begun consultation on implementing voluntary or mandatory schemes, but none of these have eventuated yet. Now is an optimal time to conduct a review of the ACT scheme, given the increasing activity at the national level to facilitate disclosure across the jurisdictions. Findings from this review can and should help inform the national proceedings.

Our approach to this review

Table 2 below provides a summary of where you can find the answers to each of the RFQ elements in this report.

Table 2: Where to find your RFQ questions in this report

RFQ element	Relevant report section
Review the scheme objectives	Section 1.1 -
Review the effectiveness of the scheme considering the regulatory framework and other technical and administrative frameworks	Section 1.3 -
Assess whether the scheme is delivering on intended outcomes	Section 1.2
Interactions between the scheme and the requirements of the National Construction Code (NCC)	Section 1.3
Undertake a comparative analysis of other schemes	Section 2
Provide detailed advice to inform how the scheme could be improved	Summary of opportunities (Executive summary) Section 3

There were three key components to this Scheme review:

1. An evaluation of the scheme's effectiveness (process evaluation) – section 1.3 of this report.
2. An evaluation of the scheme's performance against its ultimate objectives (outcome evaluation) – section 1.2 of this report.
3. A comparative analysis of other existing or emerging schemes or assessment tools to inform options for Scheme reform – section 2 of this report.

Our approach to parts 1 and 2 consisted of both qualitative and quantitative research and analysis. We conducted 12 semi-structured interviews with a cross-section of Scheme stakeholders, including: assessors, real estate agents, community-based organisations, solicitors, assessment tool developers, Access Canberra, and other relevant ACT and national government representatives. These interviews informed our process evaluation and guided our approach to the outcome evaluation. They covered topics such as:

- Audits and assessor compliance

- Assessor training and certification
- Disclosure compliance
- Market literacy and engagement
- Consumer awareness and value
- Assessment tool ease of use
- Cost of delivery
- Scope and format of an EER

In addition to this qualitative research and analysis, we also performed a quantitative analysis to assess the overall performance of the Scheme against its intermediate and ultimate outcomes. The scheme reporting systems were unable to generate sufficiently granular operational data within the timeframe for this project. However, we were able to extract reasonably comprehensive historical sales data from the All Homes website that included 131,000 sales records between 2000-2022 in the ACT. We found that, on average, this data captured 90% of total annual house and unit transfers reported in ABS data [2]. Based on that data we were able to perform a regression analysis to determine the correlation (if any) between sale price and EER. We were also able to determine the average change in rating for homes and units over the past 22 years and calculate the change in rating that is likely attributable to the mandatory disclosure scheme (i.e., excluding the contribution of National Construction Code (NCC) minimum standards). Based on this average change in rating, we were able to estimate the annual emissions, energy and cost savings that the scheme is delivering per average household.

For part 2, we performed a desktop review and a qualitative and quantitative assessment of the following assessment tools:

- FirstRate 4
- FirstRate 5
- Scorecard
- NatHERS “In Home”

We compared these existing tools to ascertain whether they are viable options for the ACT scheme to adopt imminently. We provided an overview of each tool and a description of the scope, the metrics, and rating scale used. We then assessed the tool’s compatibility with the ACT Scheme based on a variation of Common Capital’s 4Es policy options assessment framework (effectiveness, efficiency, equity, and ease of implementation). We then quantitatively compared these existing tools to assess the potential cost savings that could be delivered by improvements in ratings under all three schemes.

Limitations

The scheme reporting systems were unable to generate sufficiently granular operational data within the timeframe for this project. Hence, we used All Homes historical sales data and extrapolated based on ABS transfer data. This data appeared to be quite comprehensive for house (class 1) sales, but considerably less comprehensive for apartments. This may have been the result of discrepancies in how properties were categorised in the All Homes records.

For example, there was a category labelled “investment property” and these properties were not further categorised to house, townhouse or apartment. This category was excluded from the analysis to avoid any misclassification.

As a result of not being able to access scheme reporting data, the evaluation was based on disclosed ratings only. We were unable to obtain the data from audited, assessor reported ratings to compare these against. We conducted simple data cleaning on the All Homes dataset to remove any obvious outliers due to data entry errors (e.g., obviously incorrect pricing, property size etc.). However, based on our analysis of the results there appeared to be some unexpected EER patterns for a small percentage of total properties. The cause of these unexpected patterns is unknown, but several possibilities are outlined in section 1.2.

common capital

SECTION 1

Review of the existing Scheme

This section includes a review of scheme objectives, an outcome evaluation and a review of scheme effectiveness.

1.1 Review of Scheme objectives

Scheme objectives are not formally documented but can be inferred from parliamentary records

Limited formal design documentation exists for the ACT Energy Efficiency Disclosure Scheme, as it grew out of a Bill proposed by the cross-bench in the ACT Legislative Assembly. The Scheme was established through multiple pieces of legislation, but this legislation does not outline clear scheme objectives.

We identified three recurrent themes at a strategic objective level from a review of the Hansard [4] from when the scheme was first introduced and debated, illustrated by the below examples.

- *"…practical measures to help businesses and households reduce greenhouse gas emissions."* - **Emissions reduction**
- *"Canberra's housing stock is ill equipped for our climate."* – **Housing resilience**
- *"…adoption of this new rating scheme may result in savings of 30 to 50 per cent, or $400 to $600 per year in house energy costs."* - **Energy cost savings**

These are the three ultimate outcomes against which the scheme has been reviewed in the remainder of Section 1.

Strategic objectives can be refined to ensure continued alignment with ACT policy goals

Energy efficiency disclosure is well aligned with ACT policy goals

The ACT has committed to achieving net zero emissions by 2045 [1]. The ACT Climate Change Strategy 2019-25 provides the pathway and necessary actions to achieve ACT's interim target of reducing 1990 levels of emissions by 50-60% - and ultimately, to achieve net zero emissions. Under this strategy, there are nine goals with 22 actions for energy, buildings and urban development which are focused on ensuring a sustainable built environment that reduces emissions and ensures the comfort of its occupants [1]. Energy efficiency disclosure is well aligned with the overarching climate goals of the ACT

Since the ACT electricity supply is now offset by 100% renewable electricity, the focus has shifted towards transitioning the jurisdiction away from fossil fuel gas (which accounts for more than 20% of the ACT's total emissions) [4]. **Powering Canberra: Our Pathway to Electrification** provides the steps required to electrify the ACT and ensure that the transition is done in a responsible and sustainable way so as to minimise negative impacts on ACT residents and businesses. A well-designed energy efficiency disclosure scheme could help to drive electrification. Ensuring this is possible moving forward, will be a critical consideration throughout this review.

Whilst achieving the ACT's climate goals is a priority, the government has also established the **ACT Wellbeing Framework** to ensure achieving these goals does not come at the expense of ACT residents' wellbeing. The ACT Wellbeing Framework was conceived to provide a more holistic view to measuring the ACT's overall progress, noting that economic measurements often do not incorporate social inputs which can be difficult to quantify. There are several key domains of wellbeing included in the Framework and associated wellbeing indicators that are relevant to disclosure:

- **Housing and home** – Housing affordability and availability, rental stress, housing suitability.
- **Environment and community** – Climate resilient environment and community.

In particular, the housing indicators must be considered for this project when we explore different options for reform. We must ensure that we are not creating perverse outcomes. For example, inadvertently increasing existing inequities by pricing low-income households out of efficient homes or inadvertently increasing rental prices and rental stress.

The ACT is well placed to avoid these perverse outcomes as the government has invested in several other residential energy efficiency polices that complement the mandatory disclosure scheme. Some of which prioritise low-income or other priority groups, e.g., the Energy Efficiency Improvement Scheme which has a low-income household sub-target and the Sustainable Household Scheme which offers no or low interest loans for energy efficiency upgrades.

There is growing momentum for energy efficiency disclosure nationally

All jurisdictions, including the ACT, signed onto the Trajectory for Low Energy Buildings in 2019. The Trajectory is a national plan that sets the pathway towards zero energy (and carbon) ready buildings for Australia. Disclosure of the energy performance of residential buildings is a key policy under the Trajectory, with an expectation that jurisdictions will implement disclosure schemes by the end of 2025. While the ACT has had a mandatory energy efficiency disclosure scheme in place for over 20 years, there has been very little activity in other jurisdictions to date. However, momentum for national energy efficiency disclosure has grown considerably over the past year. The Draft National Framework for Disclosure of Residential Energy Efficiency Information was released in December 2021 as a collaborative project of the Commonwealth, state and territory governments. A working group – the Residential Energy Efficiency Disclosure Initiative (REEDI) - has been established as part of this project to further develop and finalise the framework.

The REEDI is working closely with NatHERS to develop the NatHERS In Home scheme which will accredit whole of home rating tools for use in existing buildings. The Residential Energy Scorecard, developed as a voluntary assessment tool and administered by the Victorian Government, has been endorsed by NatHERS and is likely to become the first accredited "In Home" assessment tool (anticipated by the end of 2023). It is likely that in time, jurisdictions will adopt the NatHERS scheme for their respective disclosure schemes. At present NatHERS In Home is being developed as a voluntary disclosure scheme. Implications of this for the ACT's mandatory disclosure context are discussed in detail throughout this review.

Refined ultimate outcomes have been proposed for the Scheme moving forward

This evaluation has been performed against the three strategic policy outcomes identified from the parliamentary record: emissions reduction, energy cost savings and housing resilience.

However, moving forward, we believe these outcomes should be refined slightly to better align them with the current and future ACT policy goals. We suggest the following changes – summarised in Table 3 below.

Table 3: Refined ultimate Scheme outcomes

Outcome	Explanation
Decrease emissions from residential energy use in the ACT	• Prioritises electrification (since the ACT electricity supply is offset by 100% renewable energy, converting from gas to electric space heating, water heating and cooking appliances will have the largest emissions benefit).

Outcome	Explanation
Decreases residential energy costs (public and private)	• Private bill savings for households using less energy (gas or electricity). • Private bill savings for households that fully electrify (avoided gas connection fees). • Public savings from reduction in electricity use (reduces the cost to government of maintaining 100% renewable supply). • Avoided network costs (reductions in electricity use through efficiency gains can offset rising electricity demand).
Improved health outcomes in the ACT through: • **Improved indoor air quality** • **Improved thermal performance** • **Improved access to space heating/cooling**	• Improved respiratory health outcomes e.g., asthma, through electrification of indoor gas appliances. • Improved cardiovascular, respiratory and other chronic health outcomes through reduced exposure to extreme heat and cold. This is achieved through improving a home's thermal shell or from providing better access to space heating/cooling (e.g., a home that installs solar PV or high efficiency appliances can save money on their energy bill which may enable them to use more heating or cooling when needed, while still being able to afford their bill).

This evaluation focused on the original three outcomes of emissions reduction, energy cost savings and improved housing resilience. The comparative analysis (section 2) and options analysis (section 3) was performed against these refined ultimate outcomes to ensure that any future changes to the Scheme will drive progress towards ACT policy goals.

Key takeaways

- The original scheme objectives are still relevant in the current ACT and national policy contexts.
- The language has been refined to better focus these as ultimate outcomes and ensure they directly align with ACT goals to drive electrification:
    - Decrease emissions from residential energy use in the ACT
    - Decrease residential energy costs (public and private)
    - Improved health outcomes in the ACT through:
        - Improved indoor air quality
        - Improved thermal performance
        - Improved access to space heating/cooling

Program logic and theory of change

We have developed an integrated program logic and theory of change for the ACT Energy Efficiency Disclosure Scheme (see Figure 2) that illustrates how the design and operation of the scheme allows it to deliver the ultimate outcomes above. The program logic breaks down the program into multiple strategic levels, from low-level policy outputs to immediate, intermediate and ultimate outcomes. The integrated approach considers both the "what" and the "why" behind the scheme and helps to highlight any explicit or implicit assumptions behind how the scheme is expected to operate. The program logic levels are defined as follows:

- **Ultimate outcomes** – the measurable public benefits that the scheme needs to deliver to support the government's strategic policy objectives.
- **Intermediate outcomes** – the tangible, real-world changes that need to happen to directly achieve the ultimate outcomes.
- **Immediate outcomes** – the measurable changes to dominant behaviours, attitudes and norms within stakeholder or consumer groups/markets/supply chains that are needed to influence delivery of the intermediate outcomes.
- **Outputs and activities** – the things the program must directly do, manage or facilitate to produce the key outputs that will enable the short-term (immediate) outcomes to be achieved.

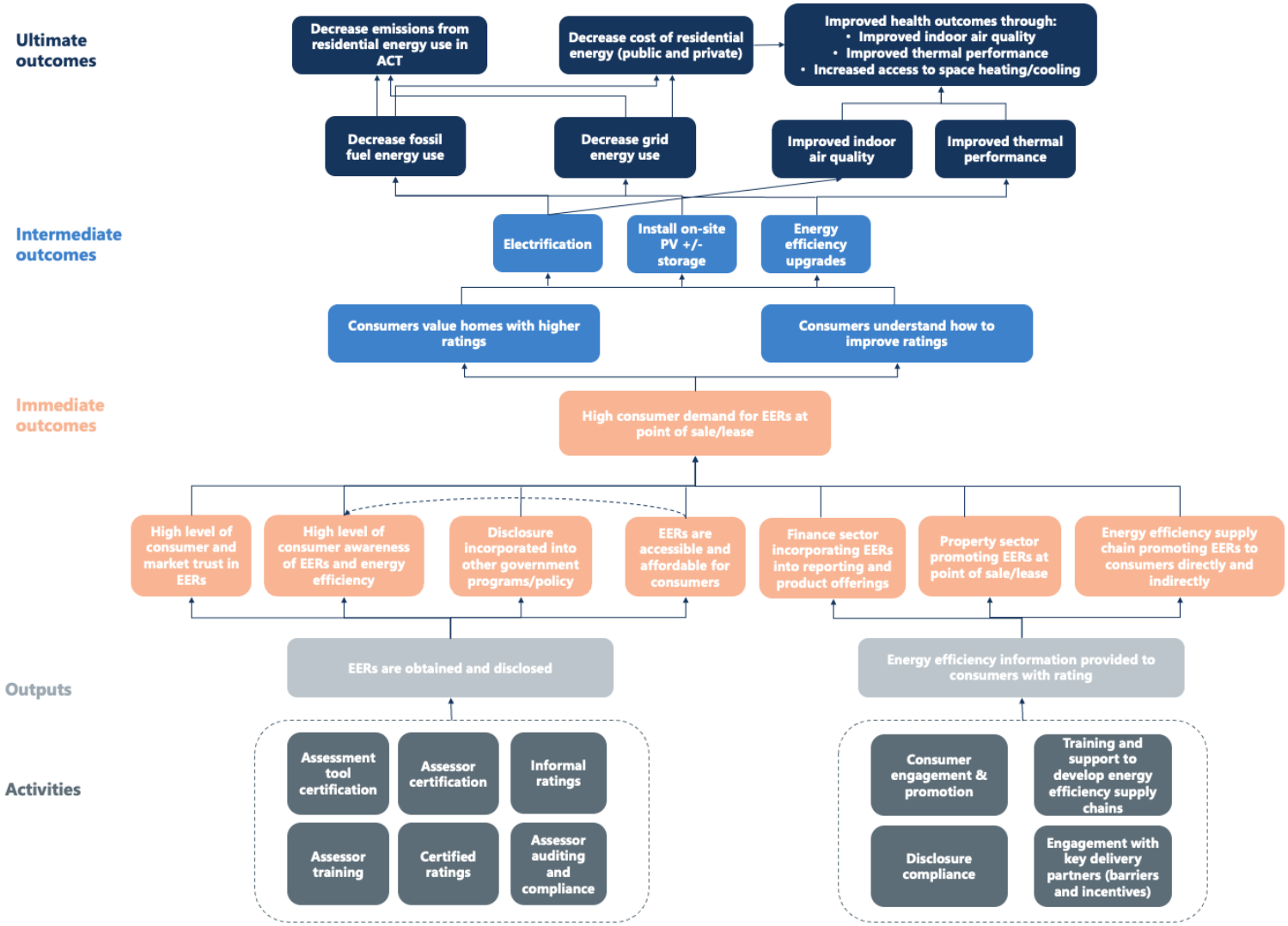


Figure 2: Program logic for the ACT Energy Efficiency Disclosure Scheme

The causal links within the program logic are evidenced based

There are three key causal links or assumptions implicit in the above program logic that need to hold true for the scheme to deliver the intended outcomes. There is sufficient evidence from the ACT scheme itself and a number of international residential disclosure schemes to suggest that these links are strong.

Assumption 1: That a high level of disclosure of EERs at the point of sale and lease will lead to high consumer demand for and value of high ratings.

- In the UK, hedonic regression modelling [5] found that there is a positive relationship between energy rating and dwelling price per square metre. The price difference increases as the Energy Performance Certificate (EPC) improves (from a 6% increase for EPC F and E ratings versus EPC G ratings, up to a 14% increase in A and B ratings). The modelling also found that the house price effect of EPC ratings is higher in regions where house price levels are lower and vice versa.
- An Australian study looked at the correlation between sale and lease prices and EER in the ACT [6]. The study analysed sale and lease transactions between 2011 and 2016 and applied a hedonic framework. The analysis found that both sale and rental properties with higher EERs attracted a price premium. For example, compared to a three-star dwelling, a zero-star rated dwelling attracted a 3.1% discount, while a six-star dwelling had a 2.4% premium.
- A study of the mandatory disclosure scheme in Austin, Texas wherein homes that are ten years or older must disclose an energy performance rating at the point of sale, found that homebuyers are willing to spend an additional $2,000-$5,000 USD to obtain an expected savings of $153 in annual energy bills [7].

Assumption 2: Consumers valuing high ratings will lead to consumers performing upgrades to increase their rating.

- There is evidence to suggest that the information provided with a rating will in and of itself be enough to compel people to upgrade their homes. For example, the mandatory disclosure scheme in Austin, Texas found there was a 31% increase in energy efficiency investments by home sellers and a 12% increase by home buyers - with even greater increases noted for the types of upgrades specifically noted on the Energy Conservation Audit and Disclosure (ECAD) audit report [7].
- Evidence from the German experience with energy disclosure has found that support from an energy assessment expert and complementary finance support are required alongside disclosure to significantly scale up the retrofit market. The German Development Bank (KfW) offers funding for energy efficiency retrofits in homes, with an additional partial debt relief element, whereby homes that achieve higher efficiency levels are relieved of a portion of the loan taken out to fund the work. The scheme has been operating since 2006 and as of 2020 it had supported the retrofitting of around 260,000 housing units [10].

Assumption 3: Upgrades that increase a household rating will result in emissions reduction, energy cost savings and improved health outcomes.

- The Victorian Healthy Homes Program [8] provided 1,000 energy efficiency upgrades to households with a health or social care need. The program randomised participants to pre-winter upgrades (intervention) and post-winter upgrades (control) and compared the results. The study found the following:
    - Intervention households were significantly warmer than control households over winter. The intervention group was 37% more likely to report reduced damp or musty smells and 48% more likely to report a reduction in condensation.
    - In regression, intervention was associated with significantly lower gas and electricity use. Intervention households were 37% more likely to report using their main heater “only when feeling cold” and 20% less likely to use their main heater “all the time.” On average, the intervention group saved $85 in energy bills over the 3-month winter period.
    - Total healthcare costs were lower for the intervention group than for the control group. In regression, the intervention was associated with $887 less in healthcare costs.

1.2 Assessment of Scheme against intended outcomes

Interviewees reported high consumer awareness and engagement in the scheme

The immediate outcomes are essentially the leading indicators of success for the scheme. They highlight things the scheme needs to achieve in the short-term to ensure energy efficiency upgrades and subsequent energy cost, emissions and health outcomes are delivered.

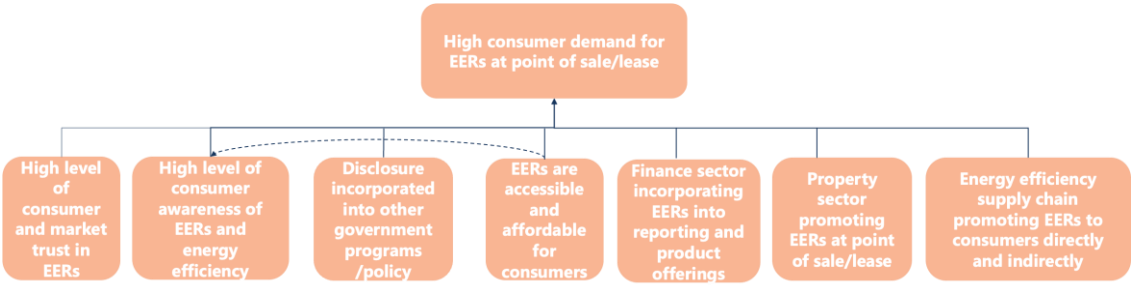


Figure 3: Immediate outcomes for the scheme, extracted from the program logic

Ideally, consumer surveys would be conducted on a semi-regular basis to assess the level of consumer awareness, trust, accessibility and affordability of the scheme in the market. Due to time and budget constraints that was not possible for this review. However, we were able to gauge an understanding of progress towards these outcomes through interviews with key market actors (real estate agents, assessors and solicitors). All interviewees reported that there

was a high level of awareness of the scheme and a decent understanding amongst consumers of the differences between good, medium and bad ratings.

One experienced agent suggested that the level of consumer awareness and interest in the scheme has increased over time. They suggested that energy efficiency and ratings were very front of mind for buyers these days. *"Back in the day they might ask what the EER is and that was it, but now there are more questions about it – what are the reasons for it and what are the improvements we could make."* They stated that generally ACT buyers were very well educated. However, they noted a demographic difference, in that it was mostly younger buyers asking questions about the EER and energy efficiency.

The level of accessibility and affordability of ratings seemed to be positive. Again, we have had to rely on the agent's perspective, but they suggested that the cost of the rating wasn't an issue. For houses and townhouses, the cost of the EER is bundled in with the pest, building and compliance reports, and this is covered by the eventual buyer. For units, the cost of the EER is around $395 and this cost is covered by the seller. Agents reported that no one *"baulks at it [the cost]".*

This differs in the rental market. Interviewees suggested that awareness of EERs and energy efficiency was much lower amongst renters. They reasoned that the market was so tight for renters that energy efficiency was never going to be a decision-making factor. Even in a higher vacancy market, there are other factors that dominate decision-making. There are also several issues with disclosure of ratings in the rental market that may explain the lack of renter engagement. These issues are discussed in detail in Section 1.3.

There are opportunities to drive greater outcomes through engaging more broadly with the finance sector and the energy efficiency supply chain. We have captured these opportunities in the program logic through the following three immediate outcomes:

- Finance sector incorporating EERs into reporting and product offerings.
- Property sector actively promoting EERs at point of sale/lease.
- Energy efficiency supply chain promoting EERs to consumers directly and indirectly.

These elements are key considerations of the Draft National Framework for Disclosure of Residential Energy Efficiency Information. There is significant work being undertaken at a national level to develop the broader market environment to support disclosure policy. These activities are more critical in a voluntary scheme, to drive demand amongst consumers. However, they can also be explored in a mandatory setting to increase the likelihood of energy efficiency upgrades occurring as a result of disclosed ratings.

Moving forward, EPSDD needs to be able to continue to track progress towards these immediate outcomes. A formal data monitoring and collection plan is required that includes periodic consumer surveys.

Evidence suggests consumers understand and value higher ratings

The intermediate outcomes we are attempting to drive through the scheme are outlined in Figure 4 below. The currently legislated assessment tool (FirstRate4) does not include

appliances or PV solar and storage, hence it is unable to drive electrification or the installation of solar and batteries. As such, only thermal shell upgrades can be attributed to the scheme at present.

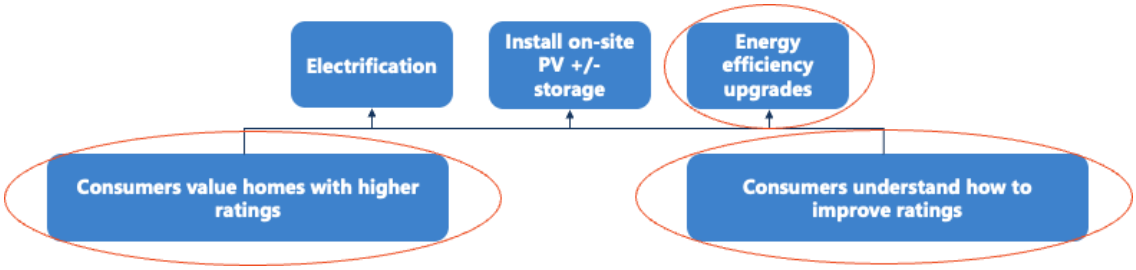


Figure 4: Intermediate outcomes extracted from the program logic - red circles outline the outcomes that can be delivered by the scheme with the currently legislated assessment software

There was some confusion from real estate agents interviewed for this review as to the scope of an EER. While they understood that things like insulation, window glazing and heavy drapes and pelmets would improve a home's rating, they would also mention things like solar and high efficiency heat pump appliances. It is likely that this confusion extends to the broader market, hence **it is possible that there is some spillover occurring whereby consumers are upgrading appliances and installing solar and batteries**, increasing the efficiency of their homes and contributing to energy and emissions savings, while not necessarily increasing their EER. This is by no means a bad thing and it is likely that the benefits of these types of upgrades will be captured under the scheme and rewarded, in future, once an updated assessment tool is adopted.

Regression analysis found a strong correlation between EER and property price

We performed a linear regression on properties that disclosed an EER on Allhomes.com.au to assess whether EER has an impact on price. We used the transaction price listed for properties. We filtered the data to include only houses that had sold more than once between 2000 and 2022 (excluding their first sales) to remove new builds from the analysis. New builds are likely to have other desirable attributes that are difficult to control for that impact the sales price. We followed the methodology used by Fuerst and Warren-Myers in their 2018 study [8]. The transaction price did not have a normal distribution, so we transformed it to the natural logarithm of the price. Similarly, the land area (including block size and/or building size) was transformed to the natural logarithm form. EER did not have a normal distribution, we treated it as a categorical variable with 7 categories ranging from 0 to 6, and EER=3 was used as the reference category. We adjusted the transaction price based on average 2022 house sale price. We included suburb fixed effects and yearly fixed effects.

The results show a strong correlation between EER and transaction price for both the entire study period 2000-2022 and for the same time period analysed by Fuerst and Warren-Myers (2011-2016) [8] (see Table 4 below). The goodness of fit is in line with expectations, with R_2 around 70%. For the 2000-2022 scenario we see that higher rated properties attract higher premiums, but the results are non-linear. Compared to 3-star ratings, 4-star, 5-star and 6-star ratings attract a 1.9%, 2.7% and 1.5% premium respectively. In contrast, compared to 3-star ratings, 2-star, 1-star and 0-star ratings attract a 2.3%, 5.2% and 6.4% discount respectively.

These results are similar for the 2011-2016 period in scenario 2 and reveal a similar pattern to the results presented in the previous study. All results were statistically significant (p<0.01).

The control variables exhibit the expected signs and magnitudes with number of bedrooms, bathrooms and car spaces all positively associated with property price. Those results were also statistically significant (p<0.01).

Table 4:Regression of property price on EER and other house characteristics

Variables	Houses sold 2000-2022 Excl. new builds price adjusted	Houses sold 2011-2016 Excl. new builds price adjusted
EER = 0	-0.636***	-0.0691***
	(0.00528)	(0.00852)
EER = 1	-0.0521***	-0.0558***
	(0.00377)	(0.00585)
EER = 2	-0.0229***	-0.0280***
	(0.00370)	(0.00572)
EER = 4	0.0191***	0.0216***
	(0.00386	(0.00605)
EER = 5	0.0271***	0.0319***
	(0.00424)	(0.00688)
EER = 6	0.0152***	0.0213***
	(0.00504)	0.00812)
Bedrooms	0.0872***	0.0881***
	(0.00182)	(0.00290)
Bathrooms	0.103***	0.105***
	(0.00200)	(0.00319)
Parking	0.0169***	0.0160***
	(0.00119)	(0.00186)
In (block/building size)	0.150***	0.143***
	(0.00237)	(0.00385)
Constant	13.06***	13.06***
	(0.0181)	(0.0289)
Observations	44,080	15,272
R-squared	0.661	0.695
Suburb fixed effects	yes	yes
Yearly fixed effects	yes	yes

Standard errors in parentheses

***p<0.01, ** p<0.05, * p<0.1

There were several limitations in our analysis due to limited resourcing. We were unable to control for many of the other variables included in the previous study [8]. We included suburb fixed effects and yearly fixed effects, but there are many other variables that likely impact sales price, e.g., courtyards, swimming pools, solar, heating/cooling, distance to airport, schools, CBD, shops etc. Despite this limitation, the results of our analysis were similar to those presented in the previous study where these additional variables were considered.

Analysis of historical sales data shows a modest improvement in EER over time that is likely attributable to the scheme

We analysed over 131,000 house and townhouse (class 1) historical sales listings between 2000 and 2022 that had disclosed an EER at the point of sale and over 23,000 apartment (class 2) listings. Table 5 below shows how the average EER changes over time for both class 1 and class 2 homes.

Table 5: Number of sales and average EER for all class 1 and class 2 sales (based on historical data extracted from All Homes)

Year	Total number sales (class 1)	Average EER (class 1)	Total number sales (class 2)	Average EER (class 2)
2001-2002	1,746	2.10	76	3.09
2002-2003	2,581	2.25	174	3.11
2003-2004	2,550	2.19	199	3.38
2004-2005	2,662	2.26	201	4.01
2005-2006	3,320	2.36	288	4.33
2006-2007	3,325	2.35	426	4.40
2007-2008	3,352	2.28	380	4.37
2008-2009	3,161	2.34	285	4.76
2009-2010	3,456	2.42	303	4.80
2010-2011	3,411	2.58	285	5.04
2011-2012	3,985	2.70	539	5.04
2012-2013	3,708	2.81	585	5.04
2013-2014	4,049	2.93	528	5.12
2014-2015	4,431	2.98	591	5.14
2015-2016	4,263	3.00	797	5.29
2016-2017	4,326	3.13	851	5.34
2017-2018	4,560	3.17	1,104	5.28
2018-2019	4,022	3.23	1,007	5.25

Year	Total number sales (class 1)	Average EER (class 1)	Total number sales (class 2)	Average EER (class 2)
2019-2020	3,997	3.31	1,062	5.32
2020-2021	3,254	3.43	1,308	5.56
2021-2022	3,626	3.52	1,605	5.61

The calculation of these average EER values includes the sales records for new build properties as well as existing properties. As such, it is likely that a considerable portion of the increase in average EER over time (seen in Table 5 for both houses and apartments) is a result of NCC minimum energy efficiency standards. We conducted additional analysis to attempt to calculate the average EER over time for existing homes, i.e., excluding new builds from the analysis. We obtained ABS data [3] on the number of new houses and units added to the ACT market each year. We assumed that these new builds were likely to account for the highest rated properties each year, and as such, we backed out the equivalent number of highest ratings and recalculated the average EER.

This additional analysis was only possible for houses and townhouses (class 1). The dataset we were able to obtain for apartments was a much smaller sample of total annual apartment transfers (based on ABS data – [3]) and varied considerably year to year. This may have been the result of excluding listings categorised in the All Homes dataset as “investment property”. We decided to exclude these listings, as they were unable to accurately be further classified as either class 1 or class 2 properties. We also observed much higher ratings across the board for apartments and based on observations of the ACT property market, it seems likely that the majority of apartments in the ACT are new builds (i.e., built post the introduction of NCC minimum standards). For these reasons, the same methodology was unable to be applied to apartments.

The results for class 1 buildings (houses and townhouses) are displayed in Figure 5 below. The dark blue line shows a modest, but steady increase in average rating over the past 10 years. However, when new builds are excluded from the dataset, this trend disappears and the average EER remains relatively flat (red line). There is greater variation in average EER year-to-year when new builds are excluded which can be explained by the considerable variation in the number of new homes added to the market each year. For example, in 2012-2013 almost twice as many new houses were added to the market than in any other year.

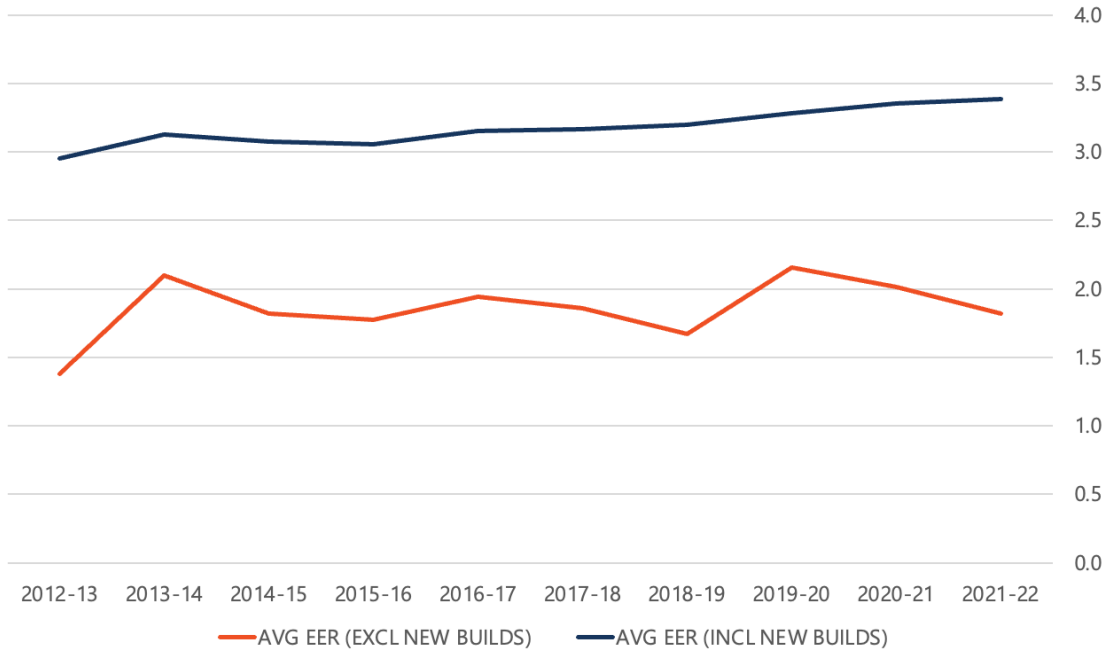


Figure 5: Average EER for house and townhouse sales between 2012 and 2022, including and excluding sales of new builds

As discussed, new builds were unable to be excluded from the data for apartment sales. The average EER trend over time for all apartment sales can be seen in Figure 6 below.

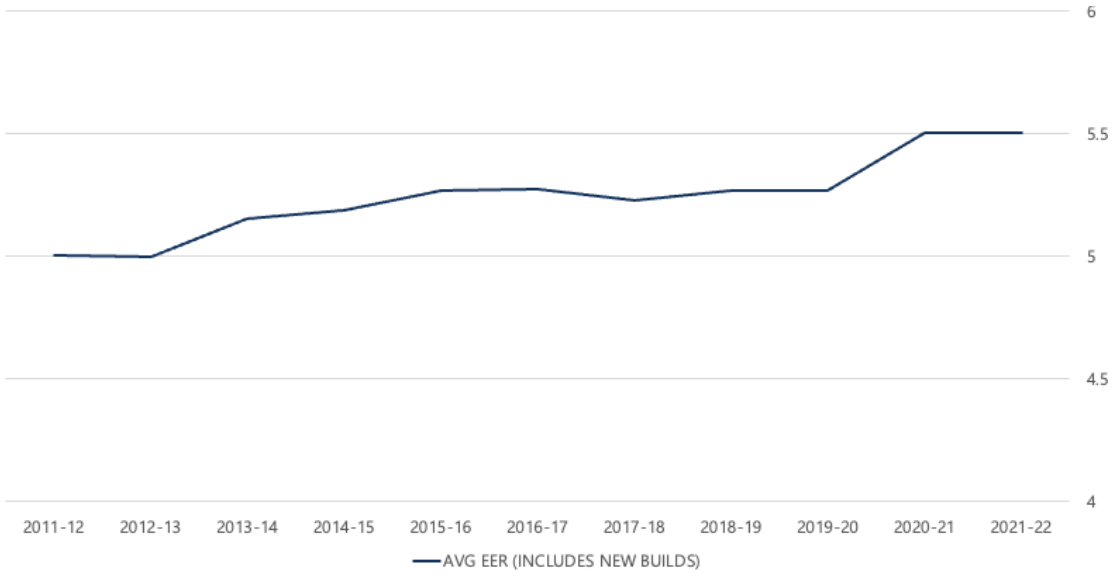


Figure 6: Average EER for apartment sales between 2011 and 2022, including new builds

While the analysis for house and townhouse sales above suggests there is no obvious increase in EER over time that could be attributed to the ACT disclosure scheme, it is possible that the impact of the scheme is simply not captured in that dataset. We heard from the real estate agents we interviewed that EERs were not a decision-making factor for people when purchasing a home, but that they were often interested in the information provided with the report and would pursue energy efficiency upgrades post purchase. Any improvement in EER as a result of a post-purchase upgrade would not be reflected in this sales data unless a new rating was obtained, and the property was sold again.

We analysed a sub-section of the data for both houses and apartments that had sold more than once between 2000 and 2022 to test whether there was quantitative evidence to support this finding from interviews. We calculated the average EER at first sale, average EER at last sale and the average difference in rating between first and last sale. Table 6 below shows the results of this analysis. Essentially, we found an average increase in rating of 0.4 stars for houses and townhouses that had resold and 0.3 stars for apartments that had resold.

Table 6: Change in EER between first sale and last sale for all class 1 and 2 buildings that sold more than once between 200 and 2022

	Change in EER between first sale and last sale																
	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8
Frequency (class 1)	2	0	2	22	122	238	860	2,708	6,208	3,732	1,530	769	401	222	92	12	3
Average change (class 1)	**+0.4 stars**																
Frequency (class 2)	0	0	4	11	11	36	68	193	986	427	199	55	25	15	11	0	0
Average change (class 2)	**+0.3 stars**																

Careful analysis of this data also highlighted some potential issues in the accuracy of disclosed ratings that should be investigated further. As can be seen in Figure 7 and Figure 8 below there are a reasonable number of properties that have had a 1-2 star decrease in EER between first and last sale and a handful of properties that have had even greater decreases in rating. It is extremely unlikely that these properties have become less efficient over time, i.e., replaced more energy efficient building materials with less efficient materials. Rather it is more likely that there have either been issues with the accuracy of energy assessments or the accuracy of disclosed ratings. For example:

- Variance between ratings performed by different assessors (due to subjectivity of input assumptions) – this may explain a 1 to 2 star decrease.
- Assessor non-compliance (historically in the early days of the scheme there were reports of this) – may explain a larger decrease in rating.
- Real estate agents entering incorrect EERs on All Homes property listings (disclosed EER does not match reported EER) – may also explain a larger decrease in rating.

Based on the data we were able to access for this review, we were unable to ascertain which (if any) of these issues were occurring. However, if additional data becomes available, further investigation may be worth pursuing.

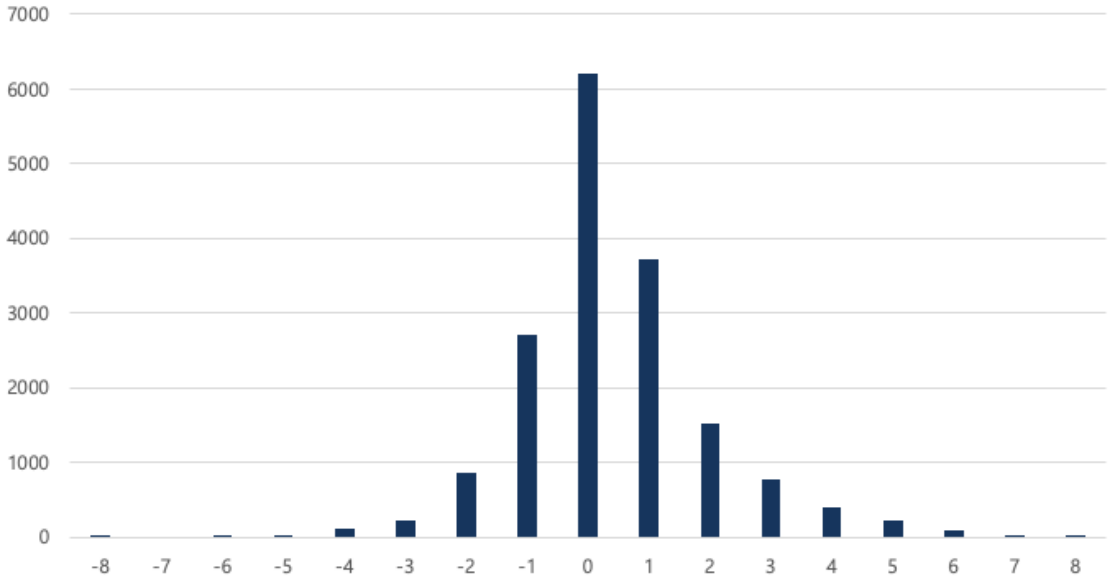


Figure 7: Distribution of change in EER between first and last sale for class 1 buildings that have sold more than once between 2000 and 2022

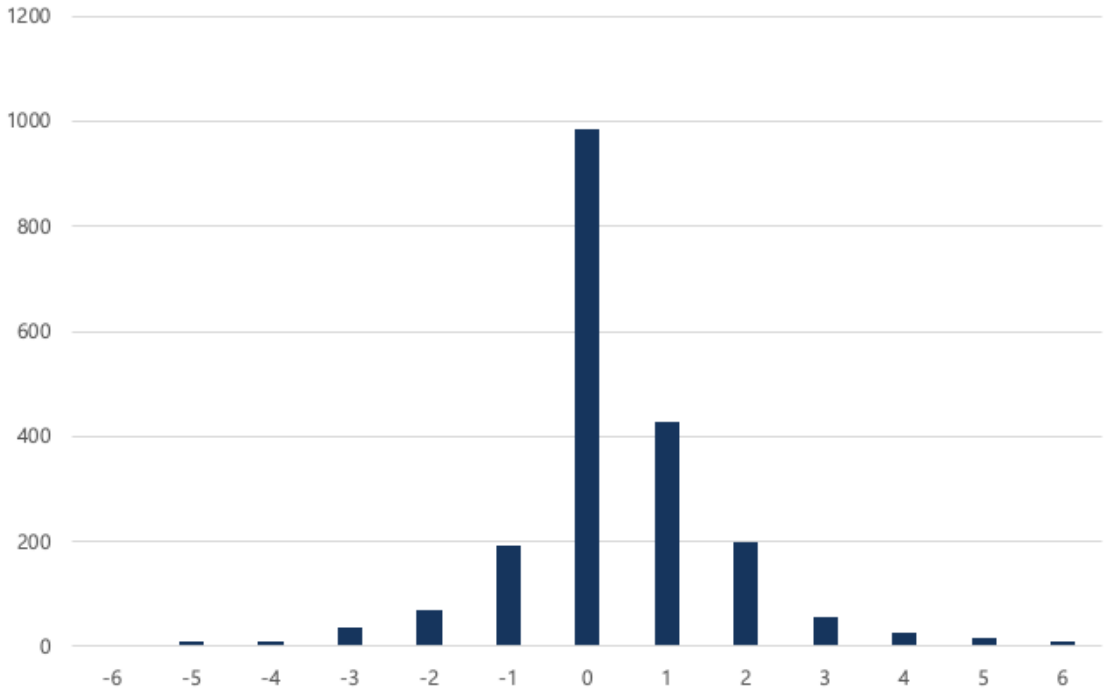


Figure 8: Distribution of change in EER between first and last sale for class 2 buildings that have sold more than once between 2000 and 2022

In summary, based on this analysis it is evident that there has been a modest increase in EER over time, for both houses and apartments that can be attributed to the scheme. Meaning that it is likely that energy efficiency upgrades (i.e., upgrades to the thermal shell of existing homes) are occurring.

The scheme appears to be delivering moderate carbon, energy and bill savings

We have assessed the performance of the scheme against its original intended outcomes: decreased emissions, decreased energy costs and improved thermal performance as a proxy for improved housing resilience. We have estimated the carbon, energy and bill savings based on the same data groups we identified above:

- All sales (including new builds)
- Properties that have sold more than once between 2000 and 2022.

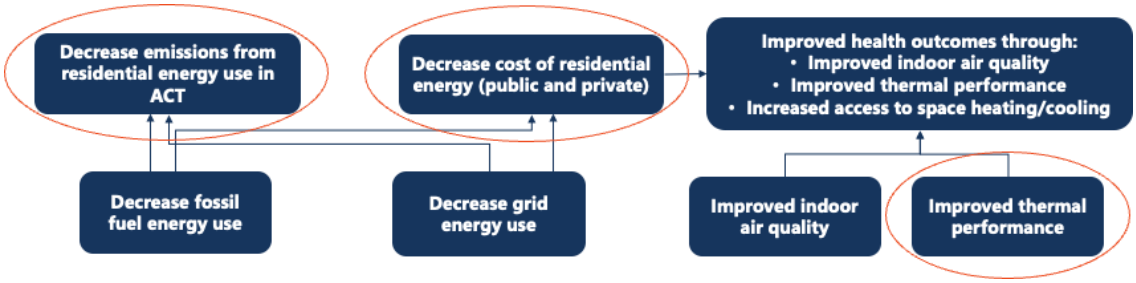


Figure 9: Ultimate outcomes extracted from the program logic - red circles outline the original scheme outcomes that we have evaluated performance against

The carbon, energy and bill savings for group number 1 will include savings resulting from the impact of NCC minimum energy efficiency standards as well as from the disclosure scheme. We have separately calculated the carbon, energy and bill savings for the second group to understand the level of savings that can be more directly attributed to the disclosure scheme.

We have calculated what the average household is saving per annum (in terms of MJ, $ and tonnes of $CO_{2\text{-}e}$) as a result of the overall improvement in rating of the ACT housing stock and as a result of the 0.3-0.4 star improvement that is attributable to the scheme. We assumed the fuel tariffs and emissions intensities (per MJ) displayed in Table 7 below.

Table 7: Assumed fuel tariffs and emissions intensities (per MJ)

Fuel type	Tariff ($/MJ)	Emissions intensity (kg/MJ)
Electricity	0.0668	0
Gas – Natural	0.0356	0.06433
Gas – LPG	0.07	0.0642
Wood	0.0185	0.0013

We have assumed an emissions intensity of zero for electricity as the ACT electricity supply is now offset by 100% renewable energy. However, there is still significant benefit from reducing electricity use beyond private bill savings. Reduction in total electricity use in the ACT through improved energy efficiency, results in network infrastructure cost savings and it also reduces the ongoing costs associated with continuing to offset the total ACT electricity supply with renewable energy.

On average, households (class 1 dwellings) are saving 4,576 MJ in energy, $192 in costs and 0.22 tonnes of $CO_{2\text{-}e}$ per year, as a result of improved ratings under the scheme. A full breakdown of savings across class 1 and class 2 dwellings are presented in Table 8 below. Our detailed methodology can be found in Appendix 1.

Table 8: Estimated annual impact of mandatory disclosure per dwelling

Case	Star rating initial	Star rating final	Electricity savings (MJ/annum)	Gas savings (MJ/annum)	Firewood savings (MJ/annum)	Total savings (MJ/annum)	Total savings ($/annum)	Total savings GHG emissions (tonnes/annum)
All houses (class 1)	2.1	3.5	3,430	11,599	528	15,557	651.87	0.75
All units (class 2)	3.1	5.6	1,646	5,314	301	7,261	304.67	0.34
Sold > once (class 1)	2.5	2.9	1,009	3,412	155	4,576	191.78	0.22
Sold > once (class 2)	4.7	5	136	438	25	599	25.12	0.03

Findings

- There appears to be high consumer awareness and engagement in the scheme.
- There may be opportunities to drive greater outcomes by engaging more broadly with the finance sector, property sector, and energy efficiency supply chain.
- Regression found a positive correlation between EER and property price, suggesting that consumers value energy efficiency and higher ratings.
- There has been a modest improvement of 0.3-0.4 stars in ratings over time that is likely attributable to the scheme.
- The average ACT household (class 1 dwelling) that has been sold under the scheme is saving $192 and avoiding 0.22 tonnes of $CO_{2\text{-}e}$ per year.

Considerations

- Develop a data monitoring and collection plan that outlines all key indicators that need to be tracked.
- Develop an evaluation plan for the Scheme that includes process, interim and outcome evaluations to support compliance and continuous improvement.

1.3 Review of Scheme effectiveness

The process of EER disclosure differs between the sales and lease markets

There are notable differences in the process of disclosure at point of sale versus point of lease that help to explain observed and reported differences in disclosure compliance. As can be seen in Figure 10 and Figure 11 below, there are additional checks built into the system on the sales side that do not exist for the rental market. Buyers' and vendors' solicitors add a layer of informal compliance to disclosure at the point of sale by ensuring the EER is present in the sales contract and up to date. In the rental market, the onus is on either the lessor to inform the leasing agent of an existing EER, or on the leasing agent to ask the lessor if a previous rating exists. There are then no additional checks in place to ensure that an existing rating gets disclosed. Robust audit and compliance practices help to ensure that accurate ratings are being obtained and disclosed. They also ensure that data is collected regularly and fed back to EPSDD to support ongoing scheme monitoring and evaluation.

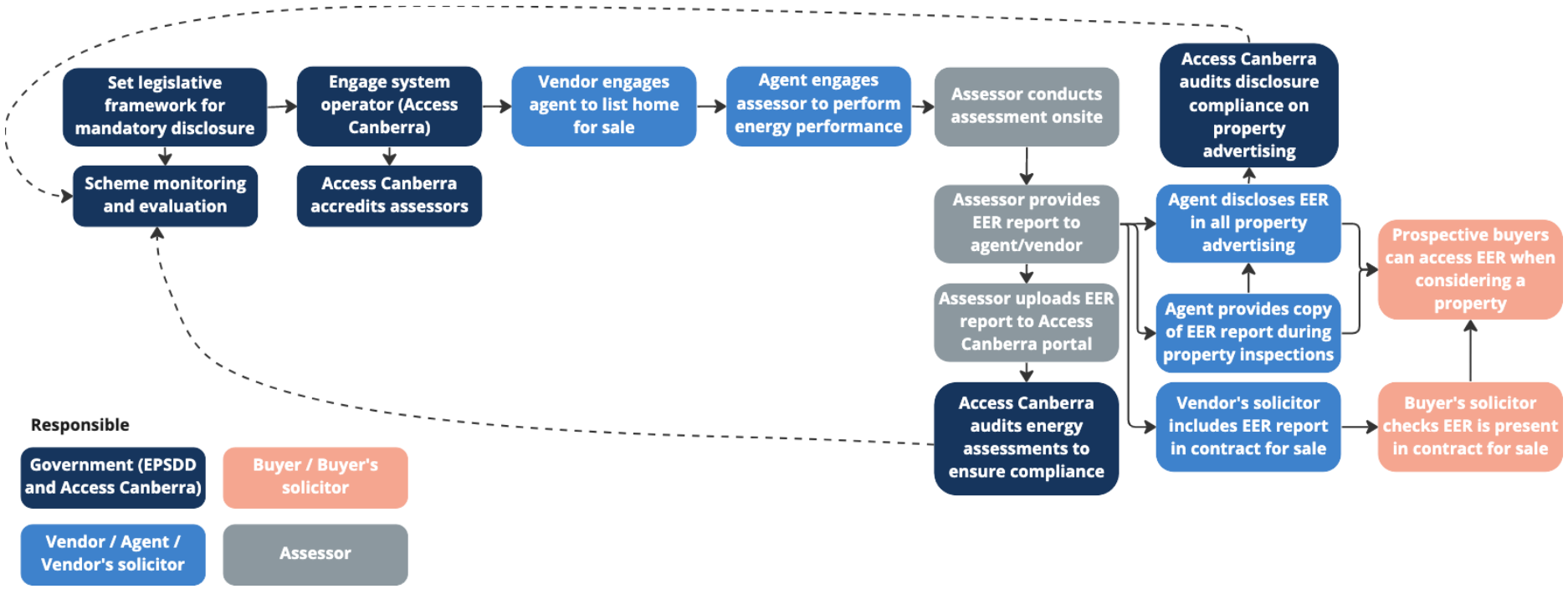


Figure 10: Process diagram showing activities of different actors during the disclosure process at the point of sale

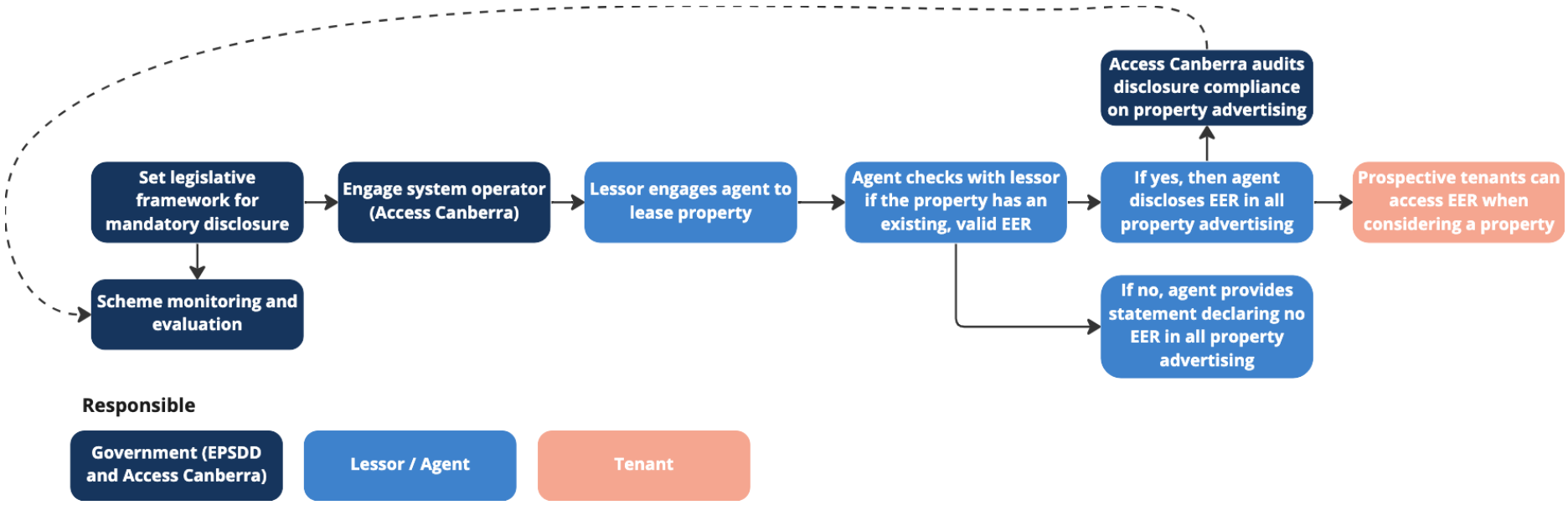


Figure 11: Process diagram showing activities of the different actors during the disclosure process at the point of lease

Legislative framework and Scheme administration can be strengthened

This section summarises the process findings relating to the parts of the scheme that fall under the responsibility of the ACT Government (EPSDD and Access Canberra). A synthesis of findings from our desktop review and stakeholder interviews is outlined below, by topic.

Legislative framework

The main software version that is listed in the Scheme legislation (FirstRate 4) is an **outdated version of software that is no longer supported by NatHERS.** As such, there is no formal training or accreditation process available for new assessors entering the market. It requires an outdated operating system to run the software and is no longer licensed by the ACT Government. Specification of the software version in legislation is unnecessary. Software is and should be updated regularly, therefore there is always the risk of the legislation needing to be frequently amended as the software updates. This is a costly process. There are other ways to ensure the software being used is fit-for-purpose while minimising the requirements for legislative amendments e.g., specifying that assessment tools must be "NatHERS accredited".

Despite the issues with the software, FirstRate4 is still being used to successfully deliver energy assessments to most ACT homes. The major existing ACT assessors are able to use existing training resources and virtual operating systems to successfully provide over 8,000 FirstRate4 assessments per year to vendors. In the short-term, Access Canberra could make similar resources available to assessors, to remove barriers to entry.

Format and scope of the rating

We spoke with real estate agents and a solicitor who all reported that EER reports were very easy to understand. They stated that the reports not only included the rating itself, but also provided **helpful and actionable information** on what could be done to a home to improve this rating. There was a view that this information had helped to drive market literacy around energy efficiency.

Agents reported that an EER wasn't necessarily a decision-making factor for people, but that the number of people asking about EERs and energy efficiency has increased over time. They also suggested that a poor EER wouldn't stop someone from buying a home if they knew that they could improve the efficiency and running costs after the fact, through retrofitting. The strength of providing information alongside the rating is that buyers know the types of things they can do post-purchase to improve the efficiency of their home.

There was some confusion amongst interviewees as to the scope of an EER. For example, real estate agents spoke about appliance upgrades and solar PV installation as things that could be done to improve a rating alongside things like window glazing, insulation and heavy drapes and pelmets. When prompted, they claimed to understand that an EER does not include appliances or solar. However, they stated that consumers considered these things alongside the EER when assessing efficiency. Agents responded positively when asked about **expanding the scope of an EER to include appliances and solar** as they believed that these were things that buyers valued. They also commented that a rating that better reflected actual running costs would be beneficial.

Both assessors and agents interviewed for this review reported that there was a level of confusion in the market as to the **differences between EER zero-to-six-star ratings and NatHERS zero-to-ten-star ratings for new builds**. One of the assessors interviewed commented that there can be up to two stars difference between a NatHERS assessment and an EER, e.g., 6-star (NatHERS) down to 4-star (EER). As a result of this they have found they get some disgruntled customers who don't understand the difference between the two schemes. They claimed that it was happening often enough that they have now included a FAQ on the differences between the two ratings in their customer information sheets. In theory, the two rating systems are based on the same scale, with the NatHERS zero-to-ten-star system being an extension of the original zero-to-six-star scale. However, there have been reports of discrepancies in ratings for the same property using both systems. One of the assessor agencies we spoke with suggested the following reasons for these discrepancies:

- Limited data entry fields in FirstRate 4 compared to FirstRate 5, meaning that some of the things that can be done to improve efficiency are not considered. Hence, overall efficiency is likely to be underestimated.
- Discrepancies between building plans (when a NatHERS rating is done) and what ends up being built.
- Compliance issues with NatHERS - assessors for NatHERS ratings may be under pressure to report that a building will meet the minimum standard.

Depending on the future direction of the Scheme this may continue to be an issue. Clear communication is required as to the differences between existing home and new build ratings. Ratings should be communicated in a way that expresses a property's star rating against the scale of possible ratings e.g., 4 out of 6 stars.

Interactions with other schemes and policies

Within the ACT, the interactions between a suite of complementary policies and programs in the residential energy efficiency space have led to a high level of literacy and high uptake of energy efficiency. If the scheme expands to a whole of home assessment that includes appliances and solar, the synergies between these policies will become more apparent and important.

The ACT Government has an opportunity to more strongly engage with the National Framework and the REEDI. The REEDI has assembled a stakeholder advisory group to advise on the direction of the National Framework and the development of new NatHERS whole of home tools for existing homes. It is unclear whether this advisory group has any ACT representation. We spoke to two assessor agencies that combined represent more than 70% of the ACT market and neither of those groups had any awareness or involvement in what is happening at the national level. Given the ACT currently has the only mandatory disclosure scheme in the country, consultation with assessors who are currently operating within the scheme and conducting up to 8,000 assessments each year should be considered.

The ACT Government also has an opportunity to actively engage with the national framework and the REEDI from a policy perspective, to ensure decisions are fit-for-purpose for an ACT setting. Findings from this review can help to inform the national work.

Monitoring and evaluation

The EPSDD Building Reform team should identify key indicators to track (based on the program logic in section 1.1) and identify potential data sources and collection processes (including who is responsible for collection and maintenance of records). Continuous data collection and monitoring allows for timely identification and resolution of issues as they arise. A formal evaluation framework should also be developed that includes process, interim and outcome evaluations with targeted key evaluation questions that support compliance and continuous scheme improvement.

Existing assessors are delivering cost effective ratings but there are barriers to entry for new assessors

This section covers the aspects of the scheme related to conducting energy assessments. A synthesis of findings from our desktop review and stakeholder interviews is outlined below, by topic.

Cost of delivery

We spoke with two assessor agencies that represent more than 70% of the ACT market and they both reported that using the current software (FirstRate4), **onsite energy assessments are cost effective**. Assessors can do between five and six homes a day (EER only), or if they are completing all four reports (building, compliance, pest and EER) they can do three homes a day. They stated that if the software were to change, assessments would no longer be viable for their businesses if the EER assessment took any longer than the current system.

The current cost and time of delivery was estimated by assessors as follows:

- 45 minutes onsite at $395 (for a unit – EER only)
- 1 hour 30 minutes onsite at $1,400 (for a house requiring all four reports).

One assessor suggested that *"time onsite is the biggest barrier to change."* Both assessor agencies have investigated FirstRate5, with one agency having trained all of their assessors in the next generation software. However, they have since reached the conclusion that it is not fit-for-purpose for existing homes. They stated that *"even though the [current] software has its shortcomings, it gives a reasonable report and is cost efficient."*

Rating accuracy and assessor compliance

Assessor agencies claimed that they were performing accurate ratings using FirstRate4 (the currently legislated software) and they believed this was true across the broader market. They stated that historically there had been issues with the quality of EERs with some assessors doing drive by ratings or conforming to customer demands for a high rating. They reported that this was no longer the case as the market now values quality and there is enough energy efficiency literacy amongst consumers to recognise if a rating is inaccurate. For this reason, there are liability concerns for assessors providing inaccurate ratings. Consumers can tell if the

house they are inspecting or purchasing does not have the things the EER report states that it has. Assessors also claimed that the **real estate agents keep the assessors honest** to a certain extent. If the assessor were to submit a 2-star rating and the property was actually a 6-star, then the agent would come and check for evidence. Although they admitted that the same would not be true for the opposite scenario (a 6-star rating for a 2-star property).

Assessor capacity, capability, certification, and training

The outdated, unsupported software creates a significant barrier to entry for new assessors entering the market. Access Canberra are no longer reviewing licence applications for assessors on account of the software and there is **no longer any official training available**. Any new assessors would require training from existing accredited assessors, who are unlikely to do this as they are creating more competition for themselves. Currently it is the same group of assessor agencies that have been active for many years under the Scheme (some from the start), with no access to professional development. This could create an environment for price gouging. However, we did not hear any evidence of this occurring. In fact, assessors reported downward pressure on prices.

There is high disclosure of EERs in the sales market but not for rental properties

This section covers the aspects of the scheme related to disclosure of EERs at the point of lease and sale and the response of the market to those disclosures. A synthesis of findings from our desktop review and stakeholder interviews is outlined below, by topic.

Disclosure of EERs

Our review of data extracted from All Homes, supported by findings from interviews with two experienced real estate agents and one property solicitor, found there to be a **high level of disclosure compliance at the point of sale**, as follows:

- A near 100% level of disclosure of EERs in advertising (see Table 9 below).
- Highly likely near 100% level of disclosure at contract exchange, i.e., EER report included with contract.
- Likely provision of EER report (alongside other reports) at open inspections for homes - unknown for units where other reports are not required.

Table 9: EER disclosure summary at point of sale and lease. Data scraped from AllHomes.com.au 26 Feb 2023.

	Dwelling type	% disclosure	Average EER	Number of listings
Sales	House	95%	4.1	943
	Apartment	99%	5.7	537
Lease	House	26%	4.4	644
	Apartment	35%	5.7	499

There are several inadvertent mechanisms for ensuring a high level of disclosure compliance in the sales market. For example, the EER field is a required field on the All Homes, RealEstate.com and Domain websites when uploading a property advertisement. This ensures a high level of disclosure in sales advertising. Buyers' and vendors' solicitors then also provide an informal compliance check by ensuring the EER is present and up to date in a property's sales contract.

For rental properties, disclosure compliance appears much lower. Table 9 above shows that only 26%-35% of properties for lease are disclosing ratings. There appeared to be a **mixed understanding amongst agents, assessors and solicitors as to the EER disclosure requirement for rentals**. When asked about the rental market, almost all interviewees stated that disclosure didn't apply for rental properties. When prompted that a rental property had to disclose an EER if one existed (i.e., if the property had been sold previously), they agreed, but were unsure what constituted an "existing EER".

Table 10: Summary of disclosure compliance for rentals (properties sold within the past 2 years). Data scraped from Allhomes.com.au on 26 February 2023.

	Dwelling type	% disclosure	Average EER	Number of listings
For lease – sold in past 2 years	House	34%	3.3	97
	Apartment	40%	4.9	43

Limiting the data to rental properties that had sold within the past 2 years (i.e., the properties that are supposed to disclose their existing rating under the legislation) shows that the disclosure compliance for rentals is considerably lower than for sales (34%-40%). These results also vary significantly by real estate agent.

The assessors we spoke with reported having no engagement at all with the rental market, i.e., with property managers. One assessor agency suggested that this was changing with the introduction of minimum standards for insulation and there is a possibility that this will have a flow on effect for rental disclosure in future.

We also noted a contrast in agents' practices between sales and leasing agents. Sales agents proactively produced ratings in anticipation of requests from vendors' solicitors whereas leasing agents left the reporting of existing ratings up to the lessors. One of the agents commented that property managers would be much less likely to proactively check for a rating. If asked, they would check for one, but they wouldn't check without prompting. It should be noted that while the two agents we spoke with were well established and experienced in the ACT market, we do not know how representative they are of broader practice.

Interviewees representing the rental market also suggested that the **market is so tight for renters, that the disclosure of EERs makes no difference**. A renter cannot choose to not take a property because of its poor rating. Even if there were higher vacancy rates, other things would still tend to dominate decision making for renters. Even for those renters that may be interested in the EER, there are significant structural barriers preventing them from doing much with the information.

Market literacy and engagement

Assessors and agents (on behalf of consumers) reported that there was a high level of awareness within the ACT market that you must obtain and disclose an EER when selling a home. They also reported that **consumers understood which star rating translates to a good, medium and bad rating**. However, they stated that a bad rating wouldn't necessarily deter someone from purchasing a home if they understood how they could improve it post purchase.

As described above, agents reported that there was a high level of literacy and engagement around energy efficiency and EERs. They stated that while an EER wasn't necessarily a decision-making factor for people, that increasingly, more people were asking about them. From market interviews that we have conducted previously for other ACT Government projects, we have discovered that there is generally a much higher level of energy efficiency literacy in the ACT than in other jurisdictions. However, this literacy and engagement extends to things like solar PV, batteries, electric vehicles, and high efficiency appliances (heat pumps) which are not covered under an EER. As a result, it is likely that both **consumers and agents overestimate the extent to which ratings are an indication of actual total running costs**.

Things to retain moving forward:

- **Format of the rating –** easy to understand and contains customised and actionable information on the types of upgrades that would improve a household's rating.
- **Timing of disclosure –** EER and associated report available to prospective buyers at all points during the sales process (online and paper advertising, during open inspections, part of the sales contract).
- **Time involved in completing an onsite assessment –** 45 minutes (EER only) 1h 30 (all 4 reports), assessors need to be able to assess 3 houses per day.
- **Cost of a rating to consumers –** the cost of the rating is covered by the buyer. While this cost is relatively trivial compared to the overall property purchase price, the current price is considered reasonable by the market.
- **EER as part of sales contract –** driver of compliance as both the vendor's and buyer's solicitors will check for it. Also ensures the vendor has a clear legal mechanism to recover the cost from the eventual buyer while allowing for all prospective buyers to access the information freely throughout the sales process.

Things to consider moving forward:

- **Expanding the scope of the rating** – to consider appliances and solar PV so that the rating better reflects actual running costs, and to consider fuel type to drive electrification in the ACT.
- **Adding EERs to a central public database** – this would provide a helpful data source for scheme monitoring and evaluation, but it could also help to improve compliance in the rental market and connect more renters with energy efficiency information about their home.
- **Attaching EERs to the building file** – currently nothing happens with the EERs post lodgement. Adding them to the building file would help to track a properties performance over time.
- **Provide access to personalised and actionable information on how to improve a rating, before having to pay for a formal rating** - note that no interviewees mentioned this as an issue, but when prompted, they agreed it was a good idea.
- **More active engagement with the REEDI** – the ACT Government should actively engage at a strategic policy level, to ensure the national framework is fit-for-purpose for the ACT Scheme (the only mandatory scheme in the country).
- **Encourage REEDI to engage with ACT assessors** – apart from Victorian Scorecard assessors who conduct a handful of voluntary assessments, ACT assessors are the only group in Australia assessing existing buildings.
- **Ensure access to assessor training, certification, and professional development** – make existing training resources and virtual operating systems available to assessors to remove barriers to entry and support ongoing compliance.
- **Increase resourcing to strengthen audits and compliance** – align with evolving disclosure scheme best practices (100% level 1 audits to check correct assessment processes are being followed and EER disclosed in property advertising matches the EER report, and 5% level 2 onsite audits – see section 2.1).
- **Better engagement with the rental market** – to clarify confusion around rental EER disclosure requirements. Increased engagement will occur as minimum standards are rolled out.

common capital

SECTION 2

Analysis of existing and emerging rating tools

This section includes a brief summary of findings on best practice disclosure, a policy comparison of existing tools, a quantitative comparison of existing tools and a brief overview of emerging tools that may have implications for the ACT.

2.1 Findings on disclosure scheme best practices

EU consumer surveys have analysed user needs and expectations from rating certificates

Energy Performance Certificates (EPCs) are the residential energy efficiency rating certificates adopted across the EU. The IDEAL EPBD research project [8], conducted between 2008 and 2011, looked at factors that influence a homeowner's decision-making with respect to home purchase and home renovations. Key findings relevant to disclosure included:

- An energy efficiency rating with distinct categories (e.g., A-G scale or 0-6 stars) is more effective than a continuous scale for communicating energy efficiency information.
- Practical recommendations and tailored advice increase people's trust in and perceived usefulness of the EPC.
- The certificate can further support homeowners to find competent and knowledgeable professionals to perform upgrades (i.e., provide referrals to energy efficiency suppliers).

- The certificate can further support homeowners by providing additional information about available financial support schemes.

A more recent survey (2021) [9] conducted amongst consumers from 5 different countries to assess the end user needs and expectations from energy efficiency certificates to inform the next generation EPCs found that:

- Comfort, heating source and energy efficiency are considered to be important aspects when buying or renting a home.
- 62% of respondents said they would like to have the energy performance score of similar buildings included on their EPC.
- 64% of respondents said that including the estimated cost of different upgrade types on the EPC would be useful. There were more respondents who considered this useful compared to those who considered the inclusion of “payback time of the renovation” or “expected impact of renovation of energy costs” useful.

Simplifying the data acquisition process is the best way to improve rating reproducibility

For rating systems to be valued and trusted by consumers, ratings need to be reproducible within one label class (e.g., D versus E rating for EPCs). This is deemed to be an acceptable level of reproducibility. There are three components that can impact the accuracy of ratings with respect to actual house performance [10]:

- **Errors in data acquisition, or variance/subjectivity between assessors** – this is the main source of inaccuracy – it can lead to a total deviation of ±30% in situations where there are a large number of assessor measured inputs.
- **Errors in default values** – e.g., efficiency of assumed heating/cooling appliances typically leads to a deviation of around ±5%.
- **Errors in the calculation method** - inaccuracy levels typically correspond to a ±10% variation with respect to the actual building’s performance.

Combined, these three errors can lead to a ±45% deviation in rating compared to actual building performance (worst case). Simplifying the data acquisition process is the best way to improve the accuracy of ratings and it has a flow-on benefit in terms of reducing the cost of delivery. For example, limiting the number of assessor measured inputs or reducing subjectivity in those measurements.

Audit and compliance best practices involve a two-level audit

Best practices processes for auditing and compliance of mandatory disclosure schemes have evolved since the ACT scheme was first introduced. Standard best practices (e.g., NABERS audits for the Commercial Building Disclosure scheme) include two levels:

- **Level 1 audit** – applies to 100% of ratings – checking correct processes have been used and ensuring no data entry errors. This involves checking that the assessor followed the correct processes and used an appropriate assessment tool and checking that the disclosure is correct, i.e., the disclosed rating matches the rating provided by the assessor.

- **Level 2 audit** – applies to 5% of ratings – a panel of external auditors conduct a second onsite assessment for 5% of ratings. These ratings are selected randomly apart from some which are chosen based on identified or suspected risk, e.g., unexpectedly high or low ratings or patterns identified in the ratings performed by particular assessors.

This two-level process safeguards the credibility of a disclosure scheme, ensuring that consumers are receiving accurate information about a property's energy performance.

2.2 Methodology for tool comparison

In the subsections below, we compare the following existing energy efficiency assessment tools:

- FirstRate4
- Residential Energy Scorecard
- NatHERS Whole of Home

We have compared the existing tools to ascertain whether they are viable options for the ACT scheme to adopt imminently. For each tool we provide an overview and describe the scope, metrics, and rating scale used. We then assess the tool's compatibility with the ACT Scheme based on the criteria and considerations listed in Table 11 below. This is a variation of Common Capital's 4Es policy options assessment framework. In Section 2.6 we then provide a quantitative comparison of these existing tools that assesses the potential cost savings that could be delivered by improvements in ratings under all three schemes.

NatHERS Whole of Home has been designed for use in new builds to assess NCC compliance. It has not been designed for use in existing homes. A NatHERS In Home scheme is currently under development for use in jurisdictional disclosure schemes to rate existing homes. As it still being developed, the detail of what the NatHERS In Home accredited tools will cover is not yet known. The Residential Energy Scorecard (RES) is currently endorsed by NatHERS and is anticipated to become the first accredited In Home tool when the scheme launches. However, the RES software will likely need to be amended to gain accreditation under the NatHERS In Home scheme. We have included RES in its current form and NatHERS Whole of Home in this analysis as it is likely that the NatHERS In Home scheme will share similarities with both existing tools.

We have also provided a brief overview of two emerging tools:

- RapidRate – a CSIRO tool that can provide a rating estimate based on existing datasets.
- MagicPlan – a tool which creates an instant floorplan for an existing building onsite.

We have highlighted any potential implications of these emerging tools for the ACT and provided some suggested actions that the government could take to protect the existing scheme from any major external disruptions.

Table 11: Criteria and considerations used for the comparative analysis

Criteria	Considerations
Effectiveness	• Does the scope of the rating align with ACT policy goals (electrification, emissions reduction, energy cost savings, thermal performance and improved health outcomes)? • Does the format of the assessment report allow for the provision of actionable information for home sellers/buyers?
Efficiency	• Will the government be responsible for all aspects of scheme administration (assessor training, accreditation, auditing compliance)?
Equity	• Is the cost of a rating prohibitive for any households? • Is the assessment certificate easy to understand? • Does the assessment include actionable information for renters and low-cost upgrade options for low-income households?
Ease of implementation	• What is the cost of delivery for assessors (i.e., time required to be spent onsite)? • What is the assessor training, accreditation and audit process? • Is this able to be scaled up to service the ACT market? • Are there any implications for other market actors (e.g., real estate agents, energy efficiency upgrade installers, finance sector, etc.)?

2.3 Current legislated tool – FirstRate4

Overview

FirstRate4 is a software package in Australia that was previously administered by the Nationwide House Energy Rating Scheme (NatHERS) and accredited under the NatHERS protocol for National regulatory compliance. FirstRate4 has not been commercially supported since 2009 but continues to be used in the ACT for mandatory disclosure purposes. FirstRate4 was replaced by the currently supported version, FirstRate5, in 2009. Despite no longer being supported, FirstRate4 continues to be used by a limited number of assessors in the ACT for the purposes of mandatory disclosure compliance.

FirstRate4 is a building shell thermal performance simulation software tool that is limited to estimates of the per square metre, annual heating and cooling thermal loads of a dwelling (assuming that a given set of thermal comfort conditions are maintained within that dwelling throughout the year).

The FirstRate4 software package does not run on modern operating systems. However, the major existing ACT assessors are using existing training resources and virtual operating systems to successfully operate the program. FirstRate4 is what is known as a correlation program. This means that it does not actually use the NatHERS endorsed CSIRO calculation engine (Cheenath) but rather uses a point scoring system for each of the key building elements to calculate an equivalent (proxy) performance rating. This means that FirstRate4 is less accurate than the currently endorsed NatHERS rating tools (including FirstRate5), all of which use the Cheenath calculation engine.

The software tool generates ratings based on a now superseded NatHERS 0-5 star rating scale for homes. The scale was subsequently expanded to a 0-10 star scale approximately 15 years ago. The tool provides a rating and includes a “tips” function that suggests tailored means for improving the rating (see Figure 12 and Figure 13 below).

When FirstRate4 is operating in regulation mode (as would be required for rating a new dwelling for the purposes of compliance with the NCC) it fixes all window coverings to be Holland Blinds and all window and door gaps to “small”. It is understood that in the ACT for the purposes of mandatory disclosure rating, that the program can be operated in non-regulation mode which means that credit can be gained for upgrading window coverings (e.g., from no window coverings to heavy drapes with pelmets).

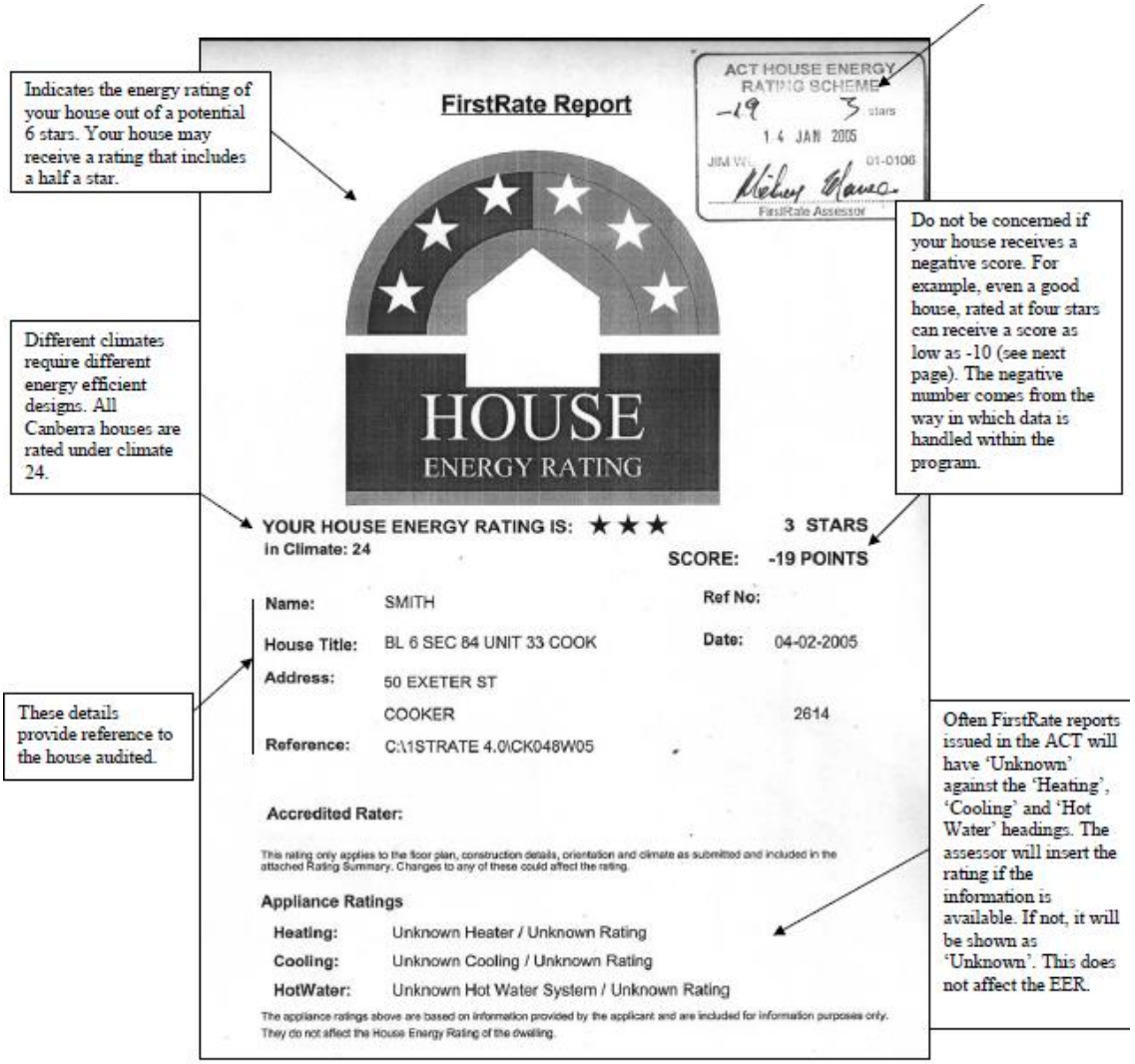


Figure 12: Sample FirstRate4 EER report (front)

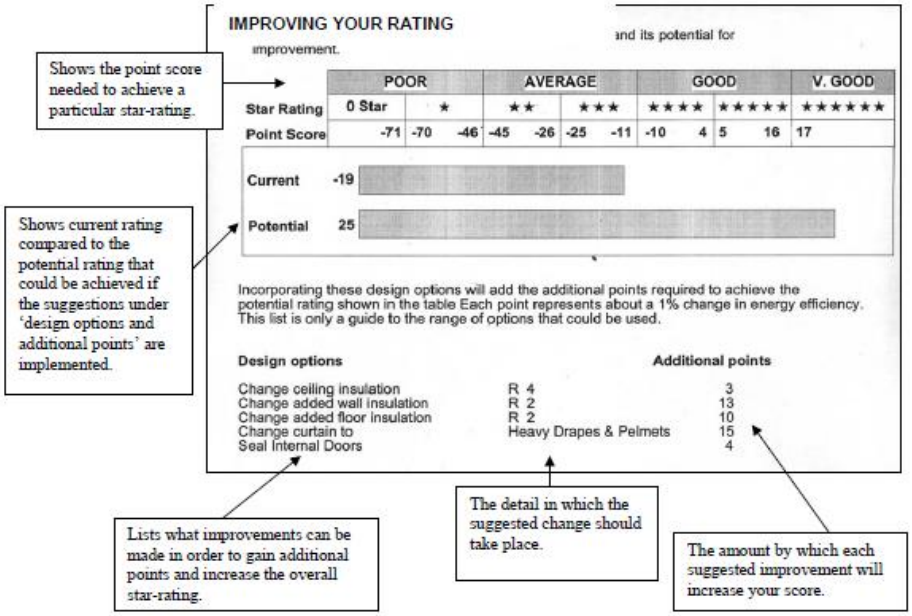


Figure 13: Sample FirstRate4 EER report (back)

Scope

As noted, FirstRate4 assessments are limited to an assessment of the performance of the building shell performance only. Consequently, the input requirements are limited to details relating to the building shell only and include aspects such as:

- Construction details and materials.
- Room dimensions.
- Window information including: size, type, orientation, shading and if there are blinds or curtains.
- Insulation details.
- Details relating to air leakage, draughtproofing and ventilation.

The rating does not consider the efficiency of the heating and cooling appliances installed to meet the estimated load or the efficiency of any other appliance that may be in the dwelling. The rating also does not consider the energy offsetting impact of any installed renewable energy sources such as solar PV with or without storage batteries.

Because a FirstRate4 assessment is limited to the thermal performance of the building shell it relates only to heating and cooling energy usage which in the ACT accounts for on average 40% of a dwelling's energy usage. Even then, the rating only provides part of the information with respect to heating and cooling (i.e., the expected load) and does not address two other key parameters:

- The efficiency of the cooling and particularly the heating equipment used to meet that load. This is important because the difference between the least efficient and most

efficient forms of heating can be a factor of 4, or more. In reasonably good building shells with high efficiency heating and cooling equipment the energy required for space conditioning can be less than a quarter of the total energy demand.

- The contribution of any installed renewable energy sources such as PVs or PVs in combination with storage batteries to meeting the heating and cooling loads. Again, this can be significant, particularly where batteries are employed.

Metrics and rating scales

Unit of Measurement MJ/m^2/year

The metric used in FirstRate4 is the estimated heating and cooling thermal load per m2 of conditioned floor area per annum. As noted, this is not a measure of how much energy an installed heater or cooler will need to consume (that will depend on the efficiency of the heater or cooler which is not taken into account in this rating), it is simply the thermal heat load that needs to be applied to or removed from the dwelling in order that a set of predefined comfort conditions will be maintained in the dwelling throughout the year. As noted, the load includes both heating and cooling. In the case of the ACT climate this is typically split as approximately 85% heating load and 15% cooling load.

The software tool generates ratings based on a superseded NatHERS 0-5 star scale for homes. The scale is non-linear. An improvement from 1 to 2 stars represents a greater reduction in thermal load compared to an improvement from 2 to 3 stars (and so on). This non-linear scale (see Figure 14) is intended to reflect the fact that low rated dwellings typically have a wide range of highly cost-effective options available to them to improve their ratings.

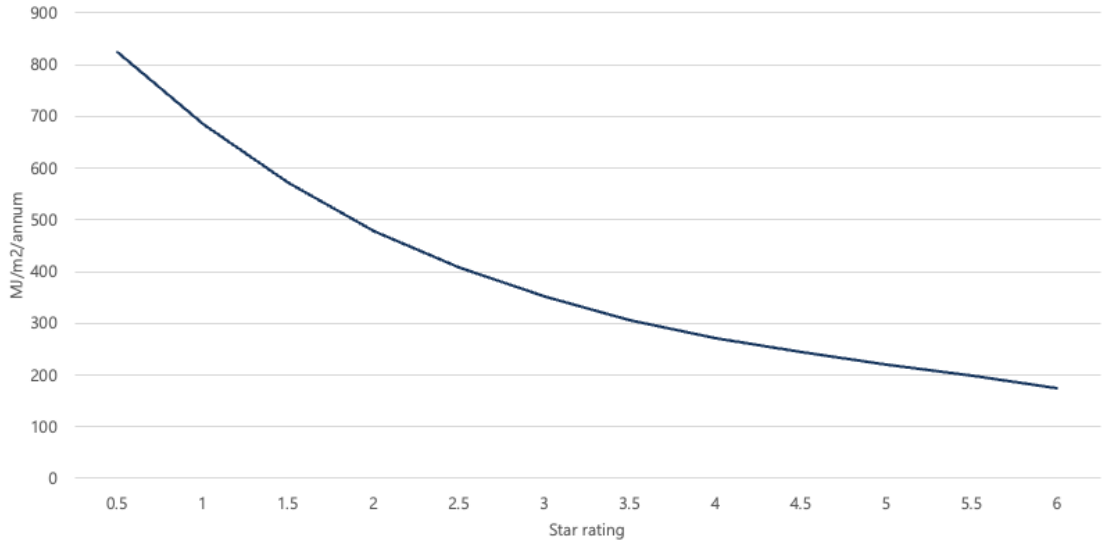


Figure 14: Thermal load versus star rating - FirstRate4 (NatHERS)

Comparative analysis

Table 12: FirstRate 4 effectiveness, efficiency, equity and ease of implementation considerations

Criteria	Considerations
Effectiveness	• Only includes thermal shell – doesn't reflect actual running costs and doesn't drive electrification. • Rating only covers 40% of a dwelling's energy use (at best). In some cases, this will be significantly less (25% or less). • EER report provides limited, but actionable information.
Efficiency	• Unsupported tool hence ACT Government (Access Canberra) is responsible for all aspects of scheme administration.
Equity	• Cost is not prohibitive for households. • Information on the EER report is easy to understand.
Ease of implementation	• Cost of delivery and time spent onsite to conduct assessment is practical. • No official training, certification or auditing process for assessors. • Operates at the scale required to service the entire ACT market. • Significant barrier to entry for new assessors. • Current assessors are operating effectively and are happy to continue in the interim until a good long-term solution is found.

Key takeaways

- Sustainable in the short-term but poorly aligned with ACT policy goals (e.g., electrification), so will need to change eventually.
- Cost of delivery and time spent onsite to conduct an assessment is practical. These should be the benchmarks that other tools need to meet to be deemed appropriate for use in the ACT mandatory disclosure setting.

2.4 Residential Energy Scorecard

Overview

The Residential Energy Scorecard (RES) is a software package developed by the Victorian Government that rates a home's energy use and comfort and provides tailored recommendations for improvements. Scorecard assessments are delivered by government-accredited assessors.

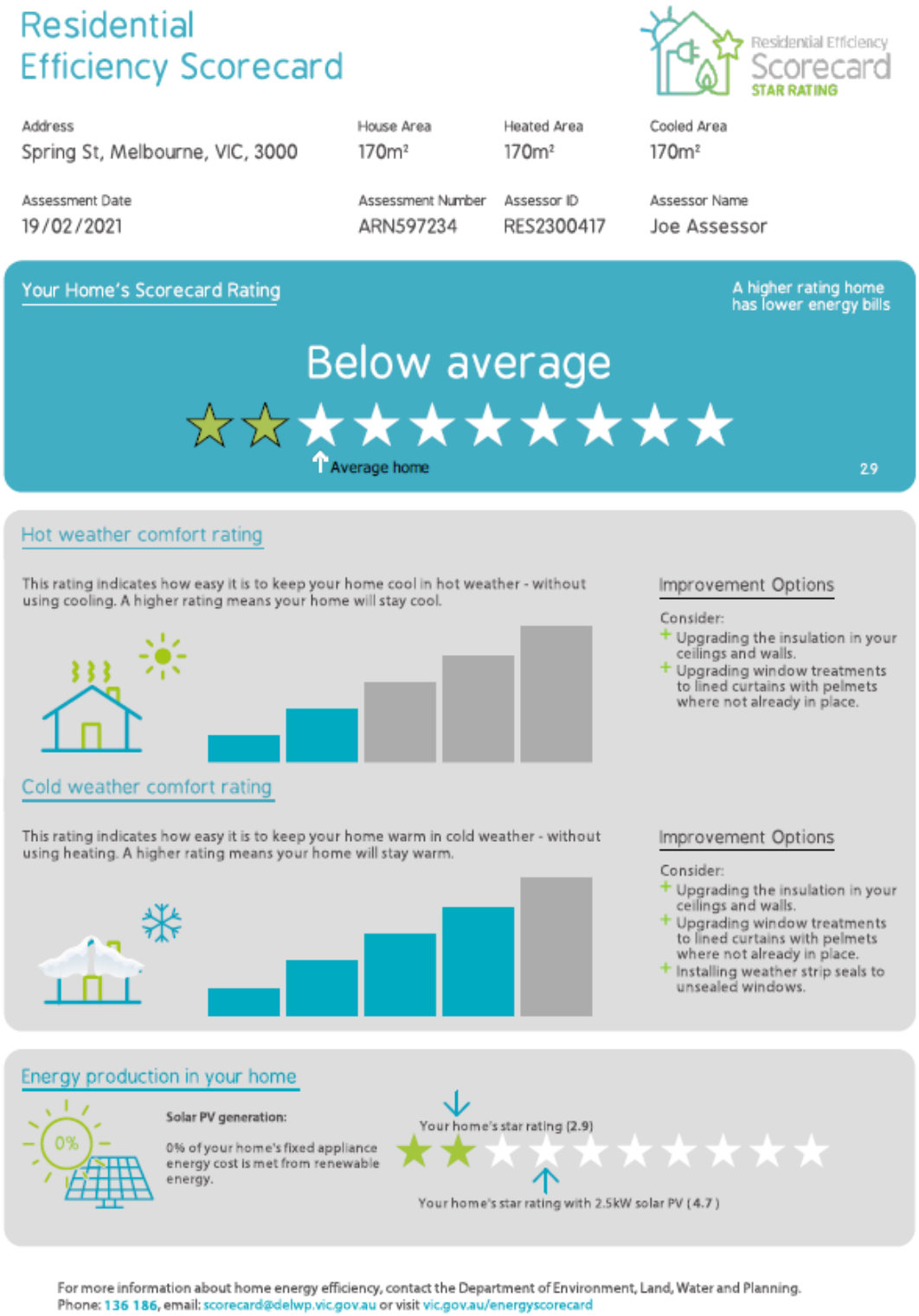
RES is a whole of home type rating tool. That is, unlike FirstRate4, the rating includes an assessment of both the building shell's thermal performance and the performance of major pieces of energy using equipment within the dwelling. Also, unlike FirstRate4 the rating is based on the estimated operational cost of the dwelling as a whole (not per unit area).

The software tool generates ratings based on a unique 0-10 star scale for homes. A sample of the rating certificate can be found in Figure 15 and Figure 16. The tool provides not only a rating out of 10 but also the following features:

- Hot and cold weather comfort ratings.
- Ratings with and without PVs included.
- Percentage contribution of the key energy using pieces of equipment to the total operational cost.
- Suggested means for improving the rating.

The rating report includes extensive tailored recommendations for improvements that could be undertaken so as to improve the rating. Typically, the assessor also provides a face-to-face assessment report at the conclusion of the assessment to the householder. This "kitchen table discussion" is known to improve the likelihood of the householder undertaking improvements in response to their rating. However, this has only been tested for voluntary energy efficiency ratings. It is likely that a vendor selling a property would be less receptive to this discussion in a mandatory disclosure setting where a real estate agent has engaged an assessor on their behalf to comply with disclosure requirements at the point of sale. Our analysis in Section 1 showed evidence of upgrades occurring post purchase, suggesting it is the buyer who is most interested in the information provided with the rating.

The NatHERS In Home scheme will launch in mid-2023 and it is anticipated that the first NatHERS accredited In Home tool will be the Residential Efficiency Scorecard. After mid-2023 other tool providers will be able to seek accreditation under NatHERS In Home.



Residential Efficiency Scorecard

Residential Efficiency Scorecard STAR RATING

Address	House Area	Heated Area	Cooled Area
Spring St, Melbourne, VIC, 3000	170m²	170m²	170m²

Assessment Date	Assessment Number	Assessor ID	Assessor Name
19/02/2021	ARN597234	RES2300417	Joe Assessor

Your Home's Scorecard Rating

A higher rating home has lower energy bills

Below average

★★★★★★★★★★

Average home

29

Hot weather comfort rating

This rating indicates how easy it is to keep your home cool in hot weather - without using cooling. A higher rating means your home will stay cool.

Improvement Options

Consider:

+ Upgrading the insulation in your ceilings and walls.
+ Upgrading window treatments to lined curtains with pelmets where not already in place.

Cold weather comfort rating

This rating indicates how easy it is to keep your home warm in cold weather - without using heating. A higher rating means your home will stay warm.

Improvement Options

Consider:

+ Upgrading the insulation in your ceilings and walls.
+ Upgrading window treatments to lined curtains with pelmets where not already in place.
+ Installing weather strip seals to unsealed windows.

Energy production in your home

0%

Solar PV generation:

0% of your home's fixed appliance energy cost is met from renewable energy.

Your home's star rating (2.9)

★★☆☆☆☆☆☆☆☆

Your home's star rating with 2.5kW solar PV (4.7)

For more information about home energy efficiency, contact the Department of Environment, Land, Water and Planning.
Phone: 136 186, email: scorecard@delwp.vic.gov.au or visit vic.gov.au/energyscorecard

Figure 15: Sample RES certificate (front)

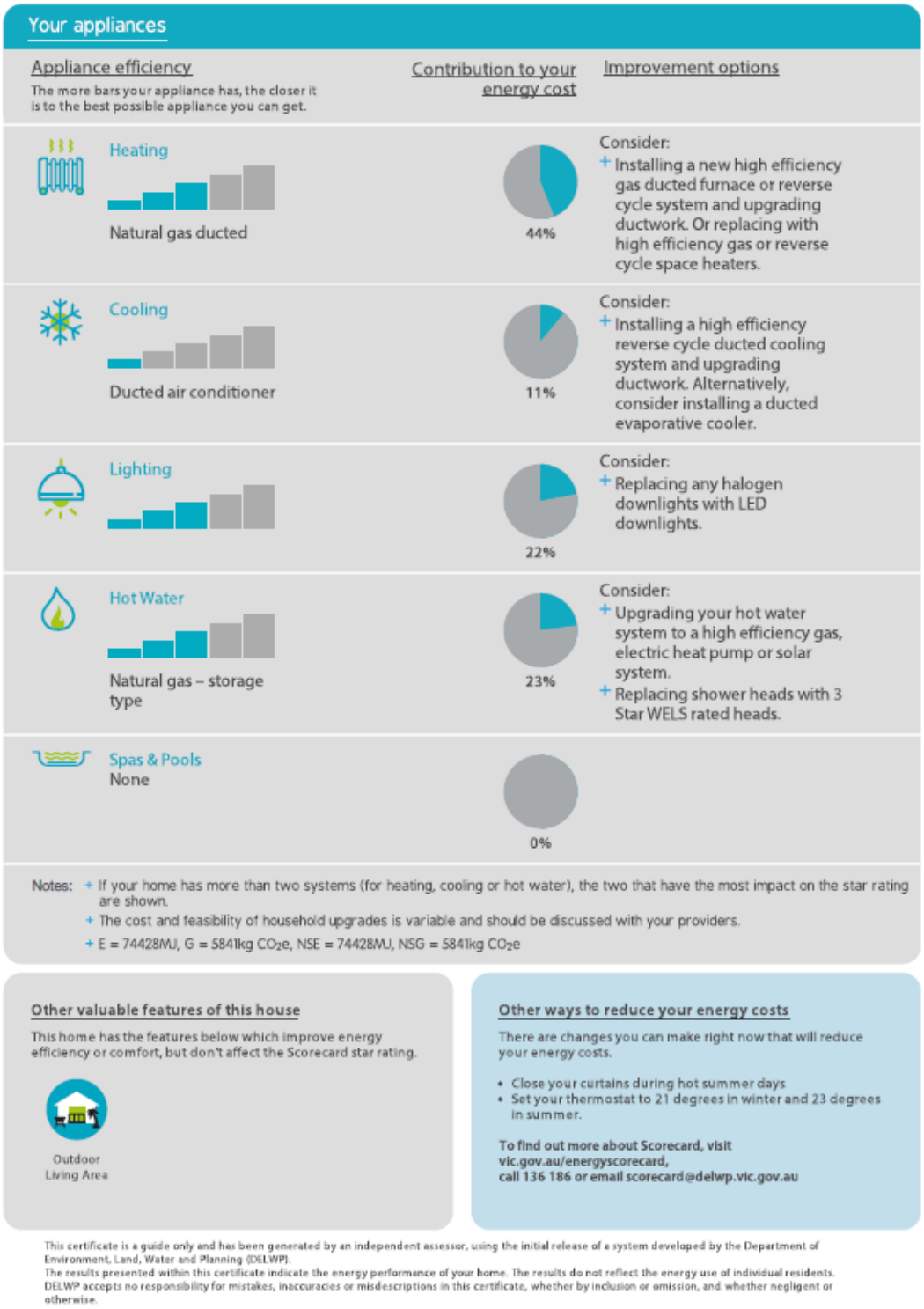


Figure 16: Sample RES certificate (back)

Scope

As noted, RES assessments cover the performance of the building shell, major pieces of equipment and renewable energy sources. The input requirements cover:

- Building shell data:
  - Construction details and materials.
  - Room dimensions.
  - Window information including: size, type, orientation, shading and if there are blinds or curtains.
  - Insulation details.
  - Details relating to air leakage, draughtproofing and ventilation.
- Heating equipment.
- Cooling equipment.
- Hot water equipment.
- Lighting.
- Pool and or spa equipment.
- Solar power.

The rating does not consider the energy consumption or efficiency of plug-in appliances such as TVs and Refrigerators which typically account for about 25% of energy demand in a dwelling. This means that the RES rating covers approximately 75% of all energy use in a typical ACT dwelling.

Metrics and rating scales

Unit of Measurement $/year

The metric used in the RES is the estimated operational cost of the dwelling as a whole, per annum. The Scorecard has a rating scale from 1 to 10 stars. Stars are graded as a percentage of the 3-star level which designates an average energy cost for the particular jurisdiction (see Table 13 and Figure 17).

Table 13: Relative Scorecard star ratings

Scorecard star rating	Percentage of 3-star rating
1	300%
2	200%
3	100%
4	75%
5	60%
6	45%
7	30%
8	15%
9	0%
10	-13%

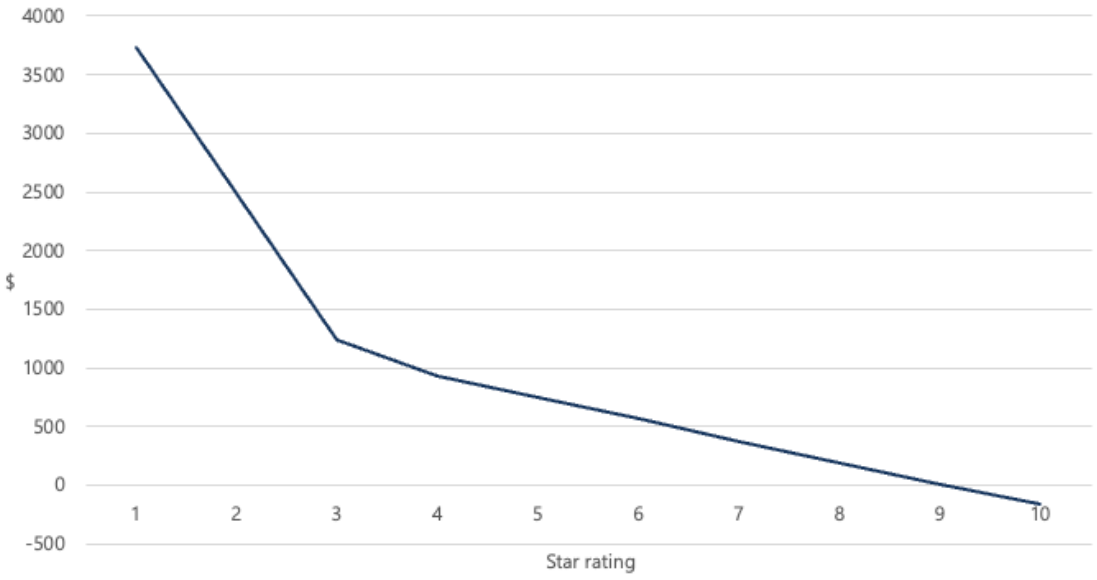


Figure 17: Operational cost versus star rating - Residential Energy Scorecard (based on ACT energy prices)
Note: This chart shows the scale using the current RES assumption for the ACT of an average energy cost (3-star level) of $1243.96 – this is currently under review and is likely to be increased.

Comparative analysis

Table 14 below summarises the key considerations against each of our analysis criterions for the Residential Energy Scorecard.

Table 14: Residential Energy Scorecard effectiveness, efficiency, equity and ease of implementation considerations

Criteria	Considerations
Effectiveness	• Scope covers appliances, PV solar and thermal shell (doesn't currently include battery storage) – covers around 70-80% of an average home's energy use (compared to 40% FirstRate4). • Would need to be adapted for the ACT to promote electrification of appliances (with a 100% renewable electricity supply, while ensuring the cost benefits of PV are still considered). • Less rigorous building shell assessment and estimate of thermal load compared to existing NatHERS tools that use hourly simulation data. However, this does reduce the data input requirements and cost of the ratings slightly. • Less rigorous assessment of impacts of onsite energy generation impacts compared to NatHERS Whole of Home tools that use dynamic hour by hour modelling. • Report provides improvement options for both thermal shell and appliances (again these would need to be tailored to the ACT to ensure gas appliances are not recommended).
Efficiency	• Administered by the Victorian Government – Scorecard team currently manages auditing (3 assessors per quarter) – unlikely to scale up. Plan to transition to AAOs once Scorecard is NatHERS accredited. • If ACT were to adopt Scorecard now, Access Canberra would need to administer.
Equity	• Cost of an assessment quoted between $250 to $500 depending on the size of the home – likely not prohibitive. • Information on the EER report is easy to understand. • Includes low-cost options for renters and low-income households e.g., drapes, pelmets, door seals. • Smaller homes will receive higher ratings than larger homes (all other things being equal), since the rating is based on energy cost rather than a cost per unit floor area – this is not necessarily a bad thing, but it is currently under review.

Criteria	Considerations
Ease of implementation	• Software is still under development and will likely need to be amended to gain accreditation under the NatHERS In Home scheme. • Current model may be difficult to scale to cover a mandatory scheme in the ACT – there are currently 3 Scorecard assessors based in the ACT and 2 more in Sydney that service the ACT by request (107 accredited assessors nationally). • Time onsite is impractical for assessors that need to complete all 4 reports (pest, building, compliance and EER) – assessors have suggested they could only do 1 assessment per day (as opposed to 3 per day with FirstRate4). • Assessor training and accreditation would need to transition to RTOs and AAOs (or to Access Canberra) if Scorecard were adopted for the ACT scheme – currently provided by Victorian Government.

Key takeaways

- The scope of the RES is well-aligned with ACT policy goals but would need to be tweaked to ensure it promotes electrification.
- Cost of delivery is likely too high for ACT assessors. They would be required to spend additional time onsite, which would reduce the number of assessments they could perform in a day.
- May be difficult to scale. Currently delivered by the Victorian Government on a voluntary basis. They would not be able to support delivery for the whole of the ACT. Would require shared responsibility with Access Canberra.

2.5 NatHERS Whole of Home

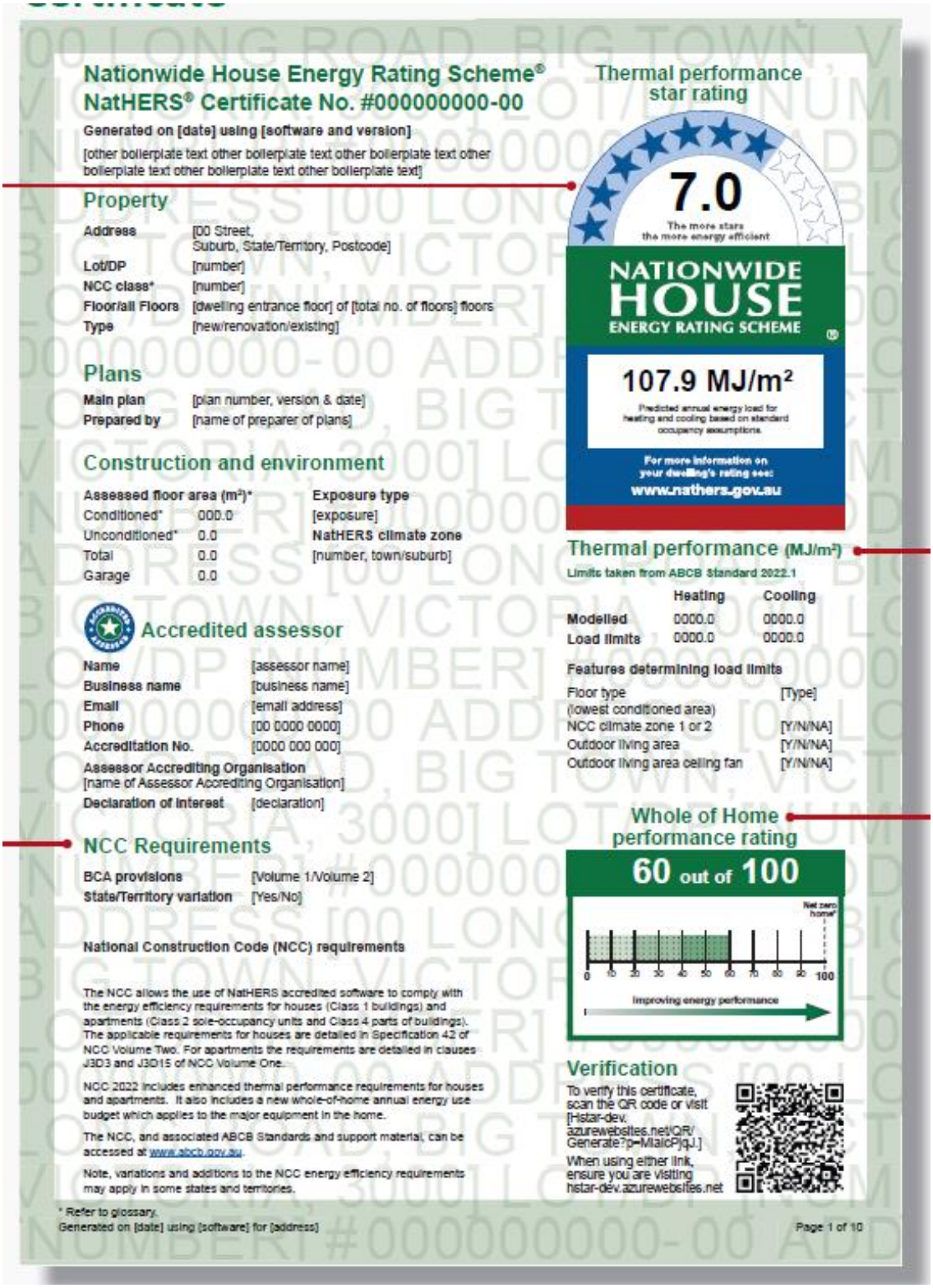
Overview

NatHERS Whole of Home software tools (currently under development for release late 2023 in time for the latest NCC 2022 energy efficiency whole of home performance requirements) builds on the existing NatHERS thermal performance assessment tools by assessing and providing information not just in relation to the building shell thermal performance but also in relation to installed equipment and on-site energy generation and storage.

NatHERS does not require tool developers to provide tailored recommendations for improvements, but it is expected that some tool developers will offer such capacity as part of their software packages. NatHERS Whole of Home assessments will be delivered by government-accredited assessors.

The software tool generates ratings based on a unique 0–100 point scale for homes. A sample of the rating certificate can be found in Figure 18 and Figure 19 below. The tool provides not only a rating out of 100 but also the following features:

- A separate building shell only performance assessment (out of ten stars)
- Percentage contribution of the key energy using pieces of equipment to the:
    - Energy
    - Greenhouse gas emissions
    - Operational cost



Nationwide House Energy Rating Scheme®
NatHERS® Certificate No. #000000000-00

Generated on [date] using [software and version]

[other boilerplate text other boilerplate text other boilerplate text other boilerplate text other boilerplate text other boilerplate text other boilerplate text]

Property

Address	[00 Street, Suburb, State/Territory, Postcode]
Lot/DP	[number]
NCC class*	[number]
Floor/all Floors	[dwelling entrance floor] of [total no. of floors] floors
Type	[new/renovation/existing]

Plans

Main plan	[plan number, version & date]
Prepared by	[name of preparer of plans]

Construction and environment

Assessed floor area (m²)*		**Exposure type**
Conditioned*	000.0	[exposure]
Unconditioned*	0.0	**NatHERS climate zone**
Total	0.0	[number, town/suburb]
Garage	0.0	

Accredited assessor

Name	[assessor name]
Business name	[business name]
Email	[email address]
Phone	[00 0000 0000]
Accreditation No.	[0000 000 000]

Assessor Accrediting Organisation
[name of Assessor Accrediting Organisation]

Declaration of interest [declaration]

NCC Requirements

BCA provisions	[Volume 1/Volume 2]
State/Territory variation	[Yes/No]

National Construction Code (NCC) requirements

The NCC allows the use of NatHERS accredited software to comply with the energy efficiency requirements for houses (Class 1 buildings) and apartments (Class 2 sole-occupancy units and Class 4 parts of buildings). The applicable requirements for houses are detailed in Specification 42 of NCC Volume Two. For apartments the requirements are detailed in clauses J3D3 and J3D15 of NCC Volume One.

NCC 2022 includes enhanced thermal performance requirements for houses and apartments. It also includes a new whole-of-home annual energy use budget which applies to the major equipment in the home.

The NCC, and associated ABCB Standards and support material, can be accessed at www.abcb.gov.au.

Note, variations and additions to the NCC energy efficiency requirements may apply in some states and territories.

Thermal performance star rating

7.0

The more stars the more energy efficient

NATIONWIDE HOUSE ENERGY RATING SCHEME®

107.9 MJ/m²

Predicted annual energy load for heating and cooling based on standard occupancy assumptions

For more information on your dwelling's rating see:
www.nathers.gov.au

Thermal performance (MJ/m²)

Limits taken from ABCB Standard 2022.1

	Heating	Cooling
Modelled	0000.0	0000.0
Load limits	0000.0	0000.0

Features determining load limits

Floor type (lowest conditioned area)	[Type]
NCC climate zone 1 or 2	[Y/N/NA]
Outdoor living area	[Y/N/NA]
Outdoor living area ceiling fan	[Y/N/NA]

Whole of Home performance rating

60 out of 100

Net zero home*

0 10 20 30 40 50 60 70 80 90 100

Improving energy performance

Verification

To verify this certificate, scan the QR code or visit [hstar-dev.azurewebsites.net/QR/Generate?p=MlaicPJqJ.]

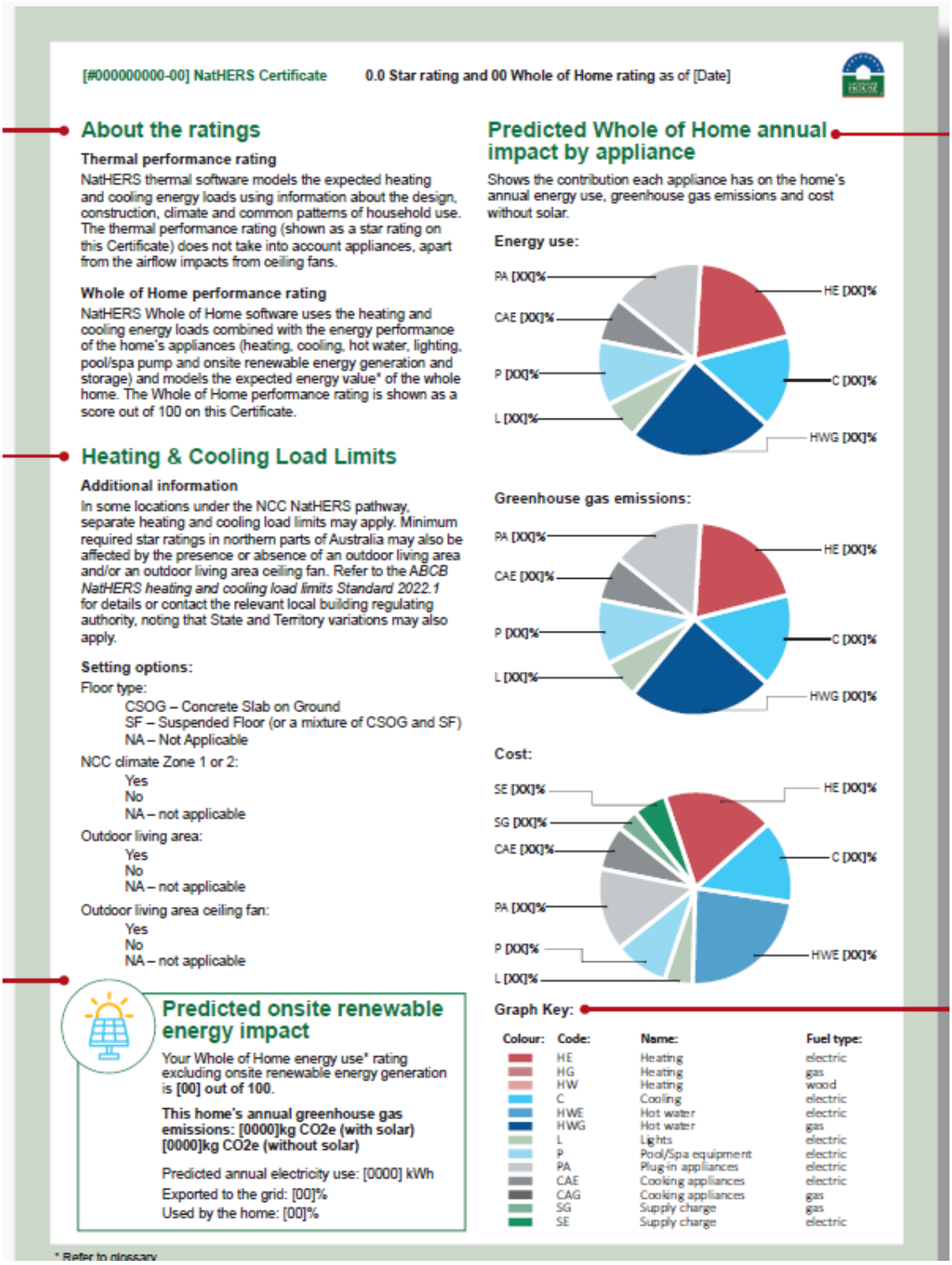
When using either link, ensure you are visiting hstar-dev.azurewebsites.net

* Refer to glossary.

Generated on [date] using [software] for [address]

Page 1 of 10

Figure 18: NatHERS Whole of Home rating certificate (front)



[#000000000-00] NatHERS Certificate 0.0 Star rating and 00 Whole of Home rating as of [Date]

About the ratings

Thermal performance rating

NatHERS thermal software models the expected heating and cooling energy loads using information about the design, construction, climate and common patterns of household use. The thermal performance rating (shown as a star rating on this Certificate) does not take into account appliances, apart from the airflow impacts from ceiling fans.

Whole of Home performance rating

NatHERS Whole of Home software uses the heating and cooling energy loads combined with the energy performance of the home's appliances (heating, cooling, hot water, lighting, pool/spa pump and onsite renewable energy generation and storage) and models the expected energy value* of the whole home. The Whole of Home performance rating is shown as a score out of 100 on this Certificate.

Heating & Cooling Load Limits

Additional information

In some locations under the NCC NatHERS pathway, separate heating and cooling load limits may apply. Minimum required star ratings in northern parts of Australia may also be affected by the presence or absence of an outdoor living area and/or an outdoor living area ceiling fan. Refer to the *ABCB NatHERS heating and cooling load limits Standard 2022.1* for details or contact the relevant local building regulating authority, noting that State and Territory variations may also apply.

Setting options:

Floor type:
- CSOG – Concrete Slab on Ground
- SF – Suspended Floor (or a mixture of CSOG and SF)
- NA – Not Applicable

NCC climate Zone 1 or 2:
- Yes
- No
- NA – not applicable

Outdoor living area:
- Yes
- No
- NA – not applicable

Outdoor living area ceiling fan:
- Yes
- No
- NA – not applicable

Predicted onsite renewable energy impact

Your Whole of Home energy use* rating excluding onsite renewable energy generation is **[00] out of 100.**

This home's annual greenhouse gas emissions: [0000]kg CO2e (with solar) [0000]kg CO2e (without solar)

Predicted annual electricity use: [0000] kWh

Exported to the grid: [00]%

Used by the home: [00]%

Predicted Whole of Home annual impact by appliance

Shows the contribution each appliance has on the home's annual energy use, greenhouse gas emissions and cost without solar.

Energy use:

Greenhouse gas emissions:

Cost:

Graph Key:

Colour:	Code:	Name:	Fuel type:
	HE	Heating	electric
	HG	Heating	gas
	HW	Heating	wood
	C	Cooling	electric
	HWE	Hot water	electric
	HWG	Hot water	gas
	L	Lights	electric
	P	Pool/Spa equipment	electric
	PA	Plug-in appliances	electric
	CAE	Cooking appliances	electric
	CAG	Cooking appliances	gas
	SG	Supply charge	gas
	SE	Supply charge	electric

* Refer to glossary

Figure 19: NatHERS Whole of Home rating certificate (back)

Scope

As noted, the NatHERS whole of home assessment builds on the existing NatHERS thermal performance assessment by providing information about and rating the energy use of the following appliances:

- Heating equipment
- Cooling equipment
- Hot water systems
- Lighting equipment
- Pool/spa pumps
- On-site energy generation and storage

Cooking and plug-in appliances are also factored into the calculations but for the initial release (and for regulatory purposes) only default assumptions regarding energy use by these end uses will be used (i.e., there will be no capacity to specify cooking or plug-in equipment types or gain credits for the use of high efficiency plug in equipment such as refrigerators and TVs). Effectively, the rating at this stage does not account for variations in the efficiency and energy consumption of plug-in appliances such as TVs and refrigerators which typically account for approximately 25% of energy demand in a dwelling. This means that the NatHERS Whole of Home rating covers approximately 75% of all energy use in a typical ACT dwelling.

Metrics and rating scales

Unit of Measurement: Societal Cost ($)/year

The metric used in the NatHERS Whole of Home rating tools is what is called the societal cost of consumed energy. This is quite similar to the simple operational cost used in RES, but with some subtle differences:

- Energy costs used in the calculations are not a simple flat rate but are varied according to time of use. During hours of expected high network demand, higher cost rates (at least for electricity) are applied, compared to hours of low network demand (e.g., overnight).
- Added to the energy cost is a dollar cost attributable to the greenhouse gas emissions from the particular fuel type used. These values are relatively low (having been adopted in 2019) and therefore only add between 5% to 10% to the overall societal cost.

The NatHERS Whole of Home tool has a rating scale from 1 to 100 points with a provision for extension above 100 points for dwellings where the societal cost is negative (i.e., for homes that generate energy onsite and feed back into the grid). Typically, such dwellings would have efficient building shells (7 + stars), efficient appliances and a significant PV capacity (possibly with battery storage).

The rating scale is set as follows:

- The 50-point score is defined by a building shell performance of 7 stars combined with 3 star rated heat pump heating and cooling (GEMS 2019 – approx. 4.5 stars for GEMS 2013) and a 5-star rated gas instantaneous water heater. There are no pools or spas and

no PVs installed (this combination is known as the “benchmark equipment”). A 50-point score is the minimum requirement for class 2 dwellings under NCC 2022.

- The 0-point score is defined by a building shell performance of 1 star combined with poor appliance selections (not including resistance electric space heating) - for Canberra this equates to 3.609 x 50-point score value.
- The 100-point score is defined by a dwelling that produces zero net societal cost.
- A score of 60 points is the minimum requirement for class 1 dwellings under NCC 2022 and is defined as 70% of the 50-point score societal cost.
- Values between 0 and 50 points and 50 and 100 points are simply defined by a linear regression between these points.

In terms of an average sized detached dwelling in Canberra the actual societal costs by point score ratings are shown in Table 15 and graphically in Figure 20.

Table 15: NatHERS WoH points versus societal cost (based on an average size detached dwelling in the ACT)

NatHERS WoH point score	Societal cost (per annum)
0	$5,549
10	$4,747
20	$3,944
30	$3,142
40	$2,340
50 (NCC 2022 Class 2 minimum standard)	$1,538
60 (NCC 2022 Class 1 minimum standard)	$1,076
70	$807
80	$538
90	$269
100	$0

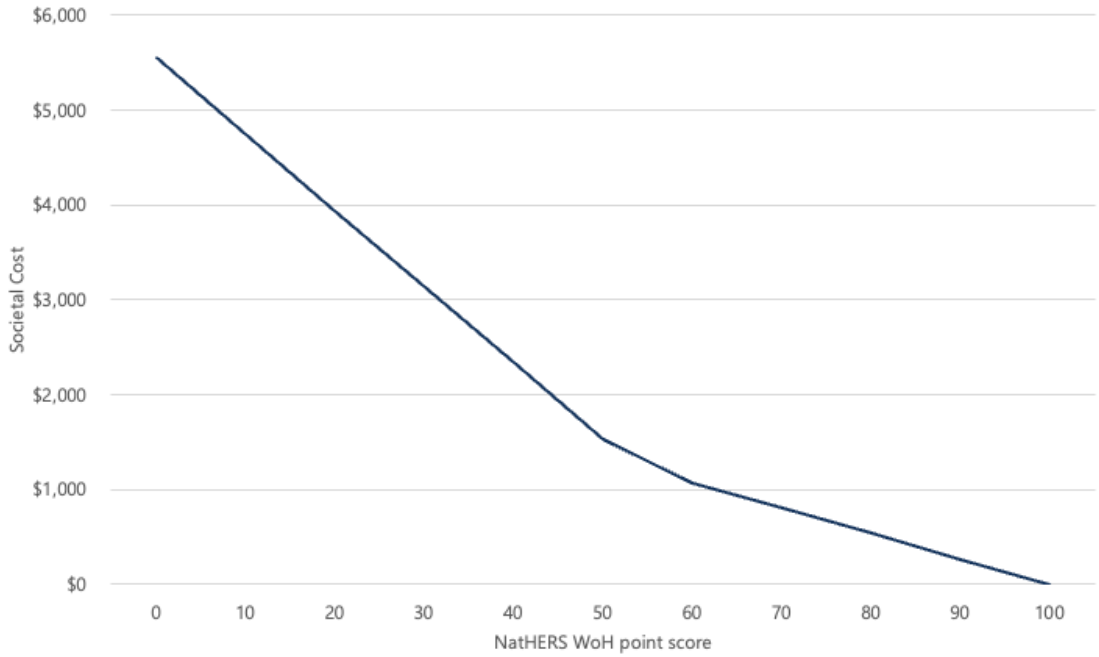


Figure 20: NatHERS WoH point score versus annual societal cost (average sized ACT detached dwelling)

Comparative analysis

Table 16 below summarises the key considerations against each of our analysis criterions for NatHERS Whole of Home.

Table 16: NatHERS Whole of Home effectiveness, efficiency, equity and ease of implementation considerations

Criteria	Considerations
Effectiveness	• Scope covers appliances, PV solar, and thermal shell – covers 70-80% of home's energy use (compared to 40% FirstRate4). • Would need to be adapted for ACT to promote electrification of appliances (100% renewable energy supply) and to ensure cost benefits of PV are still considered. • NatHERS doesn't require upgrade recommendations on certificates, but future tool developers can elect to do this. • Certificate includes a score out of 100 (heating and cooling loads and energy performance of appliances) and a separate thermal shell star rating. This may be confusing for the ACT market that are used to 0-6 star rating.

Criteria	Considerations
Efficiency	• NatHERS administers the scheme (tool accreditation, assessor accreditation). • Could share scheme administration responsibilities with Access Canberra (e.g., audits and compliance).
Equity	• Cost of delivery in an existing home is unknown but would likely be significantly higher than other options due to the onerous input requirements. • Information provided to consumers is not easy to understand (score out of 100 and a star rating).
Ease of implementation	• Official training and accreditation would be available. • Access Canberra could share scheme administration responsibilities with NatHERS and the AAOs. • Time onsite and cost of delivery are likely very high – the scheme is designed for new builds rather than existing homes hence the input requirements are very high. New innovations (e.g., MagicPlan) could reduce input time, but they are still likely to be more onerous than NatHERS In Home tools.

Key takeaways

- The scope of NatHERS Whole of Home is well-aligned with ACT policy goals but would need to be tweaked to ensure it promotes electrification.
- Designed for new builds, not existing homes and input requirements are very high. This would increase cost of delivery for ACT assessors. They would be required to spend additional time onsite, which would reduce the number of assessments they could perform in a day.

2.6 Quantitative comparison of existing tools

The 3 schemes covered in the preceding sections each offer a different scope for improvement. This scope is, to a large degree, limited by the end uses covered by each scheme and also by the scope of the rating scale.

FirstRate4 only covers the performance of the building shell itself which ultimately impacts only heating and cooling energy consumption. Whereas the Scorecard and NatHERS Whole of home also cover a range of other end uses such as water heaters, lighting and pool pumps.

Scorecard and NatHERS Whole of home also account for any installed PVs. This feature allows the rating scale of each of these rating schemes to extend beyond net zero energy use/cost so as to award even higher ratings for dwellings that actually generate more energy than they use and deliver a financial return to the owner rather than a cost. In this way the reduction in energy use/cost can exceed 100% when moving from the lowest rating on the scale to the highest.

FirstRate4 on the other hand extends from 1 star (685 MJ/m2) to 6 stars (174 MJ/m2) which represents a potential maximum saving of 75%. This 75% is also just a saving on heating and cooling energy consumption. Potentially this could be extended by using the current NatHERS star band range that extends to 10 stars. Under this scenario a potential maximum saving of 100% on heating and cooling energy consumption alone could be achieved.

A comparison of the maximum achievable savings when transitioning from the lowest to the highest rating levels in each scheme was undertaken so as to provide an indication of the maximum possible scope for improvement under each scheme. Naturally a householder could undertake improvements beyond the maximum limit of each scheme's rating scale but there would be little incentive to do so.

The basis for comparison was the expected savings in annual energy bills to the householder. The metric used for FirstRate4 is as previously noted MJ/m^2/annum of heat load. For the purposes of the comparison, this was converted to operational costs using the same methodology and assumptions as noted in Section 1.2 of this report.

No conversion is required for the Scorecard as operational cost is already the metric. The metric for NatHERS Whole of Home rating is, as previously noted, "Societal Cost" (see Section 2.5). This is very similar to operational cost (with some adjustments for the real cost of electricity according to time of use) but also includes an additional value placed on the greenhouse gas emissions saved. Effectively, this only adds about 5% to the retail fuel cost because the value of abatement in the Whole of Home system was set at just $12 per tonne and because in the ACT electricity has a very low (if not zero) greenhouse gas intensity. For the purposes of this comparison the societal cost values were discounted by 5% to more accurately reflect actual retail fuel costs experienced by householders.

In addition, it should be noted that the Whole of Home rating includes the cost of operating plug load equipment. This cost (approximately $550 per annum in the ACT) is not something that can be varied by the assessor, it is a default load applied to all dwellings at all rating levels (i.e.,

a fixed offset). Because we are comparing cost savings between two levels of performance this fixed offset for plug loads can effectively be ignored because it is equally applied to both cases.

For each of the rating schemes three levels of performance were compared, these were:

- **Worst case** – the lowest possible rating.
- **Best case** – the best possible rating but with some limitations, as follows:
    - FirstRate4 – up to the maximum under that scheme of 6 stars.
    - Scorecard – up to 9 stars or zero net cost.
    - NatHERS WoH – up to 100 points or zero net societal cost.
- **Extended best case** – the best possible rating without limitations. In the case of Scorecard and NatHERS WoH this would typically include the use of PVs in addition to efficient appliances and an efficient building shell. These options are:
    - FirstRate4 – up to the maximum of 10 stars, effectively zero thermal load. This is possible under FirstRate5 (use of which is currently allowed under the scheme).
    - Scorecard – up to 10 stars or slightly less than zero net cost (included as an incentive for those that go beyond net zero).
    - NatHERS WoH – up to 150 points or significantly less than zero net societal cost (has been proposed by NatHERS to be included in the scheme).

As evident in Table 17 and displayed graphically in Figure 21 below, the potential cost savings for a dwelling increasing from the worst case to best case rating are more than doubled by expanding the scope of the rating beyond just the thermal shell (i.e., moving from FirstRate4 to either Scorecard or NatHERS WoH). Even greater potential cost savings can be achieved under each of the schemes by improving a rating from worst case to extended best case.

Table 17: Comparative analysis of schemes – potential cost savings

Scheme	Worst case	Best case	Extended best case	Worst to best ($ savings)	Worst to extended best ($ savings)
FirstRate4	1 star	6 stars	10 stars	$2,126	$2,849
Scorecard	1 star	9 stars	10 stars	$4,950	$5,165
NatHERS WoH	0 points	100 points	150 points	$5,271	$6,550

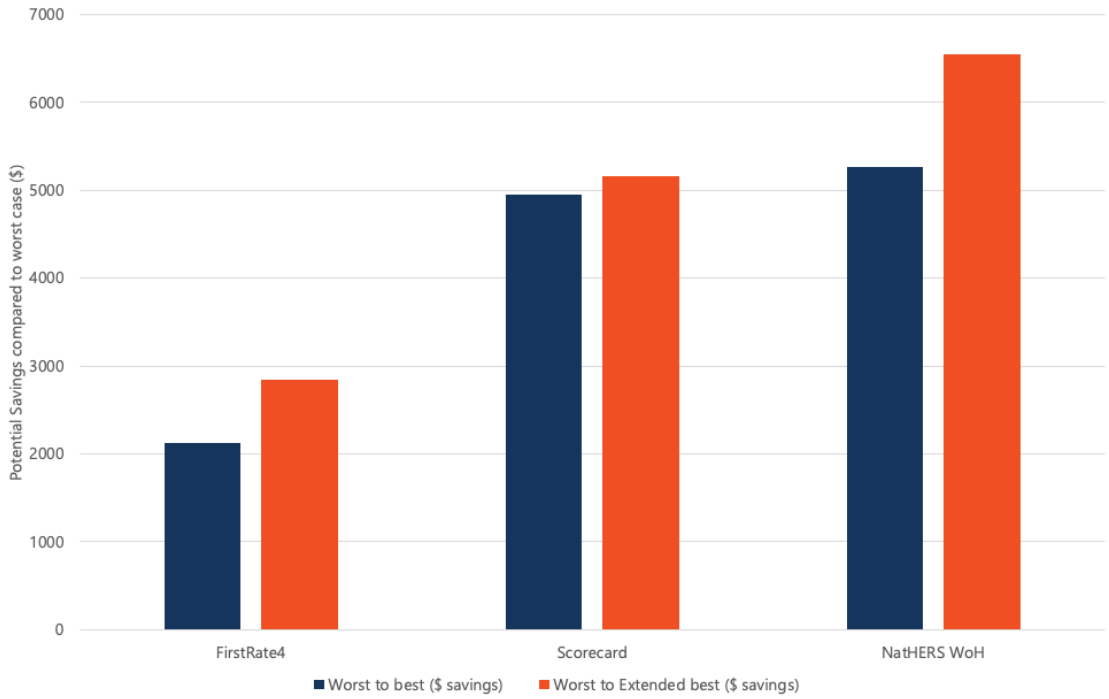


Figure 21: Comparative analysis of schemes - potential cost savings

Key takeaways

- Expanding the scope of the rating to include appliances and PV solar will significantly increase the potential cost savings (and energy and emissions savings) achievable under the scheme.

2.7 Other emerging tools

RapidRate

CSIRO has developed RapidRate using machine learning techniques. It is a statistical model that provides an estimate of a home's heating and cooling load and corresponding star rating (NatHERS rating scale). It requires a smaller number of inputs; hence it can be completed quickly. The inputs are as follows:

- Dwelling type.
- Floor area.
- External wall area by orientation.
- Window area by orientation (including % double glazing).
- Building materials (main wall, floor and roof – including insulation).
- Post code.

RapidRate can be connected to any user interface or application using an application programming interface (API). There are many potential applications for RapidRate, including

providing energy efficiency data to financial institutions to better understand the energy and emissions intensity of their housing portfolios and providing homeowners and renters with energy efficiency information to guide renovation and upgrade decision-making.

It is possible that the development of RapidRate could lead to the involuntary disclosure of energy efficiency rating estimates for every home across Australia. There are considerable benefits to this in jurisdictions that are yet to introduce disclosure schemes – e.g., providing information to homeowners and renters that is not currently accessible. However, involuntary disclosure of rating estimates is likely to have implications for the ACT market where EER disclosure is already mandated. There is likely to be considerable confusion in the market when rating estimates that are notably different to those determined by onsite assessors and reported on EERs are disclosed. If, for example, someone is viewing an online property listing and sees a RapidRate rating of 3 stars and an EER of 2 stars, then this will cause confusion, while also undermining consumer trust in the credibility of the ACT disclosure scheme.

Implications for the ACT

- Confusion in the market if RapidRate ratings are involuntarily disclosed for ACT homes – these ratings will likely be different to EERs.

Actions to consider:

- Engage with CSIRO to get them to agree not to involuntarily disclose RapidRate ratings in the ACT.
- If unsuccessful, then engage with CoreLogic and the property websites (All Homes, Domain, RealEstate.com etc. to ask them not to incorporate RapidRate ratings in the ACT).

Magic Plan

CSIRO is currently working with MagicPlan on a tool to perform faster data entry into the AccuRate software for existing buildings. The tool would enable an assessor to wander around a house picking corners of rooms to generate 3D geometry and window and door locations. This information would then be used to pre-populate AccuRate and generate a certificate. This would significantly reduce the time required onsite to produce an energy efficiency assessment report. This is likely to be able to be integrated into other rating tools in the future, in addition to AccuRate.

Implications for the ACT

- Could make existing and future rating tools (e.g., NatHERS “In Home”) more fit-for-purpose in the ACT by reducing the cost of delivery (time required onsite).

common capital

SECTION 3

Summary of opportunities and approach to scheme reform

This section summarises findings and opportunities for improvement tabled throughout section 1 and 2 and highlights some key additional actions to consider moving forward.

3.1 The ACT should retain mandatory disclosure

There was near unequivocal support amongst interviewees for retaining mandatory disclosure. Assessors and agents stated that there were some issues with the scheme related to the unsupported software and the limited scope of FirstRate4. However, they agreed that overall, the scheme is a success and it has broad market support. There are aspects of the scheme that are working particularly well, as evidenced by the extremely high compliance in the sales market and the reported increasing awareness and interest in energy efficiency and ratings.

This review has demonstrated a modest improvement in average ratings for both class 1 and class 2 dwellings attributable to the scheme. The scheme is delivering against critical ACT policy goals that align with the Climate Change Strategy and ACT net zero commitments. Abandoning the scheme would require alternative policy activity to achieve these same goals.

The ACT has committed to disclosure under the Trajectory for Low Energy Buildings. If the current scheme were abandoned there may be pressure at a national level to reintroduce it later on. Retaining the current scheme which has broad market engagement and support and

transitioning to a new framework when it is finalised will be much simpler, and far less disruptive, than removing and then reintroducing disclosure.

3.2 Continuing with FirstRate4 is not feasible long-term

FirstRate4 is no longer supported by NatHERS, creating operational challenges

FirstRate4, the current legislated tool, is no longer supported by NatHERS for accreditation and training and requires workarounds to run on current computer operating systems. This creates challenges for new assessors wanting to enter the market. Ideally any software used for a mandatory disclosure scheme would have a long-term software development pathway and provide access to official tool training and assessor accreditation processes.

Existing assessors have their own versions of the software and training resources and have developed workarounds to be able to continue using FirstRate4 to deliver assessments. The assessors we spoke to had different perspectives on whether this was an issue. One claimed that they didn't need official training and certification processes as they had enough experience within their agency to continue training new assessors. They stated that they were delivering high quality assessments using FirstRate4 and there was no need for change. There is likely some underlying bias in this perspective as changes to the scheme that improved accessibility for new assessors may impact on their market share.

On the other hand, the other assessors and AAO representatives that we spoke with stated that while they were still able to use FirstRate4 to deliver reasonable ratings, the software isn't sustainable long-term. They supported switching to a new assessment tool when one was available and feasible for use in existing homes.

ACT policy goals require a whole of home tool to drive electrification

Another reason for adopting a new tool in the long-term is to expand the scope to whole of home. Expanding the scope of the assessment tool will be required for the scheme to be able to drive electrification and additional health outcomes associated with electrification, in line with the ACT's Powering Canberra policy. FirstRate4 only provides an assessment of the home's thermal shell which can drive emissions reductions and energy savings through reduced need for space heating and cooling, but excludes efficiency improvements in other fixed appliances (e.g., hot water, cooking and solar PV). Continuing with FirstRate4 long-term will limit the ability of the scheme to deliver and reward greater energy efficiency improvements in existing homes.

3.3 Making multiple changes over time will be disruptive

Existing tools would require operational modifications for imminent use in a mandatory scheme for existing homes

As discussed in section 2, the current whole of home rating tools are either not designed for use in existing homes or are not designed for a mandatory disclosure scheme. They consider fuel type and include appliances and solar PV, which would enable the ACT to drive electrification through the scheme, but they would need to be refined to ensure that the cost of delivery is reduced in line with current EER delivery costs. Assessors in the ACT complete the EER alongside the pest, building and compliance assessments. Using FirstRate4 they are able to complete three onsite assessments per day. They suggested that if they were using the currently available whole of home tools, then they would only be able to complete one assessment per day, potentially tripling their cost of delivery.

Other operational modifications would also be required. For example, the Residential Energy Scorecard is currently administered by the Victorian Government on a voluntary basis. This system would not be able to be scaled up to service the entire ACT disclosure market without a considerable increase in resourcing. There are also only a handful of accredited Scorecard assessors servicing the ACT region at present. NatHERS Whole of Home would require similar operational modifications to be used in existing homes. Like Scorecard, the input requirements are considerably more onerous than for FirstRate4.

Continue using FirstRate4 in the short-term to avoid multiple disruptive changes

FirstRate4 is still being used to successfully deliver energy assessments to most ACT homes. The software is no longer supported by NatHERS for accreditation and training and requires workarounds to run on current computer operating systems. However, the major existing ACT assessors are able to use existing training resources and virtual operating systems to successfully provide over 8,000 FirstRate4 assessments per year to vendors. A new tool will need to be adopted eventually so that the scope can be expanded to consider fuel type and include whole of home and the scheme can help to drive electrification. However, all interviewees stated that the scheme should only change once. They agreed that multiple changes, e.g., adopting another tool in the short-term and transitioning to NatHERS In Home when it is finalised, would be too disruptive for the market and cause unnecessary confusion. The ACT Government could make existing FirstRate4 training resources and virtual operating systems available in the short-term to remove barriers to entry for new assessors and support ongoing compliance until a new tool can be adopted that is fit-for-purpose for rating existing homes in a mandatory scheme.

Increase resourcing and strengthen auditing and compliance in line with best practice

Best practice disclosure is complete public disclosure. Publishing ratings that are lodged by assessors with Access Canberra, and making these available in a centralised public database

would provide a helpful data source for scheme monitoring and evaluation. It could also help to improve compliance in the rental market and connect more renters with energy efficiency information about their home. Attaching EERs to the building file will also help to strengthen compliance and will allow for the tracking of individual properties' improvement in rating over time. This was a suggestion made by one of the assessor agencies interviewed for this review.

Best practice processes for auditing and compliance of mandatory disclosure schemes have evolved since the ACT scheme was first introduced. Standard best practices (e.g., NABERS audits for the Commercial Building Disclosure scheme) include two levels:

- Level 1 audit – applies to 100% of ratings – checking correct processes have been used and ensuring no data entry errors. For the ACT scheme this could involve checking assessors have used the legislated assessment tool and that the disclosed rating (in property advertising) matches the lodged EER report.
- Level 2 audit – applies to 5% of ratings – a panel of external auditors conduct a second onsite assessment for 5% of ratings. These ratings are selected randomly with some chosen based on identified or suspected risk.

Increased resourcing would likely be required for Access Canberra to align with best practices and ensure two level audits can continue to occur moving forward.

3.4 Align with NatHERS "In home" accredited when ready

Actively engage with NatHERS and the REEDI to ensure the In Home scheme meets ACT requirements

The NatHERS In Home scheme is currently under development as part of the Draft National Framework for Disclosure of Residential Energy Efficiency Information. The scheme is being designed for jurisdictions to adopt for voluntary residential energy efficiency disclosure. The ACT Government should actively engage with NatHERS and the Residential Energy Efficiency Disclosure Initiative (REEDI) to ensure the eventual tool, assessor training, accreditation and auditing frameworks of the NatHERS In Home scheme are suitable for the ACT. As the only jurisdiction with a mandatory disclosure scheme, the ACT is likely to be the largest user of NatHERS In Home. As such, they should have a critical role in the ongoing development of the scheme and the National Framework.

ACT should also facilitate engagement between NatHERS, the REEDI and existing ACT assessors. ACT assessors are one of the only group of assessors in the country that are routinely rating existing homes and the only group that are doing so under a mandatory disclosure scheme. The assessors we spoke to for this review have had no involvement with the National Framework to date but expressed interest in consultation. Onsite energy efficiency assessments are very different to the off-the-plan assessments done by NatHERS assessors under the NCC. There are also some critical differences between the requirements for a mandatory assessment compared to a voluntary assessment. This review has found that there is a slight difference in the theory of change for a mandatory disclosure scheme, compared with

a voluntary scheme. In a voluntary scheme, the consumer is engaged, and has willingly invited an assessor into their home to provide them with information on how they could improve the efficiency of their home. The information is for the homeowner, and they are likely to take action as a result of the assessment. In the mandatory ACT scheme, we have found that vendors aren't upgrading their homes to sell but that buyers are using the information provided in the EER to upgrade post purchase.

Conduct detailed focus group and UX design with households, agents and installers on the form of the rating certificate

Real estate agents reported that consumers find the current EER reports easy to understand. They also provide specific and actionable information that have not only increased market literacy of energy efficiency in the ACT but have also led to buyers upgrading their homes post purchase. It is critical that a similar form of rating certificate is provided when the scheme aligns with NatHERS In Home. EPSDD can engage with accredited NatHERS In Home tool providers to design a certificate which provides information similar to current EER reports, that is both easy to understand and actionable. UX design and focus group testing of certificates will ensure that the information provided to consumers will drive change and lead to maximum scheme impact on ACT policy goals.

Fund a major market and consumer education campaign to avoid breaking existing market engagement, literacy, and trust

One of the biggest successes of the scheme to date is the level of market engagement, literacy and trust that has been built amongst consumers and real estate agents in the ACT. This is one of the most difficult parts to build in a disclosure scheme and the ACT scheme has succeeded. There is a high level of understanding amongst both consumers and real estate agents as to what the ratings represent. Both groups are able to distinguish between good, average and bad ratings and they have a reasonable understanding of the types of things that can be done to improve performance. Expanding the scope of ratings to include whole of home and possibly changing the form of the rating (e.g., from 0-6 stars to 0-10 stars or to a score out of 100) is likely to cause confusion in the market and risk breaking the high level of engagement and trust that has been built up over 25 years. A major market and consumer education campaign will be required both prior to adopting a new tool and post adoption to ensure that consumer and real estate agent engagement and understanding are maintained. Further, that the scheme is able to deliver even greater emissions, energy and health outcomes for the ACT moving forward.

References

[1] Australian Government, “CBD Registers,” [Online]. Available: https://www.cbd.gov.au/registers. [Accessed 22 March 2023].

[2] ACT Government, “Energy Efficiency,” [Online]. Available: https://www.planning.act.gov.au/build-buy-renovate/for-industry/requirements-and-responsibilities/energy-efficiency. [Accessed 13 November 2022].

[3] Australian Bureau of Statistics, “Total Value of Dwellings,” [Online]. Available: https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/total-value-dwellings/latest-release#mean-dwelling-price. [Accessed 21 March 2023].

[4] Legislative Assembly for the Australian Capital Territory, “Legislative Assembly for the ACT: 1997 Week 13 Hansard (3 December),” 3 December 1997. [Online]. Available: https://www.hansard.act.gov.au/hansard/3rd-assembly/1997/HTML/week13/4404.htm. [Accessed 22 March 2023].

[5] “ACT Climate Change Strategy 2019-25,” ACT Government, Canberra, 2019.

[6] ACT Government, “Powering Canberra: Our pathway to electrification,” [Online]. Available: https://energy.act.gov.au/. [Accessed 13 November 2022].

[7] F. Fuerst and H. Adan, “Do House Prices and Rents in the Private Rented Sector Reflect Energy Efficiency Levels?,” University of Cambridge, London, 2017.

[8] F. Fuerst and G. Warren-Myers, “Does voluntary disclosure create a green lemon problem? Energy-efficiency ratings and house prices,” *Energy Economics,* vol. 74, pp. 1-12, 2018.

[9] S. Puller, J. West and E. Myers, “Mandatory energy efficiency disclosure in housing markets,” 15 November 2020. [Online]. Available: https://cepr.org/voxeu/columns/mandatory-energy-efficiency-disclosure-housing-markets. [Accessed 27 February 2023].

[10] Energy Efficiency Council, “Further, faster, together: Opportunities for collaboration between Germany and Australia on energy efficiency in buildings,” Melbourne, 2021.

[11] Sustainability Victoria, “The Victorian Healthy Homes Program: Research findings,” August 2022. [Online]. Available: https://assets.sustainability.vic.gov.au/susvic/Report-Energy-Victorian-Healthy-Homes-program-research.pdf. [Accessed 27 February 2023].

[12] J. Backhaus, C. Tigchelaar and M. de Best-Waldhober , “Key findings & policy recommendations to improve effectiveness of Energy Performance Certificates & the Energy Performance of Buildings Directive,” Intelligent Energy Europe, 2011.

[13] S. Zuhaib, S. Schmatzberger, J. Volt, Z. Toth and L. Kranzl, “Next-generation energy performance certificates: End-user needs and expectations,” *Energy Policy,* vol. 161, 2022.

[14] B. Atanasiu and T. Constantinescu, “a comparative analysis of the energy performance certificates schemes within the European Union: implementing options and policy recommendations,” *ECEEE 2011 Summer Study,* 2011.

[15] ACT Government, “ACT Wellbeing Framework,” Canberra, 2020.

common capital

Appendix one – scheme impact assessment methodology

Our approach

To gauge the estimated impact of the existing scheme the following approach was taken:

Step 1

Determine the average increase in home rating that can be attributed to the mandatory disclosure scheme. The methodology and results of this analysis were described in Section 1.2.

Step 2

The savings in thermal load were estimated using the curve below that relates star rating and thermal load (MJ/m^2/annum).

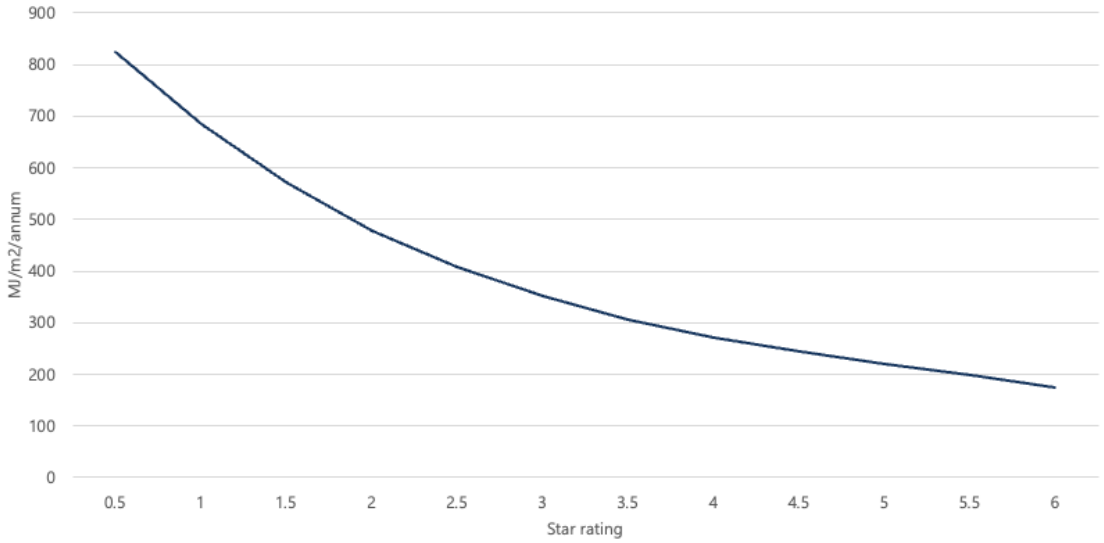


Figure 22: Thermal load versus star rating - FirstRate4 (NatHERS)

Step 3

These savings in thermal load were then discounted by 15% to account for the fact that the NatHERS rating assumes that the dwelling is occupied 24 hours a day (although not all zones within the dwelling are assumed to be continuously occupied, e.g., living spaces - 7am until Midnight, bedroom spaces - 4pm until 9am). While these settings are adequate for comparative rating purposes, they are not considered adequate for the purposes of estimating actual space heating and cooling loads expected to prevail in an average household[1]. On average, householders would occupy their dwellings somewhat less than the hours of occupancy assumed in the default settings in NatHERS. The impact of this lower occupancy would reduce the expected space conditioning load. However, this reduction is less than one might expect due to the fact that an unoccupied dwelling will to some degree store heat gained or lost during hours of non-occupancy, and this heat surplus or deficit will then be addressed once the dwelling is re- occupied.

Step 4

The estimated savings in thermal load were then split into heating and cooling components. Based on analysis undertaken for the EEIS it is estimated that in the ACT heating loads account for between 80% and 90% of all thermal loads and cooling between 10% and 20%[2]. For the purposes of this analysis, it was assumed that heating accounted for 85% of the thermal load and cooling 15%.

[1] In fact, the soon to be released NatHERS Whole of Home tools will use a new more realistic set of occupancy assumptions (including an assumption that about 40% of households are in fact unoccupied during working hours) for estimates relating to Whole of home performance.

[2] This value can vary according to the particulars of the dwelling. For example, a dwelling with high thermal mass tends to have lower cooling loads than a dwelling of lightweight construction, all other things being equal.

Step 5

These estimated savings are in the form of savings per m^2 of conditioned floor area per annum. To convert this to savings per household, estimates of conditioned floor area were applied. The conditioned floor area will vary according to the class of dwelling (i.e. either class 1 or class 2) and the type of equipment installed (i.e. whether or not the conditioner installed is a central type heater/cooler or a space/room type heater/cooler. For this study, based on data used in the EEIS as well as data used in the NCC 2022 study the following estimates of conditioned floor area were applied[3]:

- Class 1 Central conditioning = 150m2 conditioned floor area
- Class 1 Space conditioning = 75m2 conditioned floor area
- Class 2 Central conditioning = 75m2 conditioned floor area
- Class 2 Space conditioning = 45m2 conditioned floor area

Step 6

To estimate actual savings by fuel type, the propensity , conversion efficiency and distribution losses associated with the various heating and cooling equipment types installed in ACT homes needs to be taken into account. Reference was made to analysis undertaken for the EEIS in the ACT to determine these factors. The factors applied in relation to heating equipment are detailed in Table 18 (heating) and Table 19 (cooling).

Table 18: Heating equipment profile in the ACT (EEIS)

Type	Penetration	Efficiency	Losses	Fuel
CENTRAL				
Ducted heating - natural gas	34%	75%	30%	Gas - Natural
Ducted Heating - LPG	0%	75%	30%	Gas - LPG
Ducted - Reverse cycle AC	8%	302%	30%	Electricity
Hydronic - natural gas heater	2%	75%	30%	Gas - Natural
Hydronic - LPG heater	0%	75%	30%	Gas - LPG
Electric panel heating system	9%	100%	0%	Electricity

[3] Whilst some estimates are available in relation to total floor area of dwellings in the ACT, no survey data is available in relation to what proportion of that floor area is actually conditioned. To some extent that will be dictated by the type and capacity of the installed conditioner (which is taken into account) however some professional judgement is also required in arriving at these estimates.

Concrete slab heating	1%	60%	30%	Electricity
SPACE				
Natural gas space heater	12%	73%	0%	Gas - Natural
LP gas space heater	0%	73%	0%	Gas - LPG
Reverse Cycle AC split system	22%	309%	0%	Electricity
Room Air conditioner - in window/in wall - Reverse Cycle	7%	309%	0%	Electricity
Slow combustion wood heater	3%	55%	0%	Wood
Open fireplace	0%	15%	0%	Wood

Table 19: Cooling equipment profile in the ACT (EEIS)

Type	Penetration	Efficiency	Losses	Fuel
CENTRAL				
Ducted air-conditioner (cooling only)	0.55%	294%	30%	Electricity
Ducted air-conditioner (reverse cycle)	11.41%	294%	30%	Electricity
Ducted evaporative cooler	11.81%	1500%	30%	Electricity
SPACE				
Room Air conditioner - in window/in wall - Cooling only	2.43%	321%	0%	Electricity
Room Air conditioner - in window/in wall - Reverse Cycle	8.94%	319%	0%	Electricity
Split system room air-conditioner - Cooling only	2.43%	321%	0%	Electricity
Split system room air-conditioner - Reverse cycle	28.79%	319%	0%	Electricity
Portable Evaporative cooler	5.28%	1200%	0%	Electricity

Step 7

Applying the factors detailed in step 6 above to the thermal load data, then aggregating according to fuel type, savings in energy attributable to the scheme by fuel type can then be determined

Step 8

Once savings by fuel type were determined, then operational cost savings and greenhouse gas emissions savings were calculated by applying the estimated fuel tariffs and estimated greenhouse gas intensity of the various fuel types. For this analysis the following settings were used.

Table 20: Assumed fuel tariffs and emissions intensities (per MJ)

Fuel type	Tariff ($/MJ)	Emissions intensity (kg/MJ)
Electricity	0.0668	0
Gas – Natural	0.0356	0.06433
Gas – LPG	0.07	0.0642
Wood	0.0185	0.0013

common capital

Net Zero And Beyond

Suite 1
471 Harris Street
Ultimo NSW 2007

+61 2 9007 0623

commoncapital.com.au