What are energy performance certificates (EPCs) and why are they important?

Aotearoa New Zealand has over 2 million private homes but there is little detailed information on their year-round thermal performance. Energy performance certificates (EPCs) could fill a knowledge gap for policy makers, incentivise housing stock improvements and help reduce emissions.

There is limited granular data about the performance of our homes, but we do know that many New Zealand houses are cold. A recent research report by BRANZ from the Household Energy End-use (HEEP2) study found that nearly half of study respondents experienced colder-than-desired indoor conditions during winter and often experienced problems of dampness, condensation and mould. Within the HEEP2 study, most households reported heating their main living areas every or most days in winter, but this did not apply to the respondent's bedroom, with over 2 in 5 never being heated. Such insights suggest we need to find ways to encourage homeowners to expect improvements in the thermal performance of their homes. Research also indicates that greenhouse gases produced by the construction and operation of our homes is above the target levels for New Zealand to reach a net-zero carbon economy by 2050. We need to find ways of steering homeowners and the construction industry to expect and build homes that are more climate friendly.

EPCs offer an opportunity to achieve both of these objectives. EPCs provide independent and transparent information about building energy performance. Physical data is gathered from house plans and specifications or during a house visit by a trained and accredited assessor. After analysis, a home is given a rating of comparative performance from excellent to poor using a letter (from A to G used in the UK and EU – A is the best) or a star system (from 1 to 10 used in Australia – 10 is the best).

The overall rating usually covers only significant uses such as heating and cooling and in some cases water heating and lighting. Plug loads are generally excluded from most basic EPC systems because they are more occupant dependent.

The rating may include an energy performance metric of kWh/m²/year – the energy demand per square metre of usable floor area per annum. EPCs do not predict the energy use of a specific household – they predict the energy use of a standardised set of occupants and their standardised behaviours, usually using an artificial reference weather year.

EPCs are mandatory in some countries, notably the UK and member states of the EU, and they are widely used in Australia.

BRANZ research into EPCs

A BRANZ research project examined international EPC systems and considered their fit for Aotearoa New Zealand. The research investigated:

- drivers of EPCs
- public acceptance and market uptake
- good practices to make EPC data reliable and accessible
- policy recommendations
- data gaps, quality control and access to data

- common pitfalls in the tool user interface, support mechanisms, certification and verification
- alignment with the New Zealand Building Code and other assessment tools.

The research critically examined EPC schemes in Australia and the United Kingdom.

Case study 1: Australia

Australia uses two main ratings schemes for homes – both give a star rating from 1 to 10.

The Residential Efficiency Scorecard scheme measures energy costs for fixed appliances, primarily in existing homes. Upon assessment, the Residential Efficiency Scorecard gives the home:

- an energy efficiency star rating out of 10 stars – the higher the stars, the lower the costs over a year
- a comfort rating showing how well the home copes with hot and cold weather
- a star rating with and without solar power
- efficiency ratings for each of the fixed appliances such as heating, cooling and hot water service
- the energy consumption of the fixed appliances over a year
- the greenhouse gas emissions for the fixed appliances over a year
- practical options to improve the home's energy efficiency.

The Nationwide House Energy Rating Scheme (NatHERS) currently covers new homes and major renovations. The NatHERS star rating (Figure 1) takes account of a home's orientation, design and materials and local climate. A software tool uses plans and specifications to estimate the heating or cooling required to keep the building a comfortable temperature. Around 90% of new home designs use the scheme to demonstrate compliance with the National Construction Code (NCC), which requires a 7-star rating in 2024.

In 2023, the Australian Government announced plans to expand NatHERS to include existing homes. The Residential Efficiency Scorecard website (www.homescorecard.gov.au) states that "the Residential Efficiency Scorecard program is expected to be fully accredited and phased into NatHERS".

In addition to its thermal performance measure, NatHERS also has a whole-of-home rating (out of 100) that includes water heating, pool/spa equipment, lighting and plug-in appliances, solar energy generated on site and battery storage. Homes demonstrating Code compliance with NatHERS require a whole-of-home rating of at least 60 (and apartments require a minimum of 50).

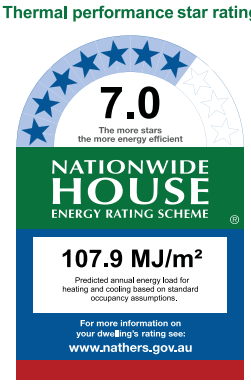

Figure 1. The thermal performance star rating component of a NatHERS certificate – the entire certificate contains a lot more information than this.

Case study 2: UK

Since October 2008, EPCs have been mandatory for all homes sold or rented in England and Wales. The UK EPC shows current running costs for heating, hot water and lighting with a rating from A to G (Figure 2). Valid for 10 years, UK EPCs are held on a searchable national register.

Since 1 April 2020, properties with a UK EPC rating of F or G cannot be rented out unless they are covered by a statutory exemption.

The methodology underpinning UK EPCs is a standard assessment procedure originally developed by the Building Research Establishment in 1992 as a tool to help the government deliver its energy efficiency policies.

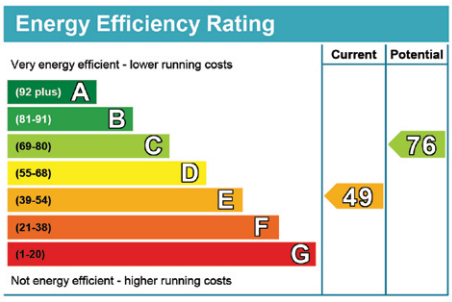

Figure 2. The energy efficiency rating component of a UK EPC. This shows the current rating for a home plus the potential rating if recommendations specified in the certificate are carried out. You can find an example of the full document here.

Benefits of EPCs

- Potential home buyers/tenants can see and compare the energy efficiency of homes.
- Certificates commonly indicate the cost of keeping a home at a comfortable temperature.
- Most EPCs outline specific retrofit solutions that could improve a home's thermal performance and EPC rating. This provides an incentive for home upgrades because a higher-rating property may have higher sale value or higher rentability.
- They provide detailed information for policy makers and decision makers. Energy rating bands can be used to set targets for energy efficiency and emissions reductions – the UK's minimum energy standards for rental properties are defined by a minimum EPC rating band as are fuel poverty targets. EPC databases can be used as an information source to monitor progress towards these targets. In the EU, EPC ratings are a key component of the move to net-zero energy homes and upgrading poor-performing homes. The technical requirements have already been well scoped out by the highest rating band.
- Defining step progress towards long-term targets is more flexibly achieved using energy rating bands than changing prescriptive requirements.

Challenges in EPC systems

Studies of EPC systems in practice have found a few issues.

In the UK, the Centre for Research into Energy Demand Solutions (CREDS) saw major discrepancies between different assessors, different classes of property, different assessments on the same property and different EPC assessment regimes. CREDS identified two potential solutions: making use of smart meter data and Internet of Things technology and improving regulatory compliance and quality control.

Inconsistencies have been found in Australia too. CSIRO scientists collected energy rating profiles for more than 5,500 apartment developments. They found many

individual apartments with a performance rating significantly below the star rating for the complex as a whole. (Compliance with Australia's NCC is based on the average rating across all apartments in a development.) For example, CSIRO found west-facing apartments exposed to late afternoon sun that use far more cooling energy than their neighbours.

In the EU, some problems come from weaknesses in methodology and/or quality control. There is currently no standardised methodology or tool prescribed for EPC calculation across all the EU member states and the level of quality control varies greatly between states.

Ratings information only has an impact if it is accessible. While EPCs must be made available when properties are marketed for sale or rent in the UK, this is not the case in Australia, and 'secret shopper' studies have found Australian real estate agents frequently do not know the ratings of the properties they are promoting.

Another key challenge is a thermal performance gap in buildings – the difference between theoretical and actual energy consumption (Figure 3). Buildings with lower thermal performance tend to consume less energy than expected, while buildings of high thermal performance tend to consume more energy than expected.

EU studies have found that standard calculations overestimate space heating consumption in older housing as well as the energy savings potential. This can undermine energy retrofit strategies and policies. Potential reasons for this include:

- residents of energy-efficient homes may choose to live in more comfortable conditions
- poor building work in energy-efficient homes may affect actual performance
- residents in less-efficient homes may have a limited income and use less heating to save on costs
- homes that are less energy efficient may have had inexpensive improvements not accounted for in modelling.

A key take-away is that improvements should not focus on thermal performance alone – attention must also be given to other areas of energy use such as water heating and plug loads where evidence suggests significant savings can be achieved.

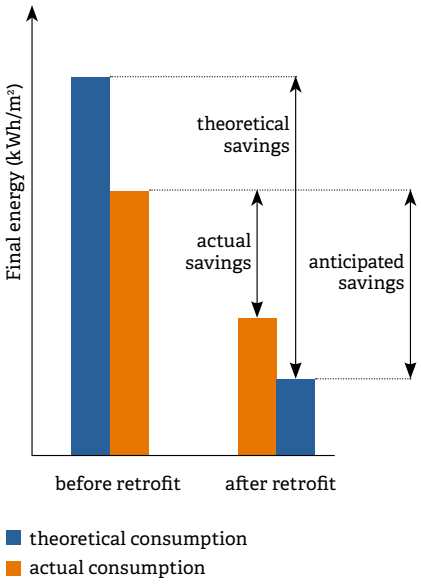

Figure 3. Differences between theoretical and actual energy consumption before and after retrofit.

EPCs in New Zealand

The key benefits of EPCs in New Zealand are seen as:

- creating transparency around residential thermal performance and therefore the associated costs
- indirectly shifting the housing market to be more thermally comfortable and climate friendly.

The potential impacts of home EPCs for New Zealand are the same as elsewhere – from educating and influencing purchasing and renting decisions to long-term policy making. For consumers, EPCs will help with estimating annual energy bills and assessing whether a prospective property would make a warm, dry and healthy home.

At a national level, aggregated data from EPCs would help capture the energy performance of the country's housing stock to inform policy making. An EPC scheme would make it possible to identify poor-performing homes where improvements could be targeted to make the biggest positive difference to living conditions and carbon emissions.

Gaps currently exist in information around EPCs in the New Zealand context, including:

- no assessment framework around which to consider costs and benefits
- a lack of current cost and benefit data in the energy efficiency space.

In October 2020, the Labour Government announced a housing policy that included a new mandatory energy efficiency certificate for residential buildings, but this did not progress very far. Again in 2022, EPCs were also proposed under the MBIE Building for Climate Change amendments to the Building Act 2004. Those amendments suggested that EPCs be adopted for new and existing commercial, public, industrial and large-scale residential buildings. However, the changes did not occur.

Conclusion

The evidence suggests home EPCs could be a practical tool to better inform policy makers, reduce greenhouse gas emissions to help achieve climate change goals and ensure more New Zealanders are living in warm homes.

Overseas experience shows that a successful EPC regime requires:

- a consistent and adequate methodology that produces reliable results
- well-trained and technically adept assessors
- engagement during development
- adequate funding
- good promotion
- suitable support mechanisms
- a monitoring system based on a central database
- robust quality control, verification and enforcement procedures.

If any one of these factors is missing, it can significantly impact large-scale acceptance.

Appropriate use of technology could be used such as smart meter data and the Internet of Things, particularly in new-build homes.

More information

- BRANZ Study Report SR495 Household Energy End-use Project 2: Report on winter comfort, heating and indoor temperatures (preliminary analysis)
- BRANZ Research Now: Energy performance certificates #2 Consumer perspectives of energy performance certificates (EPCs)
- Progressing energy performance certificates for homes
- Towards dwelling energy certification for New Zealand: normalisation issues
- About the Residential Efficiency Scorecard
- About NatHERS
- UK EPCs