



Homestar v5

Scoping Paper



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Scoping Paper Contacts

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Introduction

The New Zealand Green Building Council (NZGBC) and its members and supporters have always been a team of passionate advocates for better buildings, because we know that better buildings mean healthier, happier Kiwis. We also know that buildings and the built environment have a role to play in the response to some of the biggest issues faced by our country and the world; health and wellbeing, climate change, urbanisation, equity and poverty. The way we build, upgrade and operate our homes and buildings, and how we plan our communities, will influence how resilient we are to these forces.

The future of Homestar (as well as HomeFit, Green Star, and NABERSNZ) is influenced by the challenges we face, and by key events and policies from around the world as well as at home. These influences include the Paris Agreement, the United Nations Sustainable Development Goals (SDGs), the New Zealand Government's policies on climate change, energy, carbon, housing, health and wellbeing, and the NZGBC's own Zero Carbon Roadmap for Aotearoa's Buildings. A digest of key influences, drivers and policies can be found at Appendix A. Further information about the SDGs and how these align with Homestar can be found at Appendix B.

Version 4 of Homestar was launched in July 2017. It has been our most successful version yet. We have had nearly 5,000 registrations since we launched v4, and nearly 3,500 in the past year. We think it is possible that Homestar will begin to approach 10% of the 40,000 (or so) homes being consented in New Zealand each year and that gives Homestar the ability to influence how the housebuilding sector moves forward.

But we can't rest on our laurels. We know there are some issues to solve:

- The need to simplify the process. We are setting out steps to make the assessment process easier. Clearly though, any simplification needs to be balanced with ensuring better outcomes.
- The need to make clearer the relationship between energy performance and the Star rating. The proposed changes better communicate to homeowners the energy and/or comfort benefits of the different rating levels.
- The holistic nature of Homestar is also not as clear as it could be. The changes proposed set out to homeowners how Homestar benefits them, but also benefits the wider environment.
- The 'Zero Carbon' Act sets Aotearoa New Zealand on a pathway to zero carbon. As a result, there is increasing likelihood that Government will further regulate the built environment and Homestar needs to reflect and stay ahead of this.
- There is a growing focus on embodied emissions, which NZGBC acknowledges are important. We are proposing that Homestar should give recognition for projects that measure and account for these emissions.
- Homestar needs to keep up with building code changes. As an example, Acceptable Solutions G4 of the building code was updated in 2019 to require mechanical kitchen and

bathroom extract. As is standard with our tools, once they become regulated these elements come out of tools.

- Longer term, the building code could set out a trajectory to make homes progressively lower carbon. The goal is to have Homestar show the way beyond the minimum requirements of the building code to what the future could look like.

Providing Your Feedback

This scoping paper sets out our initial thinking on what version 5 of Homestar *could* look like. We will consult once more before launch, probably in September, when we intend to have produced a draft technical standard.

This consultation reflects conversations we have had with you all over the past few years and, we hope, shows that we have been listening.

Nothing is set in stone. We are genuinely interested in your views and opinions on how we can make Homestar transform the New Zealand house building market.

The deadline for responding is Friday 17 July 2020. We will be holding small round table sessions on this consultation with sectors of the house building industry (from architects to product suppliers). If you would like to be included in this, please contact either Sam Archer or Danidu Wijekoon.

Overall Structure of Homestar

1 Background

Homestar was consciously conceived as a holistic sustainability rating tool when it was launched in 2011. This means that it has always covered a wide range of environmental and social issues from energy consumption and health, to local environmental impacts such as stormwater run-off.

As the following table shows, Homestar can be broadly divided into measures that directly benefit people in the home such as lower energy consumption and running costs, and those that have wider environmental benefit such as reduced pollution:

Objectives	Themes
Benefit to Occupant	Energy costs
	Health and comfort
	Access to amenities, security, universal design
Benefit to the Environment (wider sustainability issues)	Global environment: Resource depletion, deforestation, carbon emissions
	Local environment: Pollution, ecology,

In developing v5 we think there is the opportunity to be clearer about how Homestar balances these two objectives. We don't wish to imply that Homestar should trade off benefit to the occupant against benefit to the environment. The tool should (and does) benefit both, but we do think Homestar needs to be clearly communicate what it is trying to achieve.

In many cases single credits achieve both objectives. For example, reduced energy consumption benefits the homeowner but also reduces carbon emissions. In some ways these dual-benefit credits are the sweet spot for Homestar. But some credits clearly do one or the other.

We want to know whether the structure of Homestar could more simply and clearly outline the benefits of a rating. We also want to explore whether a home rated under Homestar might display how it scored under the various categories (energy, health, pollution etc.).

2 Simplify the Categories?

Homestar v5 offers us the opportunity to simplify and clarify what the tool covers. The table below shows one possible new way of structuring the tool. Three new categories covering benefit to the occupant would rate the home as:

- Energy Efficient,
- Healthy and Warm and
- Designed for People.

The latter category - Designed for People - would cover items of good design and home-location such as Security (MAN – 1) and Neighbourhood Amenities (STE – 3).

A fourth category, Caring for Nature, would cover wider environmental benefit including stormwater run-off and construction waste

	<u>Possible</u> new categories	Example credits from Homestar v4	
Benefit to Occupant	Energy Efficient (and low carbon)	EHC – 2 EHC – 5 EHC – 6 EHC – 8 EHC – 11	Efficient Space Heating Hot Water Heating Lighting Renewable Energy Energy Efficient Drying
	Healthy and Warm	EHC – 1 EHC – 3 EHC – 4 EHC – 7 EHC – 9 MAT – 2	Thermal Comfort Ventilation Surface and Interstitial Moisture Natural Lighting Sound Insulation Healthy Materials
	Designed for People	DRE – 1 EHC – 10 MAN – 1 MAN – 2 STE – 3 STE – 4	Density and Resource Efficiency Inclusive Design Security Home User Guide Neighbourhood Amenities Cycling
Benefit to the Environment (wider sustainability issues)	Caring for Nature	WST – 1 WST – 2 MAN – 3 MAT – 1 WAT – 1 WAT – 2 STE – 1 STE – 2	Construction Waste Minimisation Household Waste Minimisation Responsible Contracting Sustainable Materials Water Use in the Home Sustainable Water Supply Stormwater Management Native Planting

Question: Do you think we should simplify the Homestar categories and make clearer how Homestar benefits occupants and the wider environment? Please do provide suggestions on how we should structure Homestar and the names of categories. Yes/No/comments.

3 Change weightings?

Updating Homestar to v5 also gives us the opportunity to look at how the tool rates the importance of these different categories. We are interested in your views on this.

Using the structure outlined above Homestar currently weights the points roughly as follows:

Possible new categories	Total available points	Percentage of points available
Energy Efficient (and low carbon)	22	18%
Healthy and Warm	39	33%
Designed for People	21	18%
Caring for Nature	38	32%

This shows that around 2/3 of the points in Homestar are devoted to making the home better for the occupant and around 1/3 are concerned with the wider environmental benefit. The biggest category is “Healthy and Warm”, though over half of the points (20) in this category come from a single credit, EHC-1, which covers the thermal envelope.

The energy efficiency category is largely concerned with reducing carbon emissions and homeowner’s energy bills. Perhaps it could be argued that the weighting (18%) for this category is too low given the importance of solving climate change and reducing fuel poverty?

Question: Do you think the current spread of points in Homestar v4 is appropriate? If not please outline how you think the points should be weighted and why. Yes/No/comments.

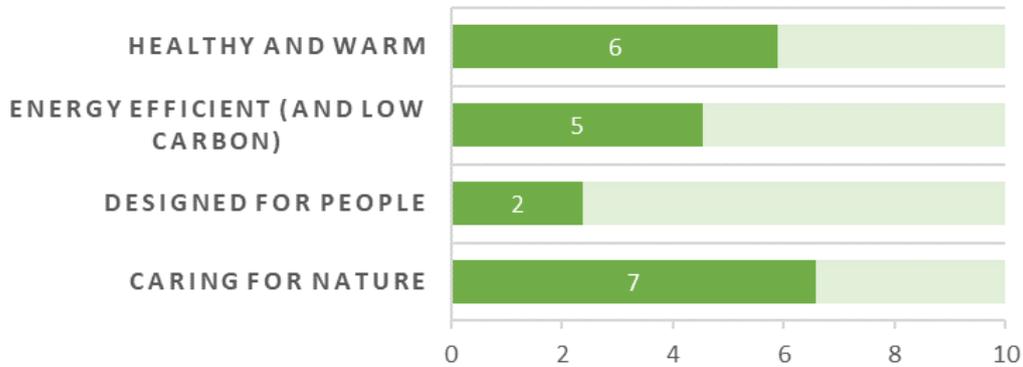
Question: Are there any credits you would like to be removed from Homestar. If so why? Comment

Question: Are there any credits you would like to be added to Homestar. If so why? Comment

4 Display score for different categories on certificate?

Currently the Homestar certificate only displays the overall Star rating for the home. We could, in addition, display how the home performed against each of the categories giving more clarity around where the points were scored. This could be displayed in all sorts of ways, but the following gives an idea of what it could look like:

HOW THE HOME PERFORMED IN EACH CATEGORY



Providing this additional information on the certificate must be balanced however with the need for simplicity: we are also exploring the possibility of providing information on estimated energy consumption as well on the certificate and all of this information may make the certificate cluttered.

Question: Do you agree that Homestar should display further information on how the home scored against the various categories? Yes/No/comment.

5 Online delivery of Homestar

NZGBC is committed to making the Homestar certification process as easy as possible. We are conscious that the current process is still relatively manual and involves the use of multiple forms, checklists and calculators. Submissions are compiled manually by putting evidence such as photos and receipts into folders and we know that this can be time consuming.

We have had some success recently with the use of a WebApp for delivering HomeFit. Submissions are made directly through the App with a simple to use interface and this has had generally positive feedback from HomeFit assessors.

As a result of this success with HomeFit we are considering the business case for investment into a Homestar App. We are very much at the early stages of thinking about this App but it would likely be a “workflow” tool that would take projects on a journey from registration to certification. The App would allow projects to either use template pathways for submissions (such as our current checklists) or produce custom certification pathways.

Question: Do you agree that the Homestar certification process would be made simpler and more efficient with the use of a WebApp? Yes/No/comment.

6 Homestar assessor integrity model

One of the pillars of Homestar (and the rest of NZGBC's tools) is that it is a third-party audited national rating scheme. NZGBC employs independent, anonymous auditors to ensure the integrity of the scheme and provide some assurance that consistent standards are being reached.

The need for rigorous auditing must be balanced with the certification costs associated with getting a rating. Currently the biggest element of the certification fee is the pass-through cost to independent auditors. And we know that Homestar assessor fees are a barrier to some projects.

NZGBC already sample-audits submissions from assessors it deems to be competent. But assessors are still required to submit full documentation even if the submission is not ultimately audited.

One change we are considering is whether to reduce the amount of documentation required from assessors deemed competent (competency standard to be agreed) but then formally require full documentation for a sample of typologies submitted from each assessor. This might be, say, one typology randomly selected from each 10 typologies submitted.

This would mean assessors would still be required to gather full evidence for each typology but only compile it into a submission for a sample of typologies. For all other projects, a core set of evidence would still be required.

Question: Do you agree with the proposal for sample auditing and reduced documentation discussed above? Yes/No/comment.

7 Ventilation, EHC-3

Credit EHC-3 deals with ventilation systems in the current version of Homestar. It is set out in a hierarchical way with intermittent ventilation (opening windows and kitchen/bathroom ventilation) getting fewest points and appropriately commissioned whole-house heat recovery (MVHR) systems getting the most points.

Since v4 of Homestar was launched intermittent mechanical ventilation has been required under Acceptable Solutions G4 (Building Code) in new homes. As a result of this we would propose to remove this lowest rung of the ventilation ladder. Homestar homes would be required to install whole home systems such as continuous extract or balanced mechanical ventilation to pick up any points.

Question: Do you agree that we should remove points available for standard kitchen/bathroom extract and opening windows? Yes/No/comments.

8 Expectation that higher levels of Homestar have higher performance whole-home ventilation systems

Evidence from abroad¹ and in New Zealand suggests that the very best ventilation outcomes (reduced humidity levels and other pollutants) come from the use of whole-house mechanical ventilation systems². Indeed, there is some BRANZ evidence³ that relying on opening windows for ventilation of habitable rooms (particularly bedrooms at night) is resulting in below standard ventilation levels.

Whole-house ventilation systems are not commonly installed in new homes in New Zealand, so mandating their use would be a significant departure from business-as-usual for home builders here. In addition, there is evidence from abroad that mainstream adoption of these kinds of systems has not been without its problems. Whole-house systems need to be skillfully designed and installed. If not, outcomes can be no better than intermittent ventilation, but with the added expense and maintenance of the system. One question we would therefore ask is whether New Zealand (with known construction skills shortages) is ready for mainstream/large-scale adoption of whole house ventilation systems.

One possibility is that we mandate whole house systems at higher levels of Homestar (stimulating a bigger market for these products) and dependent on the thermal zone, something like the following:

¹ <http://radar.gsa.ac.uk/5520/1/MVHR%20study.pdf>

² Note that this does not refer to positive pressure systems often installed in older homes in New Zealand. These are not appropriate for newer, highly insulated dwellings.

³ [BRANZ The role of ventilation in managing moisture in New Zealand homes](#)

	<u>Minimum requirement in Zone 1</u>	<u>Minimum requirement in Zones 2 and 3A</u>	<u>Minimum requirement in Zone 3B</u>
6 Homestar	None	None	None
7 Homestar	Whole-house extract ventilation	Whole-house extract ventilation	Whole-house extract ventilation
8 Homestar	Whole-house extract ventilation	Balanced mechanical ventilation	Balanced mechanical ventilation with heat recovery
9 and 10 Homestar	Balanced mechanical ventilation	Balanced mechanical ventilation with heat recovery	Balanced mechanical ventilation with heat recovery

Question: Do you agree that we should require more than just opening windows for ventilation of habitable rooms (other than mechanical kitchen/bathroom) in Homestar? Please comment, if yes, on what Star level this should kick-in. Yes/No/comments.

9 Space Heating

Version 4 of Homestar introduced a requirement for the main living space to have some form of fixed heating. We did not however mandate that the system should be adequately sized or efficient.

Since then the Government's Healthy Home Standard has set sizing requirements for heating systems installed in rentals.

Notwithstanding some disagreement in the industry with the Government's calculation methodology for sizing heating systems we think Homestar should have minimum requirements for heating systems in the main living space to be correctly sized and cost effective.

Question: Do you think that Homestar should have minimum requirements for heating systems in the main living space to be correctly sized and cost effective? Yes/No/comments.

10 Need for whole of house heating

Furthermore, there is evidence that the health problems associated with low temperatures in homes comes predominantly from low temperatures at night in bedrooms. These are not heated frequently in New Zealand, and even less frequently heated in the middle of the night when the lowest temperatures are experienced.

One possibility is that Homestar moves towards requirements for whole-house (central) heating systems that would increase the likelihood of all habitable rooms being adequately heated. This might include ducted heat pumps, MVHR systems with duct-heaters or wet-radiators connected to a

central heat pump. As with MVHR ventilation systems, central heating is extremely uncommon in New Zealand⁴ so would be a significant departure from business as usual.

Alternatively, the view could be taken that, irrespective of the heating systems installed, some families will choose not to use them for reasons of fuel poverty or cultural preference. In which case the fabric of the home needs to be optimized to increase the likelihood of high enough temperatures at night in bedrooms even if the only heating used is in the living room in the hours before bedtime.

Question: Do you think that Homestar should include requirements for all habitable rooms to be heated, perhaps at the higher levels of Homestar? Yes/No/comments.

11 Summertime Overheating

The higher levels of Homestar currently rely on modelling to show that energy used for cooling is not excessive. The energy modelling pathway sets limits for the combined energy demand from heating AND cooling systems. This approach has limits however:

- 1) Energy used for cooling may be theoretical if no cooling systems actually exist in the home
- 2) As with heating systems, if cooling systems have been installed they tend to be only in one room (heat pump in the living room) so that bedrooms are not actively cooled; particularly at night when overheating can be most problematic.
- 3) The combined heating and cooling approach allows summer cooling demand to be traded off against winter heating demand, meaning that homes can be optimized for winter and not for summer.

Potentially a better approach is to leave summer cooling/overheating to a separate summer comfort credit and assess overheating based on the number of hours above a certain threshold temperature based on thermal modelling – see following section (Energy and Carbon emissions for more details on our modelling proposals).

Homestar currently includes a simple prescriptive approach for overheating at lower levels (6 and 7 Homestar) based on levels of glazing/shading and availability of opening windows and cross ventilation. These points are not always targeted meaning that 6 and 7 Homestar rated homes are not always fully assessed for overheating potential. We'd like to know whether you think we should make assessment of overheating mandatory at all levels of Homestar.

Question: Do you support assessing summer overheating risk separately from overall energy demand? Yes/No/comments.

Question: Do you think low risk of summer overheating should be a mandatory minimum for any Homestar rating? Yes/No/comments.

⁴ <http://www.level.org.nz/energy/space-heating/central-heating-systems/>

12 Surface and Interstitial Moisture – minimum standards, EHC-4

Credit EHC-4 in v4 of Homestar deals with measures to reduce the likelihood of moisture build up within the envelope of the building (interstitial moisture) and measures to reduce thermal bridging likely to result in surface moisture and mould.

We are interested in whether the mandatory minimum requirements should be tightened up in this credit. Arguably all windows should be thermally broken, and all slabs insulated to reduce the risk of surface condensation particularly as we understand both “technologies” have become better understood, more widespread and cheaper since we launched v4.

Equally, while the evidence of systemic interstitial moisture is not overwhelming⁵ there is some NZ evidence (and certainly good international evidence) that specific vapour retarders are effective at reducing the risk of interstitial moisture. Should Homestar require vapour retarders to provide greater assurance that interstitial moisture is avoided?

**Question: Do you the mandatory requirements of EHC-4 should be tightened and if so, how?
Yes/No/comments.**

⁵ [BRANZ Vapour control in New Zealand walls](#)

Energy and Carbon Emissions

13 Background

NZGBC has a commitment to keeping Homestar as a **holistic** sustainability rating tool covering the wide range of issues covered by the term “sustainable”. This includes important environmental and social issues such as water consumption, construction waste, responsible sourcing of materials and site ecology.

However, we think the tool needs to be clearer (and put more emphasis on) how each Star rating relates to the home’s energy efficiency and likely⁶ thermal comfort compared with a typical (2020) Building Code compliant home.

Comfort and running costs are of paramount importance to potential home purchasers and the current Star rating does not offer a clear picture of this. Arguably some might conflate the Star rating with comfort and energy use, where currently the holistic (points-based) nature of Homestar makes this link weaker than it could/should be.

In addition, we see Homestar as a driver of carbon policy for new homes and the current tool is not explicit enough about the link between the Star rating and overall carbon reduction.

Lastly, now that Homestar is becoming more mainstream we need to encourage the industry to do better. Perhaps this means toughening up the comfort/energy/carbon requirements of the lower Star levels.

⁶ “Likely” here refers to the fact that thermal comfort is also dependent on occupant behaviour in addition to the design of the home. A Homestar rating refers to the ease with which the home can be kept comfortable: An occupant may choose not to heat (or not be able to afford to heat) a home to a particular temperature, or may operate the home in a way likely to lead to colder temperatures (such as leaving windows open for long periods). Because of this Homestar cannot make guarantees of temperature or energy outcomes in any one home, but we can (and should) make assurances that achieving these outcomes is easier and less costly.

14 Clear minimum energy standard for each level of Homestar?

Version 4 of Homestar does have minimum space heating demand for 6, 7 and 8 Homestar in the form of mandatory minimum points for EHC-1. One possible method of reinforcing the link between the Star rating and energy/carbon emissions is to set maximum space heating/cooling demand AND overall carbon emissions (or another metric relating to overall energy use) for each Star rating. The following gives an example of how this might be done:

Star Rating	Maximum space heating and cooling demand, kWh/m ²	Maximum overall carbon emissions, kg.CO ₂ /m ²
6	75	30
7	55	25
8	35	20
9	25	15
10	15 (or Passive House compliance)	10

(please note the actual numbers are **just for illustration**)

Question: Do you think we should have mandatory minimum energy and/or carbon performance levels for each Star rating? Yes/No/comment.

Question: What do you think are the best metrics for minimum performance (energy, cost, carbon emissions, primary energy etc)? Please comment

15 Combine all energy-related credits into one?

In order to be clearer about the effect of holistic design choices on energy consumption, running costs and carbon emissions, we think it would be beneficial to combine all of the energy-related credits into one overall energy credit (a new EHC-2) supported by an easy-to-use calculator.

This credit would combine (and replace) EHC-2 (space heating), EHC-5 (hot water), EHC-6 (lighting) and EHC-8 (renewable energy) into a single credit and calculator.

The calculator would produce overall energy consumption and carbon emissions (per m²) for the home and compare this to a typical Building Code-compliant home. This could be a fixed target or one generated by a reference home.

Points would be achieved based on the percentage reduction in overall carbon emissions compared with the Building Code-compliant home.

The space heating demand would be taken from EHC-1 (thermal comfort) which would remain as a separate credit (see below for suggested changes to EHC-1).

Question: Do you support combining all of the energy credits into one holistic energy/carbon credit supported by the development of a new calculator (possibly on-line)? Yes/No/Comments.

16 Include Appliances?

In v4 of Homestar we removed points associated with energy efficient appliances. This was mainly because v4 was specifically focused on new-build homes and feedback from housebuilders indicated that it is rare for new homes to be supplied with appliances.

However, arguably a holistic energy tool looking to recognize substantially low carbon homes should include energy from appliances - they typically make up 35% of the electricity bill⁷ including 15% for refrigeration and therefore any move towards zero carbon homes will have to include the uptake of very low energy consumption appliances. For this reason, we are seeking views on whether to include energy consumption from appliances in the overall energy consumption calculation.

An argument against the inclusion of appliances is that they typically come and go with the occupants (average home ownership is 7 years) and are often not the responsibility of the homebuilder. As a result of this perhaps Homestar should focus more on *fixed* appliances such as space heating and hot water systems. One possible compromise would be to include appliances as a separate credit and report on their predicted energy use separately.

Question: Do you support the inclusion of appliances in an overall energy calculator?

Yes/No/Comments.

17 Vary hot water consumption based on sanitaryware (shower) specification?

Hot water consumption typically makes up a large percentage of home energy use. In BRANZ's HEEP study this averaged at 34% of all energy use⁸. Showers are typically the greatest user of hot water and, for this reason, hot water consumption is influenced by the flow rate of showers used. The latest BRANZ House condition survey shows that newer homes tend to have higher shower flow rates probably because most are mains pressure which is also associated with higher flow rates⁹

Homestar already collects data on shower flow rate for Wat-1 so the influence of this on hot water energy use and carbon emissions could be easily included.

Question: Do you support the inclusion of water efficiency (shower WELS rating) in an overall energy calculator? Yes/No/Comments.

⁷ [BRANZ HEEP Study](#)

⁸ [BRANZ HEEP Study](#)

⁹ [BRANZ House Condition Survey 2015: Analysis of energy efficiency data](#)

18 Display energy data alongside Star level?

While the points achieved for a new EHC-2 (overall energy) credit would be based on carbon emissions we think carbon is not a currency that is very salient to consumers. Instead we propose that the Homestar certificate would include, in addition to the Star rating, information on the energy consumption and running costs for the home. The following shows what this could look like (please note the actual numbers are just for illustration):

	This home		Typical new Building Code compliant home	
	Consumption per m ² of floor area	Cost per year to run	Cost per year to run	Improvement
Keeping the home warm in winter and cool in summer	32 kWh	\$ 800	\$ 950	25%
Home's overall energy consumption	86 kWh	\$ 2,000	\$ 2,500	32%
Overall greenhouse gas emissions	54 kg.CO ₂			42%

Question: Do you agree that the Homestar certificate should display data on the home's predicted energy performance? Yes/No.

Question: If you do agree, what information would you like to be displayed? Multiple choice -
 Space heating demand (kWh/m2), Space heating demand (Gross kWh), Overall energy consumption (kWh/m2), Overall energy consumption (Gross kWh), Carbon emissions (kg.CO2/m2), Carbon emissions (gross kg.CO2), Overall running costs (\$ per year), Overall running costs (\$ per year per m2), space heating running costs (\$ per year), space heating running costs (\$ per year per m2), Primary Energy (kWh/m2), Other

Question: Please comment on your above choices

19 Introduce Energy Bandings for Homestar?

NZGBC would like to see a National energy/carbon label for homes much like the energy labelling for appliances (A-G) that already exists in New Zealand. This is common in Europe. Australia has a similar label (NatHers), but this only covers heating and cooling energy¹⁰.

A possibility is that we give a home an energy label as part of the certificate. This might be broadly consistent with the energy bandings required for each Star rating as follows (Again numbers are for illustration only):

Energy Label	Maximum annual space heating and cooling demand, kWh/m ²	Maximum overall annual carbon emissions, kg.CO ₂ /m ²
A+	15 (or Passive House compliance)	10
A	25	15
B	35	20
C	55	25
D	75	30

In this way a home might score highly under energy (and get recognition for this) but not complete enough other credits (water, waste, etc.) to get the equivalent higher Homestar rating. This is important as it would allow organisations to be able to set a trajectory to zero carbon homes without having to “buy into” every aspect of higher Star ratings, i.e. maintain the target of a 6 Homestar rating but gradually increase the targeted energy label.

A disadvantage of this approach is that Government may in the future come up with its own energy labelling system for buildings which would supersede (and make redundant) the approach in Homestar. We note that BRANZ is also doing work on a possible energy labelling scheme for homes and we would seek to align with this programme where possible.

Finally, a number of people have suggested to us that basing the metric on energy/carbon per m² unfairly penalises smaller homes that have a smaller gross carbon footprint. One idea is that we peg the labels to overall energy/carbon and have different gross targets related to the number of bedrooms. In this way a 130m² 3-bed home would find it easier to get a higher energy label than a 200 m² 3-bed home, reflecting the lower overall energy needed to heat the smaller home.

Question: Do you think Homestar should produce energy/carbon bandings similar to appliance energy labelling (A-G)? Yes – NZGBC should pioneer this/No – this needs to be a Government-led initiative.

Question: If you answered “yes” to the above, what is the best way for us to do this?

¹⁰ CSIRO is currently considering a whole-of-home energy label – see <https://www.nathers.gov.au/About/NatHERSExpansion>

Question: if you answered “no” to the above, are there other ways we could visually show how the home compares?

Question: Do you agree with the idea that larger homes (with the same number of bedrooms) should find it harder to get a good energy label?

20 EHC-1: Develop a standard modelling tool and methodology?

Homestar currently relies on a number of different third-party tools for modelling energy use in homes. For lower Star levels we allow use of the BRANZ ALF tool, but for higher levels we require full thermal modelling using tools ratified to the ASHRAE standard for modelling buildings. The following energy modelling tools are commonly used for Homestar compliance:

- IES
- PHPP
- Sefaira/Energy Plus
- Open Studio/Energy Plus

One disadvantage of allowing the use of multiple tools is that they inevitably produce different results for the same home. This is because they employ different methodologies and make different underlying assumptions about how energy is consumed in a home.

This variability from modelling tools is problematic because:

- It makes it hard to standardise things like predicted energy consumption and carbon emissions. As noted above we’d like to display this on the Homestar certificate and different tools will produce different predictions for the same home.
- It means the same home scores differently under Homestar when simulated using different modelling tools.

To solve this problem we are exploring the possibility of developing our own standardized energy modelling tool. The tool would provide a simple front end (like BRANZ ALF) to an existing modelling engine, but standardise many of the inputs and assumptions and include additional inputs such as heating and hot water systems, lighting and appliances to allow overall energy consumption to be calculated. Making the tool simple enough for everyone to use would inevitably mean making it less flexible than full modelling (for example, simplifying the geometry of the home) but we think the advantages of standardisation outweigh the disadvantages.

Assuming that we receive a positive response to this idea, we propose to make a prototype of this tool available as part of the second round of consultation.

Question: Do you agree that Homestar should develop (and mandate the use of) a single modelling tool?

Other improvements to the modelling methodology

Lastly, there are other areas of the Homestar modelling methodology we would wish to improve. These include:

- Inclusion of measured airtightness as an input. This would default to high value if the home is not pressure tested
- Inclusion of thermal bridging values. The tool would assume poor values unless using standard details.

Question: Please tell us about any improvements you would like to see to the existing Homestar thermal modelling protocol. Comment.

21 EHC-1: Remove schedule and NZS 4218 calculation methods?

Version 4 of Homestar introduced simpler methods of demonstrating compliance with the space heating demand credit (EHC-1). Arguably this has been helpful in introducing the industry to higher standards in a simple way. Many homes submitting for a 6 or 7 Homestar rating now show compliance by meeting minimum R-values (provided that the home has sensible amounts of glazing) instead of carrying our more complex thermal modelling. The schedule/NZS methods have also allowed us to publish simple 6 and 7 Homestar checklists that have been successful in demystifying a Homestar rating.

However, on the negative side, keeping the schedule and NZS4218 methods prevents the industry from moving on to holistic modelling of energy in homes, something that is commonplace in other countries. It would also be difficult to publish energy/carbon data for homes on the Homestar certificate if we keep the schedule/NZS 4218 methods – One possible method would be to assume high default values based on the schedule, but we are keen to hear views on this.

Lastly, and probably most importantly, schedule methods do not support more sophisticated approaches to improve the passive design of the home such as the form factor (ratio of envelope area to floor area) and window sizes, orientations and shading.

Question: Do you agree that Homestar should no longer support the use of schedule/NZS 4218 methods in EHC-1? Yes/No/comments.

22 Is there a need to tighten fabric and energy standards at the lower levels of Homestar?

The philosophy behind credit EHC-1 (heating demand) was changed significantly in version 4. Previous versions were based on the idea that homes with similar levels of insulation should get similar recognition (points), regardless of where the home was located. This meant that a 6 Homestar home in Auckland needed similar levels of insulation as a 6 Homestar home in Queenstown.

We took the view, in developing v4, that homes should get similar recognition for similar levels of energy use and thermal comfort. This meant that the requirements for homes in the South Island

were significantly tightened for 6 Homestar, but the requirements were relaxed a little for homes in zone 1 (Auckland and above). For example, it is possible to achieve 6 Homestar in Auckland with conventional aluminium glazing and an uninsulated concrete slab.

Notwithstanding that, 6 Homestar homes in Auckland do generally have higher levels of wall and ceiling insulation, stricter rules on slab R-value calculations, and have tighter controls on glazing areas than Building Code so that overall heat loss is typically lower than Building Code.

It's also worth noting that 6 Homestar is the gateway to Homestar. Its purpose is to move home builders (particularly largescale ones) onto the ladder so that, over time, they progress onto higher Star ratings. If we make the first rung of the ladder too high, we will engage fewer home builders in this process and stand less chance of building momentum behind more systemic change (i.e. changes to the Building Code).

Lastly, the purpose of credit EHC-1 is twofold:

- 1) Reducing energy consumption, energy bills and carbon emissions, and
- 2) Increasing winter temperatures in our homes. This is crucial as there is firm evidence that New Zealand homes are too cold¹¹.

Insulation by itself will not fully achieve either of these goals. Airtightness, reduced thermal bridging, good ventilation systems and access to cost effective heating are also needed. Perhaps then EHC-1 (insulation levels) does not need a significant boost in Zone 1; we need, instead, a more comprehensive package of requirements at the 6 Star level.

Question: Do you think the thermal performance requirements of Homestar should be tightened, particularly at the lower Star levels and in Zone 1? Yes/No/comments.

Question: If you answered yes, what aspects should be tightened and by how much? (pick multiple) Insulation R-values/Glazing R-values/air-tightness/thermal bridging/Other/comments.

Question: We are also interested in evidence that the cost (and skills to design and build) of better performing products and systems is reducing/improving, for example slab-edge insulation and higher performance glazing. Please use this comment to provide any evidence you might have. Comment.

23 How should Homestar keep pace with changes to the Building Code?

There has been an expectation that a Homestar rating should mean better performance than minimum building code compliance. For this to continue in the face of possible updates to the Building Code NZGBC will have to consider what to do with the lower ratings as and when acceptable solutions H1 is tightened. Three broad solutions to this are:

- 1) Accept that the building code might have caught up with the lower Star ratings in terms of energy performance, but emphasise more of the other benefits of Homestar such as lower

¹¹ [BRANZ HEEP Study](#)

water consumption, improved stormwater etc, while encouraging building owners to move onto higher ratings (that are higher than Code).

- 2) Shift the goal posts. A common strategy in rating tools globally has been to increase performance requirements as regulated performance is tightened. This would mean raising the bar for 6 (and possibly 7 Star) over the coming years. The disadvantage of this approach is that it changes what a Star rating represents to the market in terms of performance.
- 3) Retire the lower star ratings as time progresses. This might mean, for example, only allowing project teams to target 7 Star from a certain date. The disadvantage of this approach is that 7 Star is not just harder to achieve from an energy perspective, it also requires more points in other areas such as water consumption, sustainable materials, transport etc.

Question: How should NZGBC deal with possible improvements to the Building Code as and when performance requirements are increased? Keep the requirements the same but emphasise Homestar's other benefits/Shift the goal posts/Retire the lower star ratings/Other/Comment.

24 Global Warming Potential (GWP) of refrigerants

Heat pumps have grown enormously in market share (38% of all homes in 2015) for space heating over the past 10 years¹². They are also available for hot water heating. There is no question that heat pumps substantially reduce the operational electricity required for space and water heating but questions remain about the greenhouse gas risk associated with the leakage of refrigerants either during their life or at end of life when systems are decommissioned. We are interested to know whether (and how) Homestar should incentivise the use of low global warming refrigerants and better design, installation and operational and end-of-life practices to increase the likelihood that heat pumps actually deliver savings in carbon emissions.

Question: Do you think that Homestar should include recognition for low global warming potential refrigerants? Yes/No/comments.

25 Embodied Carbon of Products and Materials

The materials sustainability credit in Homestar v5 (Mat 1) is currently one of the largest credits with up to 10 points available. The credit gives points based on the responsible sourcing of products and materials for building a home and relies to a great extent on third party environmental ratings such as Environmental Choice New Zealand (ECNZ)

Since launching Homestar v4 there has been considerably more interest in assessing the lifecycle environmental impact of buildings. We are seeing more products and materials suppliers gaining Environmental Product Declarations (EPDs) and Life Cycle Assessment (LCA) is starting to gain traction, albeit mainly in commercial projects. Much of the motivation for LCA studies of buildings is to ascertain the embodied carbon impact of the materials and construction stages, but full LCA analysis includes other environmental impacts such as water consumption.

¹² [BRANZ Heat pump performance](#)

Green Star (our rating tool for commercial buildings) separately rewards projects for carrying out a full LCA analysis of a building and showing that it is lower than a comparable reference building. We would be interested in whether you think Homestar v5 should similarly reward projects for doing LCA analysis. BRANZ is due to launch a new tool based on many of the constructions in the House Insulation Guide (5th edition), that will provide calculated carbon footprints for different roof, wall and floor build ups. One possibility is that Homestar references this BRANZ information and gives credits for lower environmental impact main assemblies.

To note, the BRANZ guidance will not publish full LCA information, it will only consider carbon impacts and will therefore not provide enough information to carry out full LCA analysis. We think this is appropriate to the scale of residential projects and therefore we propose that any LCA approaches in v5 are limited to carbon footprinting. This approach also has the advantage of allowing Homestar to calculate the life cycle *carbon* impact of the home.

Finally, we would not propose that this carbon footprinting replaces the current reliance on ecolabels. Rather they would exist in parallel. We would be interested in views on how this could best be done.

Question: Do you support introducing credit for reducing the carbon footprint of main assemblies in Homestar? Yes/No/comments.

26 Explicit recognition of Net Zero Carbon (ready) homes

As noted in the introduction we think Homestar should be the framework by which organisations transition their build standard to the net zero carbon homes we need if we are to meet our Paris agreement goals. Similarly, Homestar should shine a light on any future government regulation in this direction.

Currently under v4 of Homestar there is no explicit definition of a net zero carbon home and no easy way for organisations to show they are meeting this standard.

Homestar certification is typically awarded when a home is completed (practical completion). Claims of carbon neutrality must be matched with operational data (energy bills) and this requires a year's worth of energy data after practical completion: ultimately organisations wanting to claim a home is fully zero carbon will have to do so in the years following Homestar certification.

However, what Homestar can (and should) do is make homes that capable of operating as net zero carbon - in other words, net zero carbon *ready*. In our view, this means that homes at the top tiers of Homestar should:

- Have very low energy demand,
- Be fully electric (no on-site fossil fuels),
- Have low global warming refrigerants
- facilitate the transition to 100% renewable energy supply by flattening demand for electricity throughout the year. This might include on-site generation, battery storage, intelligent EV charging and other technologies.

- stimulate industry to manufacture, supply and specify low/zero carbon products and materials. Ultimately true zero carbon homes would also have to be zero carbon at the construction stage.

Question: Should Homestar explicitly recognize and reward net zero carbon (ready) homes?

Yes/No/comments.

Question: If yes, should Homestar require homes at higher star levels (say 9 and 10) to be net zero carbon (ready)? Yes/No/comments.

Mandatory minimum requirements

27 Mandatory Minimums for Star ratings

Homestar v4 already has mandatory minimum scores for various credits to achieve a Homestar rating. Apart from minimum shower flow rates for 6 Homestar, the mandatory minimum criteria are all related to health and comfort (insulation levels, heating and ventilation systems) as follows:

Level of achievement	Requirement	Outcome if not achieved
To achieve 6 stars or above	EHC-1: 12 points	No rating achieved.
	EHC-2: A fixed heating source serving the main living area except when annual heating energy demand is less than 15 kWh/m ²	
	EHC-3: 1.5 points	
	EHC-4: 0.5 points	
	WAT-1: maximum 9L/min shower and 6/3L dual-flush toilet (3 Star WELS)	
To achieve 7 stars or above	All requirements for 6 Homestar	A maximum rating of 6 stars is available.
	EHC-1: 14 points	
	EHC-4: 1.5 points	
To achieve 8 stars or above	All requirements for 6 and 7 Homestar	A maximum rating of 7 stars is available.
	EHC-1: 16 points	

This means that the following number of mandatory points are required:

Star rating	Number of points required to be achieved as mandatory minimums	Out of total points required
6 Homestar	18.5 pts	60
7 Homestar	21.5 pts	70
8 Homestar	23.5 pts	80

In the preceding sections we suggest increasing minimum requirements for the Star rating levels such as whole house ventilation systems at 7 Star and above and minimum carbon emissions (in a combined energy efficiency credit). The effect of this would be to increase the number of mandatory

minimum criteria for different Star ratings. Another way of looking at this is that the different Star ratings would have a **minimum required standards** under the “Healthy and Warm” and “Energy Efficient” categories, with the remaining points more flexible. This would increase the level of surety around what a particular Star rating means in practice. The table on the following page gives an illustration of what this might look like.

Question: Do you agree that we should increase the number of mandatory minimums for the different Homestar levels? Yes/No/comments.

Table: How mandatory performance could be reflected in the Star ratings (**for illustration only**):

Star rating	Min energy used for heating and cooling the home (kWh/m ²)	Min carbon emissions (kg.CO ₂ /m ²)	Minimum thermal bridge performance	Type of ventilation system to be installed as a minimum	Fixed heating system must be present in at least the following rooms	Daylight. These rooms must be well daylight:	Water consumption Minimum appliance WELS rating
6	75	30	All windows thermally broken Xmm slab edge	No minimum but must be commissioned	Living room only	Living room and master bedroom	Showers: 3 WCs: 4
7	55	25	All windows thermally broken Xmm slab edge	Whole-house extract ventilation	Living room only	Living room and master bedroom	Showers: 3 WCs: 4
8	35	20	All windows thermally broken Xmm slab edge Xmm underslab	Whole-house extract ventilation	Fixed heating in living room and all bedrooms	Living room, kitchen and master bedroom	Showers: 3 WCs: 4
9	25	15	All windows thermally broken Xmm slab edge Xmm underslab	Balanced mechanical ventilation with heat recovery	Central heating system	Living room, kitchen and all bedrooms	Showers: 3 WCs: 4
10	15	10	All windows thermally broken Xmm slab edge Xmm underslab	Balanced mechanical ventilation with heat recovery	Central heating system	Living room, kitchen and all bedrooms	Showers: 3 WCs: 4

Anything else?

28 Anything else?

We are sure that many of you will have your own ideas about how Homestar could be improved. Please use this section to give us any remaining thoughts.

Comment.

Appendix A: Drivers of sustainable homes

29 Global and domestic influences

Paris Agreement

Internationally, the Paris Agreement was a watershed for global action on climate change. In 2015, New Zealand, along with almost every nation in the world, adopted an accord to take action to reduce greenhouse gas emissions and limit the global temperature increase in this century to two degrees Celsius, and to aim for warming of only 1.5 degrees Celsius.ⁱ

United Nations Sustainable Development Goals

The 2030 Agenda for Sustainable Development was adopted by all United Nations Member States in 2015. The core of the Agenda is 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries in a global partnership.ⁱⁱ For more information about how the SDGs align with Homestar, please see Appendix Y.

New Zealand's carbon policy

The New Zealand Government has set several emissions reduction targets. In 2013, New Zealand made an international commitment to reaching 5% below 1990 gross emissions by 2020. As our commitment to the Paris Agreement, New Zealand committed to a 30% reduction below 2005 (or 11% below 1990) gross emissions by 2030.ⁱⁱⁱ

In 2019, the New Zealand Government passed the *Climate Change Response (Zero Carbon) Amendment Act*, which set a new domestic target of net zero emissions of all greenhouse gases (other than biogenic methane) by 2050. This new target brings New Zealand in line with the global ambition set by the Paris Agreement and sets us on a path to a low carbon future.^{iv}

New Zealand's housing policy

The New Zealand Government recognises that the current housing situation in New Zealand is failing to meet the needs of many Kiwis.

The Ministry of Public Health notes that, "cold, damp, crowded homes can increase the risk of respiratory issues and other preventable health conditions, such as rheumatic fever and skin infections. There is strong evidence, nationally and internationally, of improved health outcomes resulting from warmer and drier homes."^v

Healthy Homes Initiative (HHI)

The Ministry of Health works with several departments and agencies to deliver the HHI which aims to provide warm, dry healthy housing for low-income families vulnerable to the health impacts of cold, damp homes.

The Ministry of Housing and Development^{vi} has a suite of programmes aimed at:

- Improving housing affordability and supply for aspiring homeowners
- Improving quality and safety of rental housing for tenants
- Creating new, high quality urban communities
- Delivering more public housing, transitional housing and services to tackle homelessness in New Zealand.

Addressing housing costs, availability and quality are critical elements in the efforts to end homelessness, reduce child poverty and improve health and wellbeing outcomes for all people living in New Zealand.

Healthy Homes Standards

The Healthy Homes Guarantee Act 2017 provides for standards to make rental homes warmer and drier. The standards in the *Residential Tenancies (Healthy Homes Standards) Regulations 2019* focus on heating, insulation, ventilation, moisture and draught stopping.^{vii}

Housing policy and better outcomes for Māori

Māori and Pasifika are disproportionately affected by inadequate housing, with impacts across generations. More than half of those in severe housing deprivation identify as Māori or Pasifika.

Housing of a poor standard can have cumulative impacts on physical and mental health, and on education and labour market outcomes – also areas where Māori experience disproportionate negative impacts. In addition to other housing policies and initiatives, the *Māori Housing Strategy*^{viii} focuses on two major outcomes:

- Improving housing for Māori and their whanau
- Increasing housing choices for Maori by growing the Māori housing sector.

New Zealand's Wellbeing Budget

In 2020, the primary focus of the Budget is the “response to the rapidly changing economic impacts of COVID-19 and its immediate impacts on wellbeing.”^{ix}

The Budget formally establishes a \$50 billion *COVID-19 Response and Recovery Fund (CRRF)* which also provides funding for both government and non-government social services to support New Zealanders' education, employment and housing outcomes.

Warmer Kiwi Homes

The Warmer Kiwi Homes programme^x provides grants to assist homeowners to install ceiling and underfloor insulation, and heat pumps or efficient wood or pellet burners for the main living area. The NZGBC recently advocated for the New Zealand Government to expand this programme to align with the Healthy Homes Standard and to scale-up the programme to target more homes. An additional \$56 million for the programme was provided in Budget 2020 as part of the CRRF.^{xi}

Progressive Home Ownership

Funding is also provided to establish a Progressive Home Ownership scheme that will provide access to home ownership to improve the wellbeing of target households. The scheme will also incorporate targeted programmes focused on Māori outcomes.

New Zealand's waste policy

The New Zealand Waste Strategy: Reducing harm, improving efficiency^{xii} has two goals. These are to:

- Reduce the harmful effects of waste
- Improve the efficiency of resource use.

New Zealand's energy policy

The New Zealand Energy Strategy (2011-2021)^{xiii} aims to make the most of New Zealand's energy potential, for the benefit of all Kiwis.

The New Zealand Energy Strategy 2011-2021 sets out four priority areas:

- Diverse resource development (including renewable energy)
- Environmental responsibility
- Efficient use of energy
- Secure and affordable energy

The New Zealand Energy Efficiency and Conservation Strategy (NZECS) (2017-2022) is the companion to the New Zealand Energy Strategy. It encourages businesses, individuals and public sector agencies to take actions that will help unlock our renewable energy, and energy efficiency and productivity potential.

A Zero Carbon Roadmap for Aotearoa's Buildings

To ensure that our buildings and homes play their part in achieving a zero carbon New Zealand, the NZGBC released *A Zero Carbon Roadmap for Aotearoa's Buildings*^{xiv} calling for:

- Building owners to start certifying their existing buildings to zero carbon in 2020 and have all their buildings zero carbon by 2030.
- Building developers to construct their new buildings to zero carbon, and 20% less embodied carbon, by 2025.
- Tenants to inform their landlords in 2020 that they will be seeking zero carbon-rated buildings in their leases by 2025.
- Government to set a 10-year trajectory to ensure new buildings are zero energy under the Building Code by 2030.
- Government to require energy-efficiency labelling on existing buildings (residential and non-residential of more than 1,000m²) when they are sold or leased by 2024.
- Government to ensure that the Ministry of Health, Ministry of Education, New Zealand Defence Force and Department of Corrections lead an all-of-government shift to verify their new buildings as sustainable and having lower embodied carbon from June 2020.

Appendix B: Sustainable Development Goals

30 Homestar and the United Nations Sustainable Development Goals (SDGs)

Homestar category	UN SDGs
Density and resource efficiency	9 – Industry, innovation and infrastructure 11 – Sustainable cities and communities 12 – Responsible consumption and production
Energy, Health and Comfort	1 – No poverty 3 – Good health and wellbeing 7 – Affordable and clean energy 11 – Sustainable cities and communities 13 – Climate action
Water	6 – Clean water and sanitation 11 – Sustainable cities and communities 15 – Life on land
Waste	11 – Sustainable cities and communities 12 – Responsible consumption and production 15 – Life on land
Management	1 – No poverty 3 – Good health and wellbeing 7 – Affordable and clean energy 11 – Sustainable cities and communities 15 – Life on land
Materials	3 – Good health and wellbeing 12 – Responsible consumption and production
Site	3 – Good health and wellbeing 9 – Industry, innovation and infrastructure 11 – Sustainable cities and communities 13 – Climate action 14 – Life below water 15 – Life on land
Innovation	9 – Industry, innovation and infrastructure

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- ⁱ Ministry for the Environment. <https://www.mfe.govt.nz/climate-change/why-climate-change-matters/global-response/paris-agreement>
- ⁱⁱ United Nations. <https://sustainabledevelopment.un.org/?menu=1300>
- ⁱⁱⁱ Ministry for the Environment. <https://www.mfe.govt.nz/climate-change/climate-change-and-government/emissions-reduction-targets/about-our-emissions>
- ^{iv} Ministry for the Environment. <https://www.mfe.govt.nz/climate-change/zero-carbon-amendment-act>
- ^v Ministry of Health. <https://www.health.govt.nz/our-work/preventative-health-wellness/healthy-homes-initiative>
- ^{vi} Ministry of Housing and Urban Development. <https://www.hud.govt.nz/>
- ^{vii} Ministry of Housing and Urban Development. <https://www.hud.govt.nz/residential-housing/healthy-rental-homes/healthy-homes-standards/about-the-healthy-home-standards/>
- ^{viii} Ministry of Housing and Urban Development. <https://www.hud.govt.nz/residential-housing/maori-housing/>
- ^{ix} The Treasury. <https://treasury.govt.nz/sites/default/files/2020-05/b20-wellbeing-budget.pdf>
- ^x Energy Efficiency and Conservation Authority. <https://www.energywise.govt.nz/tools/warmer-kiwi-homes-tool/>
- ^{xi} New Zealand Green Building Council. https://www.nzgbc.org.nz/KNOWLEDGEHUB/Story?Action=View&Story_id=563
- ^{xii} Ministry for the Environment. <https://www.mfe.govt.nz/waste/waste-strategy-and-legislation/new-zealand-waste-strategy#:~:text=Strategy%20goals,the%20efficiency%20of%20resource%20use.>
- ^{xiii} Energy Efficiency and Conservation Authority. <https://www.eeca.govt.nz/energy-use-in-new-zealand/energy-strategy-and-policy/>
- ^{xiv} New Zealand Green Building Council. https://www.nzgbc.org.nz/Attachment?Action=Download&Attachment_id=2528