15 October 2021

Neil Savery
CEO
Australian Building Codes Board

Via: https://consultation.abcb.gov.au/engagement/ncc-2022-public-comment-draft-stage-2/consult_view/

Dear Mr Savery,

The proposed NCC2022 whole of home energy provision are misleading and unnecessary

Energy Networks Australia welcomes the opportunity to provide input during the consultation period on developing the whole of home energy provisions as part of the National Construction Code 2022.

Energy Networks Australia is the national industry body representing Australia's electricity transmission and distribution and gas distribution networks. Our members provide more than 16 million electricity and gas connections to almost every home and business across Australia.

To date, the focus of decarbonisation has been on the electricity sector, but gas networks are on their own decarbonisation journey. Customers tell us that they are seeking a clean energy future and are engaged in achieving emission reductions from gas use. New renewable fuels, such as hydrogen and biomethane, have the potential to become mainstream and complementary energy solutions that will use existing energy infrastructure. Our gas networks are leading the development of renewable gas projects and blending renewable hydrogen in the Adelaide and Sydney gas distribution networks, with further projects under development for Victoria, Western Australia and Queensland.

Below are our responses addressing the limitations we have identified with regard to the proposed changes to the Whole-of-home energy provisions.

If you have any questions or would like a to discuss this further, please do not hesitate to contact me: dvanpuyvelde@energynetworks.com.au.

Yours sincerely,

Dr Dennis Van Puyvelde
Head of Renewable Gas

Energy Networks Australia www.energynetworks.com.au
Unit 5, Level 12, 385 Bourke Street Melbourne VIC 3000
P: +61 3 9103 0400 E: info@energynetworks.com.au
Energy Networks Association T/A Energy Networks Australia
ABN: 75 106 735 406

Key Messages

1. Energy Networks Australia is supportive of the housing sector's transition to net zero emissions, and we support a technology neutral approach that values actual emissions at time of use and location as the most effective way to achieve this.
2. Energy Networks Australia does not support the proposed changes regarding the *Whole-of-home* energy provisions in their current form.
3. Emission reductions in the energy sector are already being driven by the energy sector and governments which means that both gas and electricity will be zero emissions in the near future. The proposed *Deemed To Satisfy* provisions for fixed appliances will create additional complexity for customers and create an unwarranted bias towards electrification.
4. The societal cost metric adopted does not adequately recognise consumer choice and behaviour, capital costs of appliances, fuel costs at time of use and variations in greenhouse gas emissions across the day and between seasons. Due to those limitations, it creates a favourable outcome to more expensive electrical appliance options, which by themselves will not result in lower energy bills nor reduced emissions.
5. The accompanying Consultation RIS shows a negative NPV, which is compelling evidence to not proceed with the proposed changes.

Is it appropriate for the National Construction Code to drive appliance choices?

The proposed NCC2022 includes major changes to energy efficiency of buildings, extending from the fabric of the building to including a *Deemed To Satisfy* requirement based on a *Whole of Home Energy Budget*. Volume 1, Section J (Especially J1, 2 and 3) details the approach being considered and refers to other documents that contain additional data[1].

Part J3, which is not listed in the table of content, provides new requirements for energy efficiency of buildings. Energy Networks Australia's focus in this submission is on the *Deemed-To-Satisfy* (DTS) and *Whole-of-Home* (WoH) provisions noted in Part J3D14. The focus of Volume 1 of the NCC2022 appears to be on Class 2 and Class 10 buildings. We have been informed by the ABCB that the provisions will also apply to Class 1 buildings but it is unclear where that is covered in the proposed NCC2022, although the energy requirements for Class 1 buildings are described in Section H of Volume 2.

[1] For example, the 611 page Whole of Home Efficiency Factors report

The overview of the changes includes a diagram (Figure 1) describing the energy budget approach. The ABCB claims this is based on a societal cost, but the factors and evidence provided in the NCC2022 documentation shows that this is in fact based on an adjusted capacity factor[2]. All energy equivalency factors are in kW/ m^2 and multiplied by the area of the proposed house. These factors can be offset by an installed level of rooftop PV. The metrics are not expressed in dollars. It is unclear how the dollar savings and the energy factors are related.

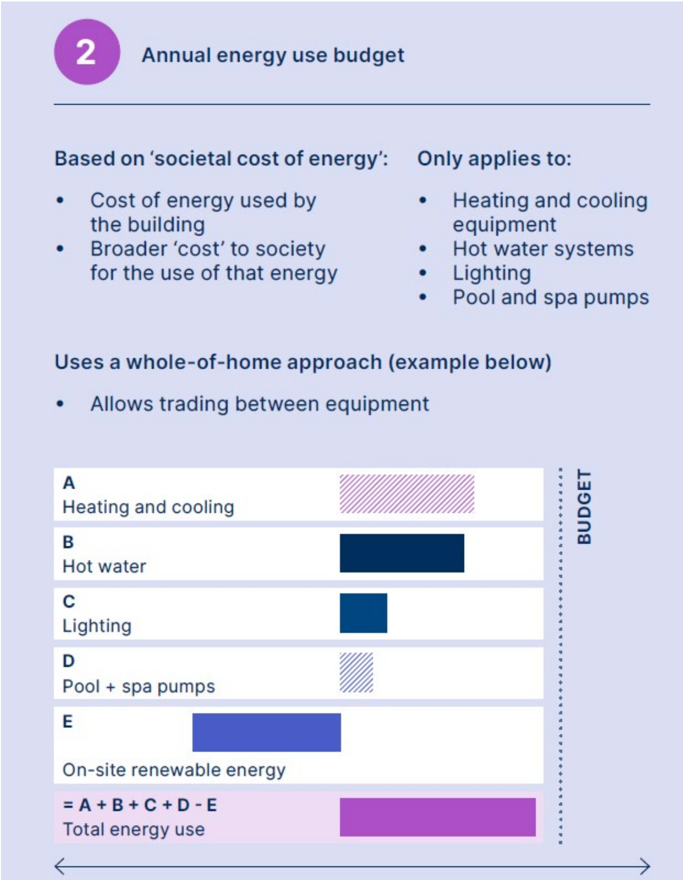

Figure 1: infographic of the annual energy use budget (Source: NCC2022 – Infographic)

Using the calculator provided as part of the consultation process, the overwhelming finding[3] is that rooftop solar PV is required in many cases, but that a higher amount of solar PV is required for new homes with gas appliances. In some cases (Figure 2), all electric homes[4] are deemed to comply with the provisions but selecting gas appliances to provide heating and hot water requires an installation of 4.7 kW of

[2] Part 2 of the Whole of Home Efficiency Factors report
[3] This observation is based on using the calculators to compare a range of appliance combinations in different climatic regions in Australia.
[4] Electric homes with heat pumps, not necessarily those with storage hot water heating.

rooftop PV. This is an additional cost of $5,568[5] for customers selecting gas appliances in their new home.

Figure 2: Comparison of rooftop PV requirements for an all electric (top) and all gas home (bottom) (Source: NCC Class 1 and 2 whole-of-home calculator 2022.xls)

The outcome from this calculator is that it will drive the appliance choices that customers will make when selecting appliances for new homes. However, these results are misleading because:

1. If, as the calculator shows, homes are more expensive with gas appliances, then the solution suggested by the calculator is to increase the costs to new homeowners by requiring them to install rooftop PV. This by itself increases the costs and hence is counterproductive to the objective of minimising energy costs.
2. The calculator does not account for capital costs of appliances. The costs of heat pumps and solar assisted hot water heating units are significantly more expensive[6] compared with gas or electric storage hot water units.

[5] Cost estimate for 5 kW solar PV system for NSW from Table 30, NCC2022 Update – Whole of Home Component

[6] For example, a installed hot water heat pumps is $4,196 while an installed instantaneous hot water gas heart is $2,182, which is around half the installed cost of the heat pump. Source: Table 32 of the NCC2022 Update – Whole of Home Component report

Both of these items create biases towards electrification that are justified in the NCC2022 via the concept of societal cost.

Energy Networks Australia does not support provisions in the NCC2022 that drive appliance choices and will outline further limitations of the provisions below.

The societal cost metric is an incomplete measure biased towards electrification

The societal cost appears to be the main justification in the DTS provisions. It is defined as[7]:

> *The cost to society as a whole, including but not necessarily limited to, costs to the building user, costs to the environment and costs to energy networks.*
>
> *In practical terms, for modelling purposes this meant that societal cost is composed of two main elements:*
>
> - *The cost of fuel to the building user*
> - *The cost of the greenhouse gas emissions associated with the use of that fuel.*

Energy Networks Australia proposes that the methods adopted to estimate the societal cost are misleading and encourage electrification of household services such as space heating, hot water and cooking.

As mentioned above, the societal cost does not reflect the capital cost of appliance choices. This by itself is a major shortcoming, as those appliance costs form part of the total cost of the home.

Misleading assumptions in the cost of fuel element

The cost of fuel is the main component of the societal cost.

Consumer energy usage patterns

The cost of fuel from fixed appliances is a function of the retail prices and the amount of energy consumed by the home occupant. Both of these are highly dependent on individual customer behaviour.

Within the DTS provision, the cost of fuel is based on the size of the home. While there may be a correlation between larger homes, more occupants and higher energy consumption, this is based on averaging historical data and does not reflect any consumer behaviour at all. For example, a retired couple has a very different energy consumption pattern compared to a young family with teenage children but could both wish to build a 4 bedroom/ 2 bathroom home.

This consumer behaviour is a key input that should be considered in the energy budget.

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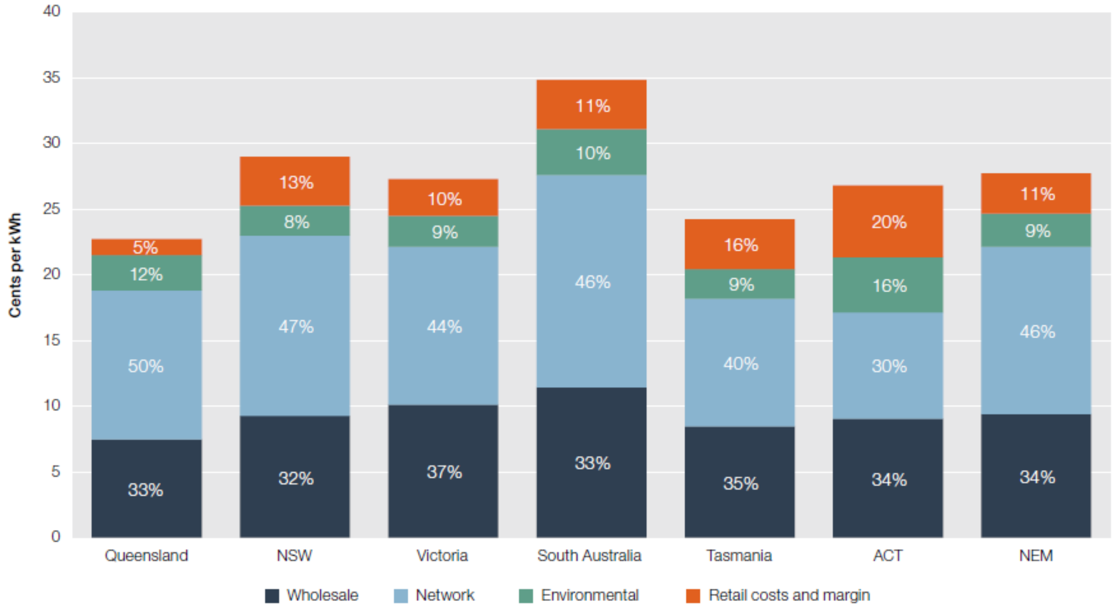
[7] Page 27 of NCC2022 Update – Whole of Home Component

Customers have many retail tariff options

The cost of fuel calculated in the societal cost are based on the retail tariffs by regions and account for peak and off-peak electricity tariffs. Retail tariffs are made up of a different components (Figure 3).



kWh: kilowatt hour.

Note: Data are estimates for 2020–21. Average residential customer prices excluding GST. Percentages may not add to 100% due to rounding.

Source: AEMC, *Residential electricity price trends 2020*, Final report, December 2020.

Figure 3: Composition of an energy retail bill (Source: Australian Energy Regulator, State of the Energy Market 2021, Figure 6.8)

Retailers also offer a wide range of discounts between 0 and 40 per cent of the total bill[8]. These discounts differ between retailers and customers can switch between retailers to receive higher discounts. This is a behaviour that a customer in a new build home would undertake after moving into their new home. The societal cost metric is limited and does not recognise that customers can switch between retail tariffs. This behaviour by itself could have significant impacts on the *cost of fuel to the building user*.

The tariff structures offered by retailers include[9]:

- single-rate or ‘flat’ tariffs, which apply a daily (fixed) supply charge plus a simple usage charge for the electricity that a customer uses;
- time-of-use tariffs, which apply different pricing to electricity use at peak and off-peak times. Lower prices at off-peak times encourage customers to shift their energy use to those times; and

[8] AER (2021) State of the Energy Market, Figure 6.6
[9] AER (2021), State of the Energy Market, pg 257

- demand tariffs, which charge a customer based on their maximum point-in-time demand at peak times. Customers can reduce their energy costs by shifting demand to off-peak periods. But even one day of high use at peak times will lead to higher charges for the whole billing period.

The modelling adopted for the NCC covers the first two structures but not the demand tariffs, which reflect the cost of electricity at different times during the day. This is a major oversight as demand tariffs are a more accurate reflection of the cost of generation during the day, which is especially the case for electricity.

Limited "Time of use" options do not reflect the true societal cost

The wholesale price of electricity is more variable compared with typical peak and off-peak tariffs used. As shown in Figure 4, wholesale prices of electricity during peak demand times are much higher than the average price. It is during these peak demand times, that space heating appliances are predominately used, and calculating the cost of electricity used for these applications based on a peak or off-peak tariff does not reflect the true societal cost.

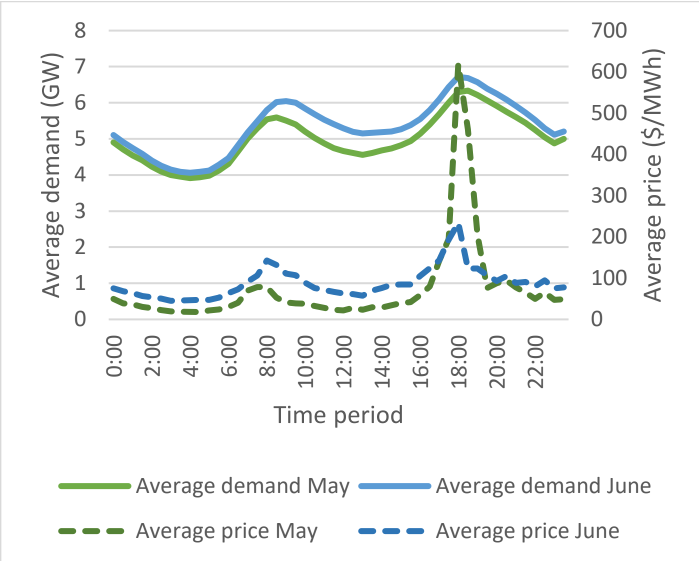


Figure 4: Victorian electricity price and demand (*Source: AEMO data*)

The same does not apply to gas tariffs as the wholesale gas prices do not fluctuate on a 30-minute period and not to the same extent as wholesale electricity prices.

Any increase to electrification - driven by the incomplete societal cost metric - will drive greater demand during peak times, leading to increased wholesale costs and subsequent increases to retail tariffs – paid for by all customers. This increase is not picked up in the current approach and as such, underestimates the cost of selecting electrical appliances.

Misleading assumptions in the cost of greenhouse gases

The second element included in the societal cost is the cost of greenhouse gas emissions. This places a greenhouse gas emissions price on appliance combinations for new homes but does not recognise alternate options for reducing these emissions.

Emission reductions options

Both the gas and electricity sectors are rapidly decarbonising through a combination of government-based targets and programs such as the Renewable Energy Target, or industry strategies such as Gas Vision 2050[10]. State Governments have adopted different targets to reduce emissions from electricity generation.

Similarly, the intention of the gas industry is to reach net-zero emissions from the energy sector well before 2050[11].

Customers have been able to access voluntary emission reduction for many years, through renewable energy technology, energy efficiency measures and carbon offset schemes. All energy retailers are now offering carbon offset options for both gas and electricity consumption.

Emission reductions are already occurring and including a metric for emission reductions in the societal costs creates a potential double count as many of these emission reduction costs are already covered via the "Environmental" component of electricity tariffs (see Figure 3), or via voluntary actions by energy users through adopting renewable energy options or purchasing carbon offsets.

Greenhouse gas emissions vary with time of use

If the ABCB wishes to introduce a societal cost for greenhouse gas emissions, then it should introduce a more accurate method to determine emissions from household energy use.

Greenhouse gas emissions of consumed electricity are a function of the generation mix at the time of use. Adopting state-based emission factors across a year[12] is misleading and not a true reflection of the level of emissions generated with energy consumption. According to the National Greenhouse Accounts Factors Handbook 2020:

> *The state-based emission factor* ***calculates an average emission factor for all electricity consumed*** *from the grid in a given state, territory or electricity grid.*
> *…*
>
> *This approach minimises information requirements for the system and produces factors that are relatively easy to interpret and apply. Consistent adoption of these 'physical' state-based emission factors ensures the emissions generated in each state are fully accounted for by the end-users of the purchased electricity and double counting is avoided.* ***It is recognised that this***

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[10] https://www.energynetworks.com.au/projects/gas-vision-2050/
[11] See for example: https://www.agig.com.au/renewable-gas
[12] Page 61 of NCC2022 Update – Whole of Home Component

approach does not serve all possible policy purposes and that alternative, more data-intensive approaches are possible.[13] *[Emphasis added]*

An example of these emission intensity changes is shown in Figure 5, based on AEMO data for electricity generation in Victoria during May 2020 and November 2020. The key observations are:

- Emission intensity is higher during peak demand times (shown in the shaded columns). This is a reflection of lower renewable generation (especially solar PV) during these periods so coal and peaking gas plants provide the majority of electricity.
- Emission intensity is higher in winter than in summer. This is also a reflection of lower levels of renewable generation during the colder months.

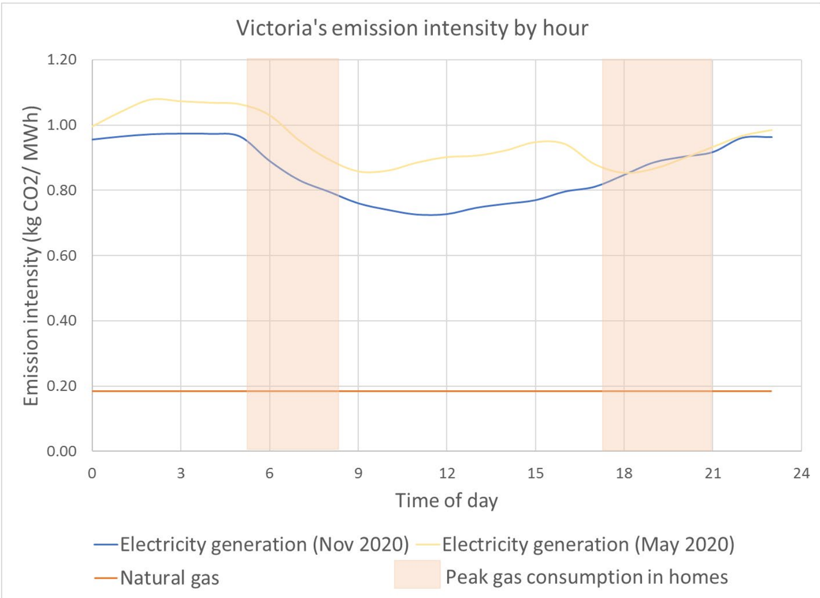

Figure 5: Electricity emission intensity variation with time of use (Source: AEMO data, Energy Networks Australia analysis[14]*)*

The use of gas for space heating occurs mainly during these colder seasons and these peak periods of demand. Using an average factor for greenhouse emissions for electricity generation underestimates its actual contribution to the societal cost of greenhouse gas emissions. This creates a bias towards electrification, and this is evident in the calculator.

Systems modelling of the gas and electricity sectors for Victoria have shown that replacing gas appliances with electrical alternatives[15] leads to increased emissions,

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[13] Australian Government (2020), Australian National Greenhouse Accounts Factros Handbook 2020, pg 17
[14] https://www.energynetworks.com.au/news/energy-insider/2021-energy-insider/playing-with-gas-victoria-should-substitute-with-its-star-performer/
[15] Heat pumps were used in the modelling as the electrical alternative.

even after accounting for the 50 per cent renewable energy target set by the Victorian government and the closure of Yallourn Power station (Figure 6).

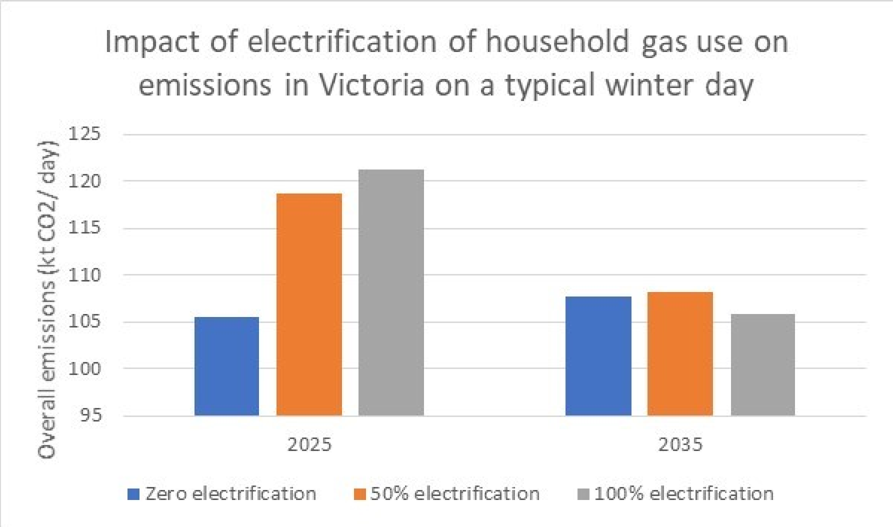

Figure 6: Impact of overall emissions through electrification of residential gas demand in Victoria (Source: Future Fuels CRC[16], ENA Analysis).

For direct consumption of gas it is much clearer, as the emission intensity of gas is constant throughout the year[17] and does not vary with time of use throughout the day.

The metric adopted in the Societal Cost does not adequately reflect the variation in greenhouse gas emissions across the year and throughout the day. This creates a bias towards favouring electrification, which does not recognise that electrification can increase greenhouse gas emissions.

If customers' appliance purchasing decisions need to be influenced to reflect greenhouse gas emissions, then an accurate representation of those emissions should be made, rather than relying on simplified average emission intensity metrics.

Scope 3 emissions

The greenhouse gas costs are estimated using Scope 2 and 3 emission intensity factors for both electricity and gas and multiplied by a flat rate of $12/ tonne, as an average of the cost of recent rounds of the Emissions Reduction Fund.

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[16] FFCRC RP1.2-02: *Regional case studies on multi sector integration* led by Professor Pierluigi Mancarella at The University of Melbourne: https://www.futurefuelscrc.com/wp-content/uploads/FF-CRC-Integrated-Electricity-and-Gas-Systems-Studies-Electrification-of-Heating-for-public-release.pdf

[17] There may be minor variations in gas quality across the year that will result in minor variations in emission intensity. These variations are related to gas supply and not dependent on time of use.

As far as we are aware, there is no broad industry agreement on the Scope 3 emission factors for natural gas being used in the societal cost calculation.

Additionally, distribution networks already purchase gas to compensate for unaccounted gas. The network tariffs include a component to purchase this gas so including that as an additional scope 3 emission results in a double count.

Energy Networks Australia recommends removing the Scope 3 emission in the societal cost.

The Consultation RIS is negative

ACIL Allen has completed a Consultation Regulation Impact Statement[18] for proposed energy efficiency provisions. This has assessed the impact of both Option A and Option B proposed by the ABCB. The CRIS addresses one of the limitations identified above by including the capital costs of appliances.

In both options, the CRIS demonstrates that the total costs outweigh the benefit. The Benefits to Cost ratio (including all the benefits) is 0.25 for Option A and 0.35 for Option B. In other words, the costs outweigh the benefits by a factor between 3 and 4.

The CRIS does not incorporate all of the above limitations (for example, time of use tariffs, potential double count of Scope 3 emissions of gas). If the CRIS was to include these limitations, it would see an increased cost with reduced benefits, lowering the Benefits to Cost ratio further.

The outcome from the CRIS should by itself be compelling evidence to not proceed with the proposed Whole of home provisions.

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[18] https://consultation.abcb.gov.au/engagement/consultation-ris-proposed-ncc-2022-residential/consult_view/