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A review of the Victorian Government's *Building Electrification Regulatory Impact Statement*

Gas Appliance Manufacturers Association of Australia

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Evaluate was formed in September 2016, to bring fresh thinking to policy and economic questions, including a strong interest in the impact of regulatory policy on Australian industry. Recent work in this sphere has included economic assessment of mining royalties, climate mitigation and adaptation investments, trade agreements, ports infrastructure, energy and the regulation of intellectual property.

Our approach is based on a traditional microeconomic toolkit, looking at all available data sources and considering a full range of policy alternatives.

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Overview

A number of concerns exist in relation to the Victorian Government's *Building Electrification Regulatory Impact Statement* (the RIS).

While the RIS has been prepared consistent with Victorian Treasury guidance, it is our contention that many of the benefits have been overstated, and numerous costs have been undervalued, rendering the CBA results unreliable across all options, including the Victorian Government's preferred one. Our concerns are focused on both the range of assumptions which provide the basis for the RIS as well as a number of the inputs to the CBA and associated calculations. These make the model overly optimistic and do not reflect real world experience: many of the assumptions are readily contestable. It is noted that the RIS acknowledges some of the data limitations that exist within it, and hopefully both this review and the consultation exercise will address these gaps.

As a headline assessment, the RIS overstates benefit cost ratios (BCRs) on multiple fronts, and alternative data demonstrates that there is no BCR which is greater than 1. Overall, this is a significant cost to consumers, distributed asymmetrically over the Victorian community.

More broadly, concerns about the RIS can be separated into seven sets. These are:

1. The assumptions in the RIS;
2. The assertion that intervention to correct "unbounded rationality" is principally to the benefit of individual consumers;
3. The asymmetry and inequity in the proposed solution designs: those who are paying do not reap a large portion of the benefits within the CBA, and there is little consideration of the impact of increased costs on the poorest Victorians;
4. That the CBA inputs are both optimistic and inconsistent with respect to both standard public economics and other work undertaken in this field;
5. That the full value of avoided emissions is included in the CBA which does not directly benefit consumers;
6. The assumptions about future energy production and consumption; and,
7. That no consideration has been given to the impacts on both industry and employment from the proposed market intervention.

To elaborate on these seven issue sets: the first relates to the assumptions in the RIS regarding the need for a strong government intervention to drive the replacement of gas appliances with electric alternatives. Options 1 through 4 in the RIS are essentially variations on a theme of compulsion although they are differentiated by comparative benefit-cost ratios (BCR).

What is not included in the RIS analysis, and deliberately so, is the alternative option of avoiding direct regulatory intervention in the market while indirectly encouraging market behaviour, which we contend would deliver similar goals at lower cost. This option might typically involve a combination of education and tax incentives, which could be priced at a range of levels to support consumers and industry.

Instead, alternative options that would provide informed and empowered decision-making are dismissed under the heading of "bounded rationality", which argues that consumers are too focused on the short-term to make socially desirable choices. No compelling evidence is presented that this is a material barrier in Victoria's appliance market (noting the widespread availability of on-line information, including from Governments, as well as companies offering energy service advice) nor that it is an insurmountable problem using conventional approaches. Similarly, the RIS provides no evidence that the preferred pathway would necessarily deliver a lower BCR than alternative options not considered.

At the very least, some calculation of the deadweight losses associated with redirecting consumer expenditure away from natural patterns should be undertaken, which would add to the assessed cost of gas prohibition, rather than indirectly encouraging different choices over time.

Second, and related to the "bounded rationality" assumption, is the assertion that direct intervention is ultimately to the benefit of individual consumers because forced conversion to electric appliances will protect them from paying future higher gas prices. However, if this is true – and there are certainly both contrary and well-informed opinions about future gas pricing – then such price signals would be expected to combine effectively with indirect measures to deliver the preferred behavioural change at a faster rate and a lower net cost.

This leads in turn to the third issues set which is that of asymmetry and inequity in the proposed solution designs. On the asymmetry dimension, it is notable that all the expenditure outlined in the RIS – new capital, installation costs and future energy consumption – are private costs and borne by the individual households who need to periodically replace their water heating, space heating, cooling, cooking and other appliances. In contrast, a significant proportion of the assessed benefits in the BCR are public benefits, particularly the expected reduction in carbon emissions.

The consequence of this is that a subset of individuals are forced to bear costs in return for benefits to others, which is an inequitable approach.

This means a BCR in which the payers and the beneficiaries are different groups although the former is considered a subset of the latter.

On the broader issue of equity, it is important to reflect that the direct costs of replacement will be significantly more onerous for households in lower socio-economic quartiles as well as for those in regional and remote areas. While the RIS makes reference to exemptions for some very limited high-cost circumstances, these are not clearly enunciated and are in any case absent from the proposed regulations. The formulation provided is that they would only operate in extreme circumstances where there is a conflict with other legal requirements rather than to address problems of general inequity.

Fourth – and exacerbating concerns about equity – the CBA inputs are both optimistic and inconsistent with respect to both standard public economics as well as to what previous reviewers have discovered about the appliance market. Costs for the base case appear overstated, and benefits of the recommend options appear overestimated. Taken together, the net economic benefits of the proposed policy intervention are highly questionable.

Some of these inputs are at the higher level of model specification, including carbon price, discount rate and assumptions about the rate of renewable energy. Each of these is contestable. Perhaps more significantly, estimates about appliance costs and savings are substantially divergent from real-world surveys regarding conversion and replacement and the difference is well beyond the 25% sensitivity test for selected inputs.

Fifth, and adding to the questions of both symmetry and input selection, it is unclear that the full cost of avoided emissions has any natural place in the CBA. It does not, for example, form part of the arguments concerning bounded rationality or the future state of the gas market, which are the ostensible reasons for the proposed market intervention.

In other words, the intervention should "stand up" without the need for the benefits assumed to flow from emissions reduction, but it patently does not. At the same time – and taking into account both different nations and, for that matter, different Australian states' approaches to emission reduction – it is not credible that any benefits that do flow would be captured by the broader Victorian economy, let alone the specific cohort of households who are being compelled to change their energy source. In this context, it is problematic that the only abatement measure considered here is the ban on gas appliances.

Emissions and their environmental costs are understood in economic terms as negative externalities of energy production and consumption. It appears from the RIS that a significant proportion of the emissions expected to be avoided over time will come from the migration of electricity generation to renewable sources. Given this, it is expected that the benefits of these reductions in externalities are captured (and appropriately compared for efficiency and cost-effectiveness against alternative abatement measures) elsewhere in the economic analyses underlying the rationale for Victoria's renewable investment program (the Roadmap) and that they should not be further allocated to consumer-level initiatives.

Evaluate acknowledges that this is a fundamental challenge with climate economics. Nonetheless, to avoid even greater asymmetry, the question of whether this belongs in a localised BCR calculation needs to be revisited.

Issue set six concerns the assumptions about future energy production and consumption. Three statements may be made here in summary as follows:

1. There is a significant cost to upgrade current electricity supply infrastructure, which is not included in the BCR. While this may be regarded as a sunk cost, there is a strong argument that it should be partly hypothecated against the savings proposed for this measure. At the very least, if the full

value of avoided carbon emissions is included, then the partial cost of infrastructure investment to enable these avoided carbon emissions should also be included in the same equation;

2. Hot water, heating and cooking demand for electricity are asymmetrically distributed during the day, typically biased to morning and evening, as well as across seasons, typically biased to winters, so a significant proportion of electricity which replaces current gas use will be demanded at peak times and rates rather than an average cost; and,

3. There is powerful evidence that accelerated decarbonisation will increase electricity tariffs with inflationary effects which parallel those suggested for future gas supply.

Finally, consideration needs to be given to effects on both industry and employment if the Victorian Government effectively outlaws a significant part of the natural demand for replacement gas appliances and the installation services which accompany them.

While the RIS expresses confidence that increased electrical work will add to Victorian Gross State Product, it is unclear what percentage of such work can reasonably be allocated to electrifying households. At the same time, this all appears to be upside with no clear estimate of the loss of gas-related activity. Leaving aside the general economic impact, the RIS has only limited recognition of the human and commercial impact of market intervention: manufacturers of gas appliances do not transform their operations to electric appliances without considerable investment, retraining and reallocation of resources, and gasfitters do not readily transform into electricians overnight.

Each of these is an argument for a market-based indirect solution, as discussed above. At the very least, the RIS should be reworked and augmented with a proper consideration of the BCRs of non-direct interventions.

The Bounded Rationality Argument

The proposed market intervention and the associated RIS follow a sequence of prior assumptions regarding need, which in turn lead to conclusions that justify the selection of scenarios describing different levels of compulsion. These assumptions are that:

1. There will be a material increase in consumer gas prices in coming years;

2. Despite this, Victorian consumers will continue to replace aged gas appliances with new gas appliances;

3. This represents an irreconcilable example of “bounded rationality”, apparently categorised in this instance by consumers focusing narrowly on the capital cost of the new equipment rather taking into account the discounted lifetime cost; and,

4. As a consequence, the State Government must act to limit consumer choice in order to protect Victorians from their own poor judgment.

In economics, bounded rationality is an almost ubiquitous phenomenon as, in the last few decades, it has become accepted that individual behaviour rarely conforms to the rational human models of classical economic theory. The acceptance of this forms the foundation of behavioural economics which has provided solutions across a broad spectrum of human choices.

The underpinning assumptions to a claim of bounded rationality are generally information-based, either that people have insufficient information to make the rational choice; the costs of obtaining appropriate information are individually high; or, in some cases, individuals are considered to have insufficient cognitive capacity to make an informed decision. In this instance, this means that individuals who continue to prefer gas cooking, hot water and heating are engaged in "heuristics or mental shortcuts"[1] which lead to suboptimal choices.

It is important to acknowledge here that the RIS does note various surveys[2] which show consumers prefer cooking with gas for a variety of reasons, including because of its perceived performance as well as some expected short term costs of changing to electricity, such as the need to purchase new cookware.[3] If these are part of the 'heuristic' leading to bounded rationality, then the RIS is implicitly dismissing them as prejudices whereas there may be cultural issues and rational foundations (such as cooking experience) leading to a preference for gas.

More significantly, the first response when problems of incomplete or asymmetric information need to be addressed should be to address the information gap involved rather than to ban what the RIS categorises as a suboptimal decision. This may involve a range of strategies, including:

1. Amplifying important information which may not be generally well-understood. This could be undertaken, for example, through a public education campaign, potentially involving both free and paid media and aimed at the general population;

2. Lowering the cost of access to information for the specific part of the population which is considering purchasing new gas appliances by requiring some disclosure about expected medium-term cost alongside the capital price; and/or,

3. Introducing some targeted financial incentive to address the average capital gap between electrical and gas replacement appliances in order to alleviate any short-term focus on behalf of consumers. This would need to be costed, but would follow the existing model of Victoria's hot water system discounts.[4]

Notably, the last of these – whether a subsidy, rebate or other financial instrument – would require public funds, which would be more appropriate if there were broader public benefits to achieving the proposed change in consumer behaviour. This question is addressed further below.

[1] RIS, p.49.
[2] RIS, p.50.
[3] It is not clear that this potential expense is included in the CBA.
[4] https://www.energy.vic.gov.au/victorian-energy-upgrades/products/hot-water-system-discounts Accessed February 2025

The first two options are typical information-enhancement, or education, measures which lie at the heart of behavioural economics. They also have the benefit that, if consumers aren't aware of the full cost of their choices, then making them aware is likely to be the least-cost option.

This observation suggests a fallacy which is central to the RIS, which is that there are only four options, each of which is a species of direct regulatory intervention or different level and kind of ban. Normally, this option set would include an information campaign, which may deliver a significant proportion of the desired outcome at lower overall cost, although this cost might be borne by the Government rather than by consumers.

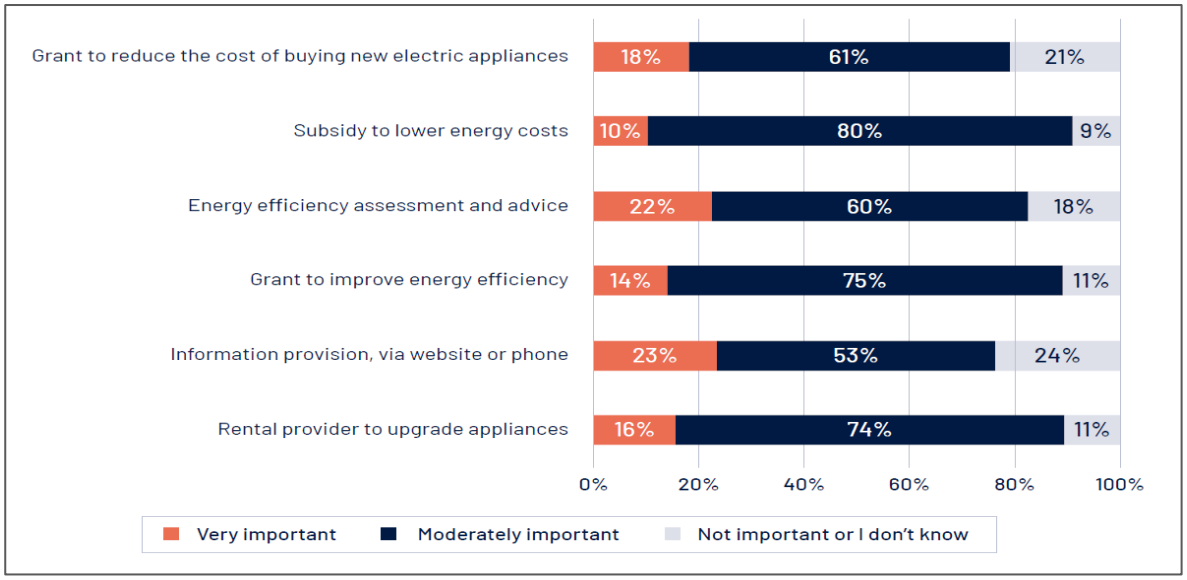
Somewhat surprisingly, the RIS cites a survey that demonstrates that information from reliable sources could have profound effects on the desired outcome before then dismissing it.[5] This survey's findings indicate that strong support exists for shifting away from gas in Victoria. It also emphasised that capital costs, financial stresses and information gaps were key barriers for consumers and the need for any transition to be well managed to avoid exacerbating disadvantage.

Building on this the survey found that information provision is considered as important by 76% of respondents, and is "very important" to more respondents than any of the other forms of support as outlined in Figure One below.

Respondents stressed the importance of the source of information, noting that reliable guidance is essential in choosing when and how to replace appliances, whether planned or urgent. Information is particularly trusted when provided by social welfare groups, local government and cultural networks, particularly for Culturally and Linguistically Diverse (CALD) households:

[5] Chandrashekeran, S; de Bruyn, J; Bryant, D and Sullivan, D (2023): Enabling electrification - Addressing the barriers to moving off gas faced by lower-income households, Social Policy and Research Centre

Figure One: Importance of support measures to households surveyed



However, in a single paragraph,[6] the RIS dismisses this alternative, noting that the State Electricity Commission already has a digital platform – of which consumers may or may not be aware – and that, moreover:

> "The prevalence of externalities means that additional information is unlikely to completely increase electrification of residential and commercial buildings. Therefore, information and education campaigns are not likely to drive the pace of change required to meet Victoria's needs."

The use of the words 'completely' and 'Victoria's needs' here are significant because, if a population target is set at 100%, then some level of bounded rationality is unavoidable, and the concept becomes effectively meaningless. However, this seems at odds with the central argument of the RIS which asserts that the principal reason for addressing bounded rationality is to unlock individual consumer benefits. In equity terms, this also has the tendency to privilege the goal of reducing gas consumption over other social welfare concerns.

In contrast, if in fact complete electrification and its associated environmental and social outcomes are the overriding goal, then the idea that the proposed market intervention is to protect consumers from rising gas prices has the status more of narrative than justification.

Appendix B[7] also discussed financial incentives but notes particularly the challenge that, in rental properties, short-term consideration of capital costs may be stronger as the landlord will not be directly exposed to the energy price although this may indirectly affect rental demand and price over time.

[6] RIS, p.151.
[7] RIS, pp. 151-2.

Nonetheless, if consumer concerns are an important policy consideration – and consumers are certainly funding the denominator of the BCR – then a combination of education and financial incentives should be considered as an alternative solution.

The fundamental question here is in two parts as follows:

1. Would a program of education and financial incentives deliver a significant part of the electrification goal?; and,

2. Could it do so with both lower total costs, and a higher BCR than the four options considered in the RIS?

The question might also be asked as to whether financial incentives have a particular equity benefit as, for consumers in lower socio-economic groups, the marginal up-front cost of electrical replacement is a more significant impost, and some degree of compensatory funding may make a significant difference.

While indirect options will not deliver a 100% behavioural change, this target is based on non-consumer goals. For other reasons as outlined below, incremental albeit substantial behavioural change may in fact be preferable.

Finally, it should be noted that the CBA does not take into account any deadweight loss in the economy associated with the proposed market intervention. Insisting that consumers and businesses spend their money against their existing market preferences for investment or consumption is equivalent to taxing and redistributing funds. This is particularly important for commercial entities. And as a general principle, the rate of deadweight loss rises with selective imposition. In contrast, informed behavioural change over time is a normal market shift and would not cause the same level of market distortion.

Price Signals

One of the assumptions which sits behind much economic theory, including concepts such as bounded rationality, is that consumers will respond to price signals. This is a commonly understood concept that, as prices for a good or service rise, consumers will be more likely to consider or seek out substitutes.

If the proposition that gas prices are expected to rise radically in coming years is accepted, it can be assumed that, as a result, consumers will become more likely to consider an electrical appliance to replace their historical gas appliance, or a more efficient gas appliance. The rate at which this will occur is unclear and there is obviously some lag for consumers who have recently replaced their appliances,[8] but this would be normal market behaviour.

Here we note an Infrastructure Victoria study which finds that long-run elasticity of Australian consumers' responses to higher prices will follow the theoretical expectations, with clear willingness to invest in more

[8] Though some of this lag will be present even where there is direct action.

energy-efficient appliances in response to price signals.[9] This is a stronger observed response than in the short term, where capacity to ration energy use is constrained by need.

Alongside this, there is no comparable consideration given in the RIS to inflation and uncertainty in electricity prices.

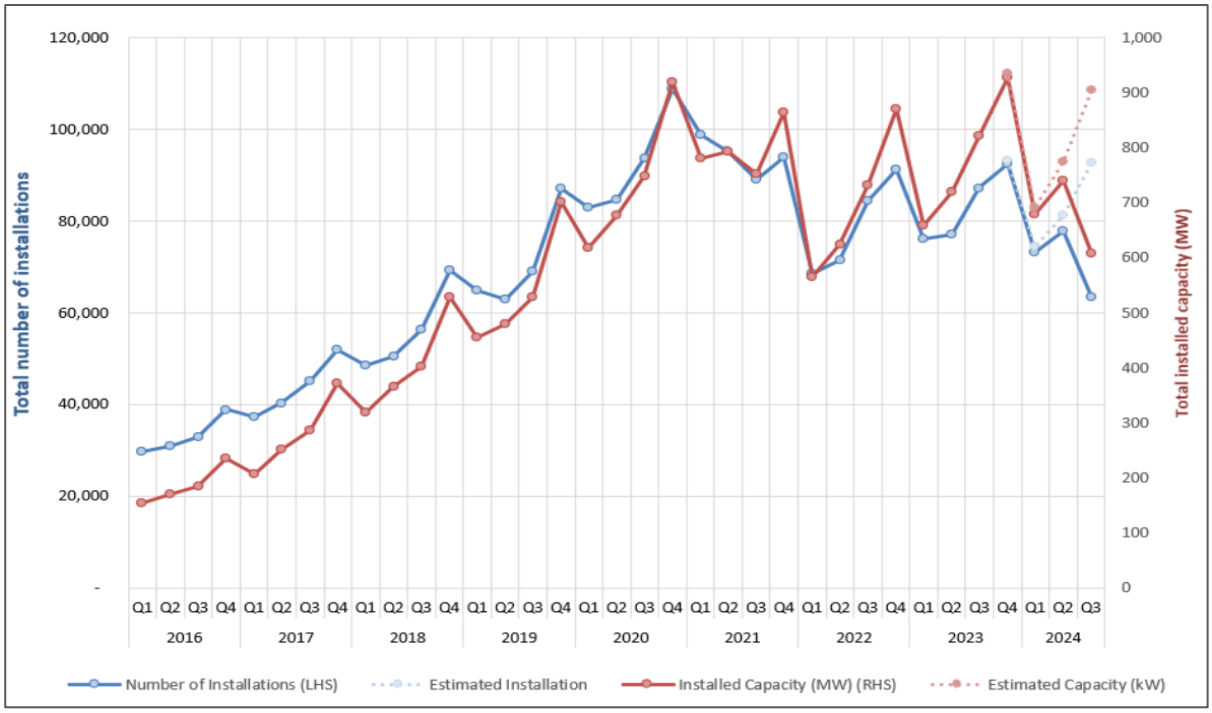
The principle that consumers will react to price shifts should also guide the authors of the RIS to reconsider indirect actions - particularly education - to encourage people to more rapidly transfer to more energy efficient gas or electric appliances. This is particularly the case if consumer benefits are a genuine policy goal. With effective communication, there is no reason to suggest that consumers will delay action until the expected price signal emerges, especially as there are numerous examples of people's increasing willingness to trade off short-term against medium-term costs.

In the energy sector, perhaps the best example of this is the rate of installation of household solar generation, which has been increasing in recent years although it may have stalled to some extent recently due to current inflationary constraints. Notwithstanding the high levels of subsidy typically available to purchasers of such systems, solar installation nonetheless involves a considerable upfront investment with the promise of recovery over a significant time horizon, as energy prices increase, and consumers benefit from avoided costs by generating their own electricity.

The rapid uptake since 2016 as shown in Figure Two below suggests that consumers have been able to fully comprehend the short term/medium term trade off, despite the uncertainty over future energy prices (or perhaps because of said uncertainty):

[9] Lorraine Conway and David Prentice, "How much do households respond to electricity prices? Evidence from Australia and abroad". *Infrastructure Victoria: Technical Paper 1/19*, September 2019.

Figure Two: Rate of Solar PV Installation, 2017-2024[10]



While it is impossible to isolate individual decisions, it is reasonable to assume that increasing grid electricity prices have contributed to some extent to this investment, which will only repay itself over time. This has occurred without enforcement (though there are some incentives in different jurisdictions)[11] and represents positive and rational change in consumer behaviour. It also provides an equivalent example in relation to people's capacity to understand both economic and perceived environmental benefits. There is no compelling evidence to suggest that consumers cannot make similarly informed decisions around appliance replacement costs and potential savings.

Cost-Benefit Asymmetry

Within the RIS, the CBA takes into account a series of identifiable costs and benefits associated with the electrification program which are generally common to both household and commercial compliance with

[10] Australian Energy Council, "Solar Report: Quarter 3, 2024", p.3. https://www.energycouncil.com.au/media/y4cb1kkz/australian-energy-council-solar-report-q3-2024-1.pdf Accessed February 2025

[11] For example, the Clean Energy Regulator's Small-scale technology certificates, though it typically takes multiple years for these to outweigh the marginal cost of installation. https://cer.gov.au/schemes/renewable-energy-target/small-scale-renewable-energy-scheme/small-scale-technology-certificates Accessed February 2025

the proposed market intervention. 100% compliance is assumed[12] and the 10-year estimated benefit-cost ratios (BCR)[13] are outlined in Figure Three below.[14]

[12] RIS, p.83. A number approaching this is reasonable although 100% compliance is rarely achieved even with enforcement.
[13] While the following table has 20-year estimates, this paper focuses on the medium-term in this paper because costs and benefits beyond a 10-year horizon are inherently unreliable. In this section, however, the conclusions would not differ radically if the longer time-horizon were used.
[14] RIS, p.86.

Figure Three: 10-Year CBA NPV Results ($M)

	Option 1	Option 2	Option 3	Option 4
Appliance upgrade and installation costs	2,021	11,713	4,766	3,771
Building upgrade costs	199	1,751	1,051	1,734
Administrative cost	-	254	53	110
Costs to government	-	18[1]	11	18[1]
Total costs	**2,221**	**13,736**	**5,882**	**5,633**
Avoided energy cost	791	5,750	4,226	3,547
Avoided GHG emissions cost	573	4,455	3,282	3,107
Avoided air pollution costs	8	67	49	43
Avoided capital cost of cooling appliances	830	4,146	2,664	2,139
Avoided gas network cost	592	1,139	678	968
Total benefits	**2,795**	**15,558**	**10,900**	**9,803**
NPV	**574**	**1,822**	**5,018**	**4,170**
BCR	**1.26**	**1.13**	**1.85**	**1.74**

The first concern which emerges here – before looking individually at the input estimates – is that there is a fundamental asymmetry between payers and beneficiaries. As the Victorian Government is limiting its role to the auditing of plumbing compliance certificates,[15] their contribution to total costs in the preferred option, Option 3,[16] is $11 million, a mere 0.19% of the expenditure burden. The remainder will be met by households and businesses. This is a significant difference between what the public and private sectors will pay.

However, on the benefits side, nearly 31%[17] of the benefits are from avoided greenhouse gas (GHG) emissions and air pollution. These are not benefits captured by the private payers on the cost side but rather are nominally consumed by the community as a whole.

This leads to an asymmetric BCR model, calculated as: $\frac{Private\ Benefits + Public\ Benefits}{Private\ Costs}$

In practice, the Government's enforcement cost is a rounding error to the denominator. Instead, it would be more proper to calculate two distinct BCRs as follows:

[15] RIS, p.75.
[16] All forward calculations in this document are based on and compared to Option 3.
[17] Sum of emissions and pollution values divided by total benefits.

- One strictly household and commercial (private) BCR which, with a reduced total private benefits figure of $7,569 million,[18] presents a marginal BCR of 1.29; alongside,
- A collective/Government BCR of 302.82.[19]

It might conceivably be argued that at least a *pro rata* proportion of the avoided GHG emissions and air pollution should be allocated to private benefits but even this would be unsound. The reasons why are discussed at some length below.

Four further propositions flow from this observation of asymmetry:

1. If the conclusion that direct market intervention is preferred to indirect encouragement to drive behavioural change, founded on a consumer case relating to energy prices, then the case is relatively weak at an estimated private BCR of 1.29. Looking to alternative data (below), even this is a significant overestimate;
2. At this BCR, a 25% multivariate sensitivity test will find that, in some scenarios, the proposed market intervention is simply a medium-term nett cost to consumers;
3. More importantly, when there is a discussion of various input values as below, the proposal that there is a direct consumer/commercial benefit from the proposed market intervention begins to look very marginal; and,
4. To the extent that the Government seeks a collective benefit from the proposed market intervention, it should provide collective funding via broad-based revenue measures rather than insist that a specific cohort pay for broader public benefits. This would also be expected to reduce any deadweight losses as the economic effect is more evenly distributed.

We note that this is the reason why many economists prefer measures such as Pigouvian taxes and emissions trading systems over direct interventions such as this, so that a natural equilibrium is reached, and both costs and benefits are evenly distributed. Finally, the lower direct-to-consumer BCR will clearly exacerbate the inequity that would be experienced for those with less disposable income. Other factors also come into play: for example, electrification in older buildings is likely to be more expensive. In these cases, it is suggested that the Government reconsider the limited approach to exemptions outlined in the RIS.[20]

At the moment, it appears that exemptions do not take into account the excessive burden on some households or, for that matter, commercial users. At the very least, hardship provisions would be warranted here whether delivered via exemption or subsidy.

[18] Total benefits minus the sum of emissions and pollution values divided by Total costs minus costs to Government. Avoided gas network costs are retained in consumer benefits, though whether they are really consumer benefits is ambiguous.
[19] Emissions and pollution benefits divided by costs to Government.
[20] RIS, p.138.

It is further commended that alongside indirect options, the Government should consider the cost-effectiveness of GAMAA's preferred option to include the option of high-efficiency gas replacements.

Inputs to the CBA

There are also a range of concerns regarding specific inputs into the CBA which, if adjusted to more realistic and publicly accepted factors, will put downward pressure on the BCR for each listed option. As Option 3 here is the recommended path, this paper focuses on the data for this option as per the table replicated in Figure Three above.

Appliance Upgrade and Installation Costs

Option 3 lists an aggregate 10-year discounted appliance upgrade and installation cost of $4,766 million.

Frontier Economics collected data during a 2022 study [21] , which looks at the real cost of replacement. The Frontier data was based on an extensive survey of suppliers and tradespeople who quoted on real costs of relevant upgrade and installation work and equipment.

Based on the data in this study, it is found that the ten-year marginal costs are in a substantially different range to those suggested in the RIS. The ranges are as follows, depending primarily on widely varying electrical upgrade costs:

- A low estimate of $6,673 million;
- Typical estimate of $7,951 million; and,
- A high estimate of $11,269 million.

These figures are now conservative, noting the significant rise in installation (trade labour) costs that have taken place since the Frontier study was undertaken in 2022. Nevertheless, if the typical cost is taken here and plugged into Option 3, this gives:

- An NPV (loss) of around -$231,000;
- A BCR including the GHG and pollution avoidance of only 0.90; and,
- A consumer/commercial BCR of 0.54.

Even if the low estimate is used, the respective BCRs are only 1.05 and 0.62, depending on whether carbon and pollution are included.

[21] *Frontier Economics Cost of switching from gas to electric appliances in the home, June 2022,* https://gamaa.asn.au/wp-content/uploads/2022/07/Frontier-Economics-Report-GAMAA.pdf

This is obviously well short of a compelling proposition, even if it remained the highest BCR amongst a universally inefficient set. It would further slide in comparison to any BCR for an indirect option as proposed above.

The principal reasons for the disparity between the RIS calculations and the industry survey data are threefold as follows:

1. Given their real-life experience, the industry appears to have asked more comprehensive and granular questions regarding prospective costs;

2. It appears the RIS has not considered the full costs of retrofitting electrical appliances in a previously dual fuel (gas and electric) home as well as the different electrical requirements of the different appliances requiring power supply upgrades. These costs are available, from previous work done by Frontier Economics/GAMAA, which informs alternative calculations provided below;

3. At the same time, the only costs included are for the limited cost component of replacing gas appliances with electrical rather than new gas without fully recognising the cost of removing existing gas appliances.

The RIS acknowledges that there are various data gaps in its consideration and requests input from experts across industry. The above data should be considered in filling these gaps.[22] Notably these data sets have previously been published and are publicly available.

Avoided Energy Costs

Avoided energy costs are the most valuable component of the consumer benefit in the RIS and are valued at $4,226 million.[23] Data provided by GAMAA shows avoided energy costs of $2,377 million which suggests the RIS savings appear to be overestimated by around 79%. Again, the RIS should be reviewed in light of this GAMAA data.

The difference in estimated costs avoided is most likely to be mainly due to the RIS overestimating the energy consumption of gas appliances, underestimating the energy consumption of electric appliances and not having scaled the heating energy use according to dwelling size (instead using an average). In addition, neither the RIS nor the GAMAA analysis consider the time-related as well as seasonal use electricity. In particular, both cooking and heating are typically used early and late in the day – including at night – and demand will also increase for heating during winter where renewable energy sources are less efficient. The pattern of demand therefore means that much of the electricity consumed will be at peak demand with higher tariffs, resulting in lower avoided energy costs.

There is an associated issue here insofar as demand patterns suggest that the principal consumption of electricity instead of gas – for heating in particular – is likely to take place at times when renewable energy

[22] Though it is acknowledged that the Frontier data reflects residential installation and upgrade costs.
[23] It is noted that there is inconsistency on this measure in the RIS between Table 2.1 (p.37) and Appendix C

is less efficient. This may therefore mean that the estimates of GHG and pollution avoided are overly optimistic.

Value of GHG Avoided

As noted above, the combined GHG and pollution avoided represent over 30% of the numerator in the RIS BCR for Option 3. Beyond concerns about the asymmetry of this calculation, Evaluate also believes the incorrect values have been used for GHG.

The prices used in the RIS for carbon per tonne are selected from the Intergovernmental Panel on Climate Change *6th Assessment Report*.[24] This is actually inconsistent with Australian practice which instead seeks to align Commonwealth, State and Territory jurisdictions via the Australian Energy Markets Commission (AEMC).[25] Figure Four illustrates the differences between the prices used in the RIS and the accepted Australian prices for carbon emissions from the AEMC.

Figure Four: RIS v. AEMC Carbon Price per Tonne

Year	RIS	AEMC	Overstatement
2024	$106	$70	51.4%
2025	$112	$75	49.3%
2026	$118	$80	47.5%
2027	$124	$84	47.6%
2028	$130	$89	46.1%
2029	$135	$95	42.1%
2030	$141	$105	34.3%
2031	$154	$114	35.1%
2032	$167	$124	34.7%
Mean	**$132**	**$93**	**43.1%**

This is a material difference and, if the BCR is to include the GHG and pollution components, calls for substantial revision.

Avoided Capital Cost of Cooling Appliances

This is another large component of the BCR calculation, valued at $2,664 million in benefits. The RIS assumption that households whom replace their gas heating appliance with a combined electric heating and cooling (reverse cycle) appliance can avoid the future capital costs of replacing cooling appliances already installed is logical. However, the RIS contains no detail as to how this figure was calculated.

[24] Converted to Australian dollars at an unspecified exchange rate.
[25] Preferred national values may be found in: AEMC, "How the national energy objectives shape our decisions", 28 March 2024, p.16.

Alternative calculations by GAMAA, based on the RIS assumptions of existing cooling appliance prevalence and lifespan, and recognizing that a proportion will reach end of life every year and not require replacement show the avoided capital costs to be considerably lower, ranging between $1,787 and $1,802 million.

Revisiting the BCR

Incorporating the various observations discussed above, but leaving other values constant, Figure Five lists alternative BCRs reflecting revised assumptions. It should be noted that in revisiting the BCR, we have had to rely on the summary table in the RIS, as we did not have access to the modelling underpinning the CBA calculations. The timing of impacts (costs and benefits) matters a great deal in CBA analysis, but this has not been made available to interested stakeholders, thereby reducing the transparency underpinning the results.

Figure Five: Revised BCR calculations ($ million)

Element	RIS Option 3	Without GHG	Low Revision	High Revision	Low Ex-GHG	High Ex-GHG
Appliance upgrade and installation costs	4,766	4,766	6,673	9,579	6,673	9,579
Building upgrade costs	1,051	1,051	1,051	1,051	1,051	1,051
Administrative cost	53	53	53	53	53	53
Costs to government	11	11	11	11	11	11
Total costs	5,881	5,881	7,788	10,694	7,788	10,694
Avoided energy cost	4,226	4,226	2,377	2,377	2,377	2,377
Avoided GHG emissions cost	3,282	-	1,867	1,867	-	-
Avoided air pollution costs	49	-	49	49	-	-
Avoided capital cost of cooling appliances	2,664	2,664	1,787	1,802	1,787	1,802
Avoided gas network cost	678	678	678	678	678	678
Total benefits	10,899	7,568	6,758	6,773	4,842	4,857
NPV	5,018	1,687	-1,030	-3,921	-2,946	-5,837
BCR	1.85	1.29	0.87	0.63	0.62	0.45

It is clear not only that there is a range of pictures which might be painted of the relative costs and benefits associated with the proposed market intervention in Victoria but that the assessed value of direct intervention is highly sensitive to input assumptions. Importantly, none of the BCRs with revised values is greater than 1, representing a nett cost to both consumers and the broader Victorian economy.

We note that there are other considerations which may affect the BCR, particularly where we have not allocated alternative assumptions, and these are discussed further below.

Discount Rate Selected

The RIS uses a 4% discount rate for future years.[26] This is consistent with the Victorian Government's Guidance for Regulatory Impact Statements for regulation change.

However, as with the carbon price assumptions, the 4% rate used in the RIS is inconsistent with Australia's national approach to energy infrastructure reform. Specifically, the most recent recommendations to the Australian Energy Market Operator advise that the current technology-neutral real pre-tax discount rate is estimated at 6.98%, conventionally rounded to 7%.[27]

While this is a "regulatory change", it is also a capital cost and one that will predominantly be paid by consumers. Accordingly, the higher discount rate should be considered.

Critically, while both future costs and benefits are discounted at a common rate, the higher discount rate will have a more significant adverse effect on the benefits side of the calculation as these are received entirely after the initial capital expenditure.

Treatment of Avoided Emissions

As noted above, the value of avoided emissions, as well as to a much lesser extent reduced pollution, is included as a significant share of the benefits within the RIS' BCR calculations. There are four concerns with this as follows:

1. This is not a benefit that can be captured by consumers paying for new electrical appliances and their installation unlike, for instance, the nominal savings in lifetime energy costs. This issue is discussed earlier in this paper;

2. The benefits, for that matter, are not even able to be captured locally. Victoria is part of an interdependent national and international environment where local reduction of carbon emissions sits within a global pool and the economic value is not locally realised;

3. Typically, substitution of energy and its associated reductions in undesirable emissions would sit within a more macro-level evaluation of energy generation so there is the potential for double-counting of these benefits when these are also hypothecated within a consumer BCR; and,

4. Modelling undertaken by GAMAA suggests that the effective abatement cost of carbon through the electrification initiative averages from $208 (low capex) to $525 (high capex) in real terms by 2035. Given the proper allocation of value for carbon emissions, this suggest the chosen option is highly inefficient and inequitable.

[26] RIS, p.153

[27] Oxford Economics Australia, "DISCOUNT RATES FOR ENERGY INFRASTRUCTURE PREPARED FOR AEMO FOR THE 2026 INTEGRATED SYSTEM PLAN", December 2024.

None of this is to suggest that the overall long-term goal of the Victorian Government to reach zero emissions lacks merit. However, use of avoided emissions to bolster a consumer-funded efficiency case is an inappropriate methodology.

Whether the value of avoided emissions may even be appropriately allocated to Victoria as a whole, is an open question as, while pollution may be captured locally – particularly in major cities, the effects of CO2 emissions are principally on international weather patterns rather than directly local. This is the argument for international cooperation around climate action and investment and, while instruments such as tradeable carbon credits may make avoidance appear locally capturable, this is misleading.

To emphasise, there is no dispute that there are benefits from avoiding carbon emissions. The argument is that they are out of place in this BCR.

Future Energy Costs

The RIS maintains that the proposed options are expected to have minimal effects on electricity prices compared to the Base Case. This is because future investments in infrastructure and network expansion is already accommodated, as there are existing and proposed government initiatives, including the increasing electrification of rental properties and government facilities.

While electricity consumption is expected to rise under these options leading to increased gas-powered generation (GPG), the overall consumption of natural gas across the energy system is projected to decline. This is primarily due to a significant drop in reticulated gas demand as more consumers transition to using more electricity.

This is why the RIS excludes any consideration for electricity network expansion costs in the CBA while including $678 million of benefit in the form of avoided gas network costs.

We note that the underlying assumption that there will be a reduction in net capital investment across the energy network is contrary to recent expert opinion on the impact of rapid electrification and decarbonisation in Victoria which, in the medium term, will require incremental energy to be derived from both renewables and gas.[28]

The principal driver of this is that Victoria's aggressive decarbonisation and electrification strategies, particularly the retirement of the State's 5GW brown coal fleet mean that simultaneously:

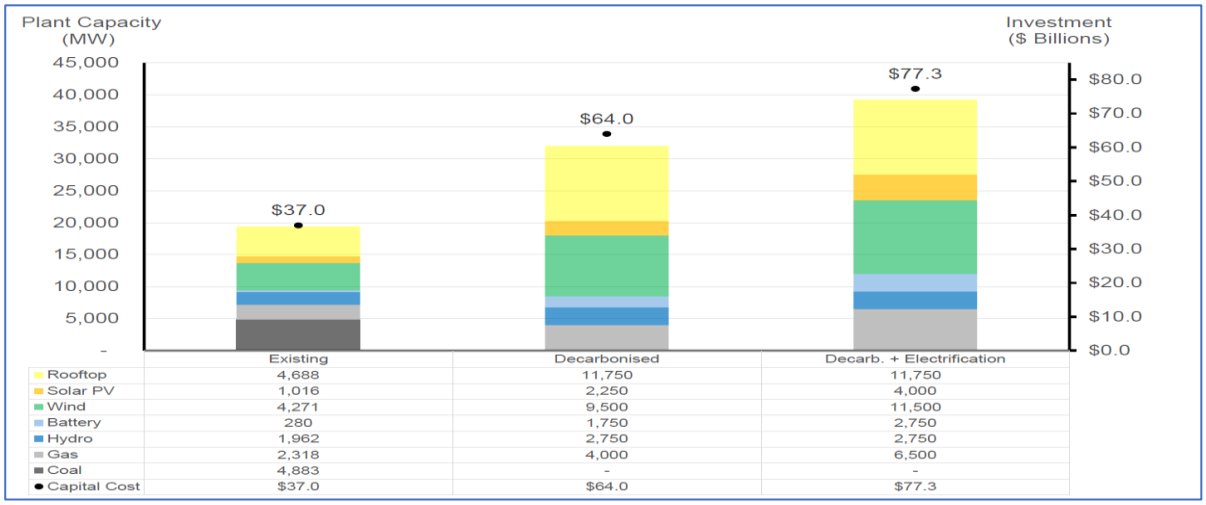
- There will be a 41% increase in peak electricity demand from 9,500 MW to 14,000 MW;
- This will require new infrastructure in transmission, hydro, other renewables and gas powered generation (GPG); and,

[28] P Simshauser and J Gilmore, "Policy sequencing: on the electrification of gas loads in Australia's National Electricity Market", 2024.

- This will present significant capital requirements which are not included in the current model.

The consequences of this are illustrated in Figure Six below.

Figure Six: Victorian Generation Investment v. Existing Capacity[29]



From a fiscal perspective, the conclusion is that an extra $13.3 billion in capital costs will be required by 2035 to provide the backbone to decarbonisation and electrification at the rate currently intended by the Victorian Government. Evaluate notes that this figure is broadly consistent with the $22 billion on-costs to consumers over 20 years modelled by Energy Networks Australia,[30] which would swamp assumed benefits in terms of avoided energy costs, and would radically change the BCR of electrification.

The RIS does not acknowledge this investment requirement, presumably treating it as an external matter, a type of sunk cost or already incorporated into the Base Case, but the decision to aggressively pursue electrification alongside decarbonisation does have a clear impact on the level of investment required. Further, the revised BCRs in Figure Five above would be considerably further reduced if anywhere near $13.3 billion in additional network costs was added to the cost side of the CBA equation. This is likely to be transferred to consumers through increased electricity network charges.

However, it seems inconsistent to include capital savings outside the household and commercial properties, which are not borne by their owners and tenants, if the capital costs occasioned by the proposed market intervention are not also included in the costs side. This suggests an additional two pathways for revision of the RIS and particularly its BCR calculations, either that:

[29] Simshauser and Gilmore, "Policy sequencing".
[3030] Energy Networks Australia, "The hidden cost of forced electrification in Australia", 27 February 2025. https://www.energynetworks.com.au/news/media-releases/the-hidden-cost-of-forced-electrification-in-victoria/ Accessed February 2025

1. An appropriate proportion of the capital investment required for electrical generation to meet the building electrification component of overall decarbonisation and electrification needs to be added to the cost side of the BCR equation; or,

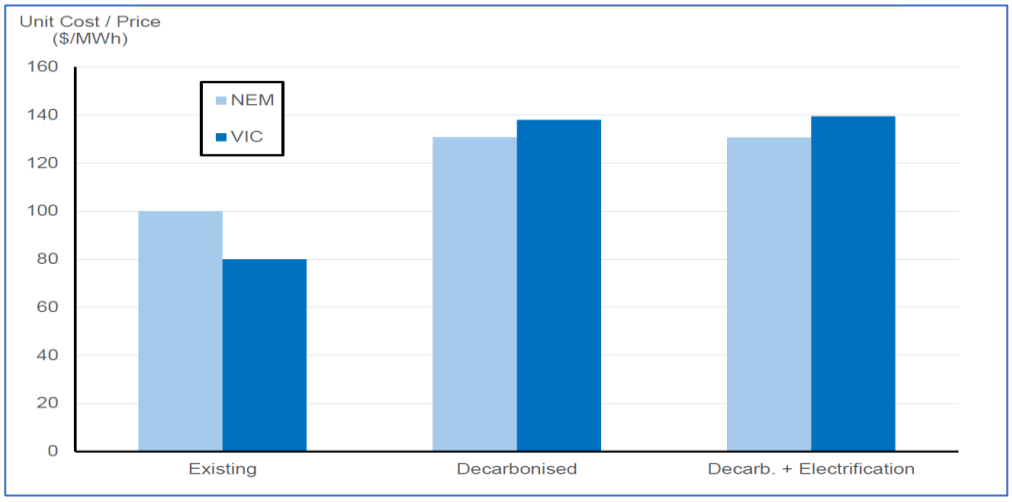
2. Components of both costs and benefits which are not directly borne by the cohort of consumers compelled to electrify their homes are removed from the calculation while separate values are calculated for those paying for new electric appliances and their installation in their homes and businesses and, at a Government level, separate values are also calculated for the more broad-based costs and benefits associated with energy reform in Victoria.

The latter is a more sensible approach and is also consistent with the observations on GHG and air pollution above. In addition, it would also permit removal of government compliance and enforcement costs from the BCR for energy consumers. Iin the Low-Revision ex-GHG scenario above, for example, this would lead to a reduction in the BCR from 0.62 to 0.54.

Cost of Electricity

Associated with the high cost of capital investment above, the RIS is optimistic in its assumptions about future electricity tariffs. The same modelling of decarbonisation and electrification which shows the forward capital costs suggests that the proposed market intervention would result a significant move for Victoria from a nationally inexpensive market for energy to a significantly more expensive one given the increase on mean national pricing demonstrated in Figure Seven.

Figure Seven: Changes in Unit Costs/Prices: National Energy Market (NEM v. Victoria)[31]



It is recommended, in light of this evidence, that the RIS team consider whether this change to the data goes beyond its 25% sensitivity analysis for energy prices.

[31] Simshauser and Gilmore, "Policy sequencing".

Alternative Responses to Gas Supply Shortages

The expert opinion regarding future energy costs outlined above reveals an interesting paradox. While reducing gas demand through customer electrification of systems and appliances lowers overall annual consumption, the increased reliance on GPG needed to manage fluctuations in energy supply during winter, when renewable generation reaches its lowest levels of the year, offsets this reduction, resulting in minimal change to gas demand.

With this in mind, it is worth noting that the proposed Building Electrification Regulation has limited impact on gas demand, reducing it by a mere 40 PJ by 2035. Since reducing gas demand is a cornerstone of the proposed market intervention, and in light of the assessment made above about the veracity of the CBA's results, it is worth examining whether it would not be much cheaper for the Victorian community to address the gas supply shortage.

The gas supply forecast is a more complex story than the RIS provides as outlined in Figure Eight below. The forecast is based on contracted, committed and anticipated supply only, which is understandable, and does not include either the Port Kembla or the proposed Geelong LNG import terminals, the SW Queensland Pipelines (SWQP) stage 3 capacity upgrade or Narrabri. With the exception of Port Kembla, these don't have any impact in the near term but do become important from 2030 onwards.

While it may be debated whether or when Narrabri enters production, the other three projects are all progressing. Port Kembla is largely completed, Viva is in permitting processes for Geelong and SWQP stage 3 is now being progressed following the Australian Energy Regulator's decision not to regulate the pipeline. Sitting north of the SWQP are several announcements of new coal seam gas projects in QLD including Arrows' announcement on Surat.

The analysis excludes the new underground storage facility in Victoria. This facility will not add supply but will double Victoria's ability to manage demand, which is especially important in winter.

To see what those projects could mean, the AEMO southern supply table in its most recent Gas Statement of Opportunities (GSOO) is modified to include the extra projects, based on gas flows at announced capacity. While these flows can be debated, the GSOO shows that the physical supply gap can be bridged with a significant capacity buffer. It also makes it abundantly clear that mandatory electrification, which will reduce gas demand in Victoria by around 40PJ by 2035, makes little difference to the need for the extra supply options. Of note, the LNG terminal at Port Kembla will be able to make a significant difference to the supply / demand balance. Jemena announced very recently that it is commencing works to make Port Kembla – Eastern Gas Pipeline (EGP) bi-directional and will be able to provide an extra 200 TJ/day into Victoria by winter 2026. If the LNG contracts come, they can increase compression and take that number to over 500TJ/day.

Figure Eight: Forecast Contracted, Committed and Anticipated Supply

	AEMO 2024 Gas Statement of Opportunites Gas Supply-Demand Projections for Southern gas market (PJ)					Additional supply options in late construction or advanced permitting and planning (PJ)				
Year	Developed and Committed Supply	Anticipated Supply	Flow from North SWQP	Step Change Demand	Supply-Demand Balance	Port Kembla LNG [31]	Viva Geelong LNG [31]	SWQP Stage 3 [32]	Narrabri [33]	Supply-Demand Balance
2024	356	23	-6	373	0					0
2025	347	31	5	383	0					0
2026	315	42	68	434	-8					-8
2027	257	46	89	401	-10	130				120
2028	189	43	106	384	-46	130				84
2029	132	38	128	374	-76	130				54
2030	115	30	128	328	-55	130	130	37		242
2031	97	22	130	316	-66	130	130	37	73	304
2032	76	17	135	315	-87	130	130	37	73	283
2033	51	14	140	335	-130	130	130	37	73	240
2034	37	12	146	363	-168	130	130	37	73	202
2035	32	11	148	349	-158	130	130	37	73	212
2036	26	10	148	328	-143	130	130	37	73	227
2037	23	9	148	336	-157	130	130	37	73	213
2038	19	8	146	338	-165	130	130	37	73	205
2039	16	7	147	338	-167	130	130	37	73	203
2040	12	6	149	340	-173	130	130	37	73	197
2041	6	5	150	338	-177	130	130	37	73	193
2042	5	5	151	341	-180	130	130	37	73	190
2043	5	4	151	335	-175	130	130	37	73	195

Industry Economic Impact

Evaluate understands that GAMAA has provided its industry survey data to the Government. We further understand that this reflects inputs from over 75% of the industry by capacity, accounting for turnover of $668.3 million annually, and 2,291 employees.

No analysis of this as an overall economic impact is provided here, but a number of data points are worth commenting upon as they are not fully considered in the RIS.

Among these, the most significant issue is the matter of worker redundancy, with 94 FTE staff having lost their jobs to date and an expected 444[35] expected to be made redundant in the event that the currently proposed electrification proceeds.

It is not assumed that this means the same number will be unemployed: less-skilled or more generalist labour will find opportunities elsewhere in the economy. However, there is a proportion of workers for whom this measure is potentially catastrophic: gasfitters do not readily transform into electricians overnight.

[32] Both import terminals have announced nameplate supply capacity around 180 PJ per year so a 75% capacity factor has been applied to be conservative - Source Squadron and Viva Energy websites
[33] Source: Stage 3 of APA expansion to increase north-south gas delivery by ~24%. PJ conservatively derived from APA website
[34] Source Santos website
[35] These are survey numbers, and are not scaled up to whole of industry figures, though the latter will be approximately 1⅓ of the quoted number, or in this case 592 workers.

Further, the loss to those who have invested in and built these businesses is substantial, estimated at around $190 million *per annum*, or 29% of turnover. This is a significant threat to private business, and a difficult signal for the broader manufacturing market to digest. 90% of respondents express concern about the continuation of their businesses, which is understandable given the uncertainty unilateral Government interventions typically cause.

These losses might well be added to the cost side of the BCR calculation: if we assume the annual loss is constant and discount it for the next ten years only at 4%, this is a cost increment of $1.55 billion, which would deliver further revised BCRs of between 0.40 and 0.52. It is acknowledged that much if not all of this expenditure will occur elsewhere in the economy, but given the asymmetry inherent in the RIS BCR calculations, the business loss is added to the schedule of payers for illustration.

Finally, it is clear from the survey that appliance manufacturers are investing in sustainable options, including renewable gas products and electricity appliances. These require time to move through the R&D cycle, and the combination of such normal market investment with appropriate education and other indirect measures would again offer the prospect of meeting emission goals at a significantly lower cost, and with both greater equity and lower industry impact. Time for transition is critical, and consideration of less radical options is commended.

Regulatory changes of the nature proposed typically afford participants a lead time of 3 years. While this type of phase-in timeframe would not address asymmetry and equity issues for consumers, it would enable industry to develop new products, establish new supply chains, and update and repurpose production lines. The proposed 1 January 2026 commencement date which would follow a decision made in the second half of 2025, simply drives affected business into an immediate shut-down response which will exacerbate the business and the human costs of this measure.