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‘Renewable gas’ campaigns leave Victorian gas distribution networks and consumers at risk

Jay Gordon, Research Analyst, Australian Electricity
Kevin Morrison, Energy Finance Analyst, LNG/Gas Sector

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Key Findings

Campaigns to promote ‘renewable gas’ could leave Victoria’s gas distribution networks exposed to significant reputational and legal risk, which should be considered by financiers.

The ‘renewable gas’ future the gas distributors promote is at odds with proposed plans they have submitted to the regulator, which include A$461 million in risk mitigation for an electrified future, compared with A$19 million for ‘hydrogen readiness’ activities.

Australia’s governments and regulators should work to protect consumers from potential stranded investments in gas appliances and in gas distribution network assets.

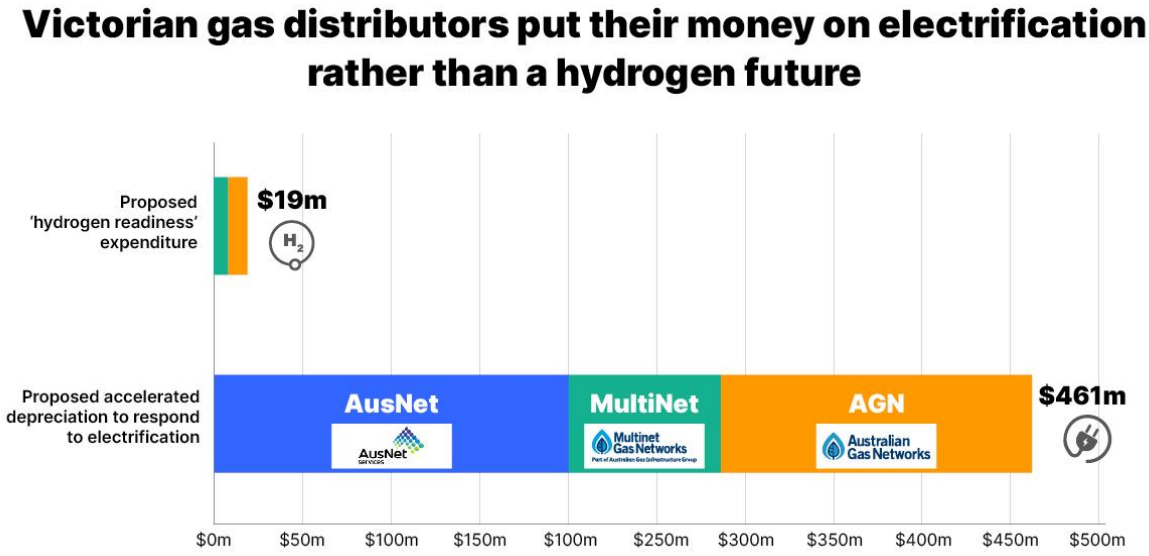
Executive Summary

Gas distribution networks and their industry representative bodies have been promoting the message to households that their gas network infrastructure will continue to be used under a transition to net zero emissions. They have asserted that gas distribution networks will likely be repurposed to deliver ‘renewable gas’ to homes, derived from either biomethane or hydrogen, instead of the current supply of fossil gas.

These campaigns are inconsistent with the compelling evidence that electrification is the best option for decarbonising household fossil use. Electrification would cost less than switching to biomethane or hydrogen. Moreover, there are serious technical constraints to relying on biomethane or hydrogen for household energy use; by contrast, electric appliances for cooking, space heating and water heating are mature and already widely used by many Australian households.

Especially concerning is the fact that the messages presented in Victorian gas distribution networks’ ‘renewable gas’ campaigns appear inconsistent with their own statements to regulators, their investment plans, the opinion of the regulator and energy market consumer representatives.

Victoria’s gas distribution networks have requested to recover an additional A$461 million in accelerated depreciation costs from consumers over the next five years, of which A$333 million was granted by the Australian Energy Regulator (AER), equal to nearly 7% of their total asset base. Accelerated depreciation in gas networks was first argued for in 2020 by the Australian Gas Infrastructure Group (AGIG) for its Dampier Bunbury gas pipeline in Western Australia. AGIG argued that the improving economics of renewable electricity, combined with government emissions policies, were likely to lead to a decline in demand for fossil gas supplied through their network, leading to asset stranding risk.



Meanwhile, the networks have proposed only very modest expenditure, A$19 million, on preparing their networks for hydrogen, which the regulator allowed despite finding that it was non-conforming with respect to the National Gas Laws. An additional A$6 million in proposed operating expenditure is on ‘renewable gas’ promotional campaigns, to be partially charged back to consumers.

The Institute for Energy Economics and Financial Analysis (IEEFA) believes that gas distribution networks may be exposing themselves to substantial risks by encouraging consumers to continue to purchase gas appliances under the belief they will be useful under a low-emissions future due to ‘renewable gas’. Promotional campaigns have not clearly acknowledged the low likelihood of a significant role for ‘renewable gas’ in distribution networks, and that the dominant policy direction is towards electrification in homes. The Australian Consumer and Competition Commission (ACCC) has issued warnings for businesses engaging in misleading conduct, and Victoria’s gas distribution networks could be at risk of an investigation into their ‘renewable gas’ campaigns.

Furthermore, the size of investments made by customers who continue to buy gas appliances is likely to number in the billions of dollars. In the likely event that a ‘renewable gas’ future does not eventuate, attempts to recover some of these sunk costs by legal means could have highly material financial consequences for the network businesses. In IEEFA’s opinion, financiers should consider these risks in their allocation of capital.

Governments and regulators should also act to protect consumers, by ensuring that the networks’ campaigning activities are lawful under Australian consumer law, and that expenditure on ‘renewable gas’ activities is not approved where it is not in the long-term interests of energy consumers.

Introduction – Do gas networks have a future in a net zero world?

Governments across all state and territory jurisdictions, as well as the Federal Government, have committed to achieving net zero emissions by 2050 or sooner. In Victoria, which has the highest household consumption of fossil gas, the state government has committed to net zero emissions by 2045, and an ambitious 75-80% reduction on 2005 levels by 2035.[1] Multiple groups suggest that achieving these targets will require an almost complete phase-out in the use of fossil gas, including the Grattan Institute,[2] Environment Victoria[3] and the independent panel that recommended the 2035 target.[4]

A range of expert analyses from organisations in Australia and overseas, such as the European Academy of Science,[5] the Grattan Institute,[6] Infrastructure Victoria[7] and the Rocky Mountain Institute[8], have recommended that a top priority in phasing out fossil gas should be to switch households over to electric appliances. This adds to growing public health concerns regarding fossil gas in the home, with pollutants from gas cooktops linked with more than 12% of childhood asthma cases in Australia.[9]

The Victorian government has sent strong signals that it recognises electrification as the most cost-effective and most likely forward pathway for Victorian households. In 2022, Victoria released its Gas Substitution Roadmap, with a strong focus on electrification.[10] This was followed by updates to the Victorian Energy Upgrades (VEU) program to encourage uptake of electric appliances[11], and most recently, a ban on gas connections for new residential buildings from 2024.[12]

A trend away from household fossil gas use in Victoria is looking increasingly likely, given that the state’s historic source of cheap fossil gas, Bass Strait, is experiencing declining outputs and increasing production costs.[13] Daily average fossil gas consumption in Victoria is at its lowest level since 2014-15.[14]

[1] Victorian Government Department of Energy, Environment and Climate Action (DEECA). Victoria’s 2035 Emissions Reduction Target. 2023. Page 5.
[2] Grattan Institute. Getting off gas: why, how, and who should pay? June 2023. Page 3.
[3] Environment Victoria. Gas sector emissions and Victoria’s new 2035 climate targets. March 2023. Page 18.
[4] Independent Expert Panel for the Victorian 2035 Emissions Reduction Target. Victoria’s 2035 Climate Target: Driving Growth and Prosperity. March 2023. Page 9.
[5] EASAC. The Future of Gas. May 2023. Page 2.
[6] Grattan Institute. Getting off gas: why, how, and who should pay? June 2023. Page 3.
[7] Infrastructure Victoria. Towards 2050: Gas infrastructure in a net zero emissions economy. December 2021. Page 42.
[8] RMI. Regulatory solutions for building decarbonization: Tools for commissions and other government agencies. 2020. Page 4.
[9] Medical Journal of Australia. Knibbs et al. Damp Housing, gas stoves, and the burden of childhood asthma in Australia. 2018. Page 301.
[10] DEECA. Victoria’s Gas Substitution Roadmap. 2022.
[11] DEECA. Electrification and home energy rating assessment updates. 18 May 2023.
[12] Premier of Victoria. New Victorian Homes To Go All Electric from 2024. 28 July 2023.
[13] Australian Financial Review. Exxon warns of dwindling Bass Strait Gas. 22 March 2023.
[14] AER. Industry statistics. Gas demand

A large-scale shift from gas to electricity in Victorian households could lead to material financial consequences for the owners of the state’s gas distribution networks. This is because households account for more than 93% of Victorian gas distribution networks’ revenue.[15]

However, gas distribution networks and their industry representative bodies have promoted the idea that they can continue to play a useful role in supplying energy to households under a net zero emissions pathway. This argument centres on the idea of repurposing their pipelines to distribute ‘renewable gas’ derived from either biomethane or hydrogen.

Biomethane is chemically equivalent to fossil gas. Its production typically starts with biogas – a mixture of gases including methane and carbon dioxide derived from processing organic matter via anaerobic digestion. At present most biogas is produced from organic matter within municipal waste in landfills, as well as wastewater. However, it can also be produced from animal waste, food processing waste and crop residues. Biogas can be upgraded to biomethane by removing the carbon dioxide and other impurities.[16]

Biomethane produces carbon dioxide when burned, and is itself a greenhouse gas (GHG) just like fossil gas. When burned in the home, it also carries the same health impacts of fossil gas. However, the primary advantage of biomethane is that pathways exist to produce it that lead to lower or net zero emissions. This makes it an attractive lower-emissions alternative to fossil gas.

When producing and utilising biomethane, care needs to be taken when accounting for emissions. For example, some biomethane production-utilisation pathways involve removing carbon dioxide from the atmosphere and replacing it with methane, which may lead to more potent short-term global warming impacts.[17] Although not expected to be a major projected pathway for Australia, biomethane produced from wood can involve a release of carbon into the atmosphere that otherwise would have been stored in natural sinks.[18]

Renewable hydrogen or green hydrogen refers to hydrogen derived from water through electrolysis, using renewable electricity as an input. Green hydrogen is the main focus of the gas distribution networks’ ‘renewable gas’ campaigns. The production and combustion of green hydrogen generates no GHG emissions, which makes it another lower-emissions alternative to fossil gas. It appears increasingly likely that green hydrogen may play a critical role in decarbonising key industries – for example as a feedstock in chemical manufacturing, or as a source of high-temperature heat in heavy manufacturing. However, its use in broader sectors of the economy such as residential buildings is widely contested.[19]

It should be noted that, even if it is produced from renewable energy, transporting hydrogen may have hidden global warming impacts. If leaked, hydrogen interacts with greenhouse gases in the

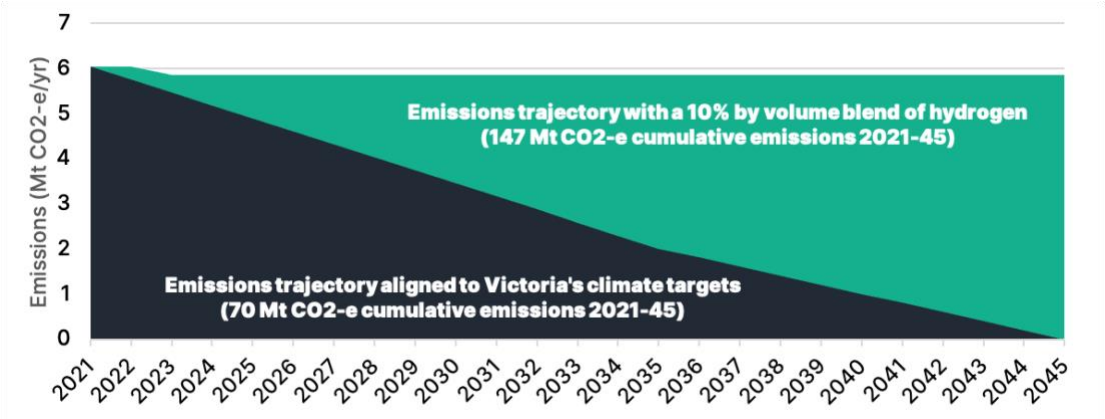
[15] AER. Gas Network Performance Report. December 2022. Page 107.
[16] IEA. An introduction to biogas and biomethane.
[17] Environmental Defense Fund. Not all biogas is created equal. 15 April 2019.
[18] Brack, D. Woody Biomass for Power and Heat: Impacts on the Global Climate. February 2017. Page 3.
[19] Michael Liebreich. The Clean Hydrogen Ladder. 15 August 2021.

atmosphere, with one tonne having an equivalent global warming impact of 11.6 tonnes of carbon dioxide over a 100-year timeframe.[20] Hydrogen’s small molecular size makes it much more prone to leakage in pipelines than fossil gas or biomethane.

Biomethane or hydrogen need scale to meet emissions targets

Australian gas distribution businesses have invested in small-scale pilots to deliver blends of 10% hydrogen by volume to sections of their networks.[21] However, due to the low energy density of hydrogen, it can only deliver up to 3% of the energy content in these blends, and hence mitigate up to 3% of annual residential gas emissions.[22] If Victoria’s residential fossil gas emissions were to reduce in line with its economy-wide targets, much deeper reductions are required, with an implied sectoral carbon budget of 70 million tonnes of carbon dioxide equivalent (Mt CO_2-e) from 2021-45. Figure 1 shows that simply relying on a 10% volumetric blend of hydrogen in gas distribution networks could see this sectoral budget exceeded by 112%.

Figure 1: Low hydrogen blends offer limited emission savings for Victoria



Note: Emissions from residential fossil gas combustion in Victoria were 6.05 Mt CO_2-e in 2021.[23] Taking the midpoint of Victoria’s 2035 climate targets (75-80% reduction on 2005 levels)[24] implies a 67% reduction on 2021 levels in 2035, followed by net zero emissions in 2045. Hydrogen blending trajectory assumes gas consumption is held constant; emissions would be higher if the gas network grows.

To fully decarbonise residential energy use, a 100% substitution of fossil gas with either hydrogen or biomethane would be necessary. This is a far more costly endeavour than enabling low hydrogen blends. A small number of global trials have started looking at 100% hydrogen distribution networks. However, there are no demonstration projects planned for Australia.[25]

[20] Sand et al. A multi-model assessment of the Global Warming Potential of hydrogen. Nature Communications Earth & Environment. 7 June 2023.
[21] Australian Gas Networks. Blended Gas.
[22] Frontier Economics. Indicative Analysis of Blending Hydrogen in Gas Networks – Update. May 2020. Page 4.
[23] DCCEEW. Australia’s National Greenhouse Accounts. Paris Agreement Inventory. Victoria: Sector 1.A.4.b.i. 2021.
[24] DEECA. Victoria’s 2035 Emissions Reduction Target. May 2023. Page 5.
[25] National Renewable Energy Laboratory. Hydrogen Blending into Natural Gas Pipeline Infrastructure: Review of the State of Technology. October 2022. Page 40.

Electrification offers cheaper, easier decarbonisation than piping ‘renewable gas’ to homes

Gas distribution networks and gas appliance manufacturers have commissioned or promoted several studies suggesting that a switchover to ‘renewable gas’ is a better option for decarbonising households’ energy needs than replacing gas appliances with electric alternatives.[26] These studies typically argue that replacing fossil gas with electricity is an expensive endeavour, and that as extensive infrastructure already exists to deliver fossil gas to homes, it makes sense to repurpose this for alternative gases.

However, substantial evidence exists in opposition to these arguments. While biomethane and hydrogen may play a targeted role in certain applications (for example, hydrogen in steelmaking or biomethane in the food industry), when it comes to satisfying household energy needs:

- running electric appliances at home is four times cheaper than using biomethane, and more than ten times cheaper than using hydrogen due to their high relative efficiencies; and
- significant practical and technological constraints would need to be overcome before existing infrastructure could be repurposed to deliver biomethane and hydrogen to homes.

Electric cooking, space heating and water heating appliances are already in widespread use across millions of Australian households.

‘Renewable gas’ will cost far more than using electricity

Introducing biomethane into gas distribution networks would add significant costs to consumer bills. The competitive global biomethane cost averages at A$17/GJ wholesale, and this is not expected to decline significantly over the next decade.[27] Costs are initially likely to be higher in Australia until biomethane is commercially widespread, with near-term estimates of A$22.27/GJ for Victorian production.[28] If biomethane was piped to homes at the same delivery costs as for fossil gas, this would lead to a retail cost of A$38.62.[29]

Hydrogen is a significantly more expensive fuel, with wholesale costs currently averaging A$83.33-A$125/GJ in Australia.[30] Optimistic long-term cost forecasts for hydrogen production from renewable sources have it dropping to between A$15.75/GJ and A$30.92/GJ by 2030.[31] Taking the

[26] For example: Frontier Economics. The Benefits of Gas Infrastructure to Decarbonise Australia. September 2020. Page 5; Energy Networks Australia. Gas Vision 2050. 2017.
[27] ENEA & Deloitte. Australia’s bioenergy roadmap: Appendix – Production Pathways. November 2021. Page 16.
[28] Weighted average of Victorian LCOE from Table I in Future Fuels CRC. Where are the most viable locations for bioenergy hubs across Australia? June 2022. Page 6.
[29] Delivery costs of A$16.34/GJ; calculated by subtracting the Q1 2023 average wholesale fossil gas price of A$11. (AER. Victorian gas market average daily weighted prices by quarter.) from the average January 2023 retail fossil gas price of A$34.59 (calculated from SVDP Victorian Energy Prices 2023 p.47)
[30] A$10-15/kg converted to A$/GJ based on an energy density of 120 MJ/kg. From DCCEEW. State of Hydrogen 2022. Page 18.
[31] A$1.89-3.71/kg converted to A$/GJ based on an energy density of 120 MJ/kg. From Australian National University, Crawford School of Public Policy. Green hydrogen production costs in Australia: implications of renewable energy and electrolyser costs. CCEP Working paper 20-27. August 2020.

average of these ranges, and assuming delivery costs equivalent to current fossil gas costs, this leads to a retail price of A$121/GJ now, or A$39.67/GJ by 2030.

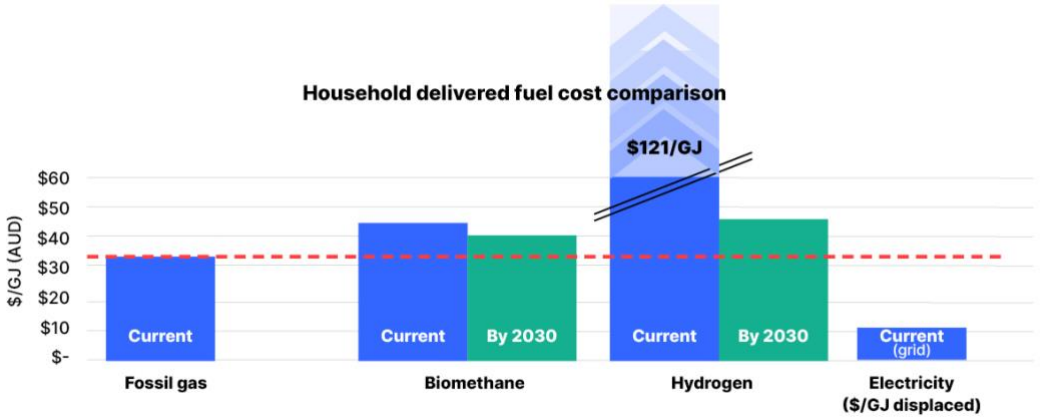
By comparison, the average retail fossil gas price in Victoria in Q1 2023 was A$34.59/GJ.[32]

The average retail electricity price in Victoria in the same period was A$334/MWh or A$55.92/GJ.[33] However as more renewable generation is integrated into the grid, this is expected to put long-term downwards pressure on electricity prices. Wholesale electricity prices are increasingly being set by cheap renewables during a greater portion of the day.[34]

> **An electrified household may require less than one-fifth of the energy of a gas-reliant household to meet the same needs.**

Moreover, gases do not compete with electricity on a joule-for-joule basis. Due to the high efficiency of electric appliances, an electrified household may require less than one-fifth of the energy of a gas-reliant household to meet the same needs.[35] As shown in Figure 2, this means that, per unit of useful delivered energy, electricity is around one-third of the cost of fossil gas at current prices.

Figure 2: Biomethane, hydrogen and electricity delivered energy costs compared to fossil gas



Graph assumes biomethane and hydrogen can be delivered at the same cost as fossil gas. The high relative efficiency of electric appliances means that 1 GJ of fossil gas can be displaced with 0.2 GJ of electricity.

Sources: Australian Energy Regulator (AER) – Victorian gas market average daily weighted prices by quarter; St Vincent de Paul Society – Victorian Energy Prices January 2023; Future Fuels CRC – Where are the most viable locations for bioenergy hubs across Australia?; Enea Consulting and Deloitte – Australia’s bioenergy roadmap; Department of Climate Change, Energy, the Environment and Water (DCCEEW) – State of Hydrogen 2022; Australian National University (ANU) – Green hydrogen production costs in Australia.

[32] Aggregate price calculated based on St Vincent de Paul Society. Victorian Energy Prices January 2023. Page 47.
[33] Ibid.
[34] AEMO. Quarterly Energy Dynamics Q1 2023. April 2023. Page 18.
[35] A 5-star gas heater (efficiency 0.95; Energy Rating 2011) connected to ducting (efficiency 0.63 – BZE 2013) uses six times the energy of reverse cycle air conditioners with an average CoP of 3.65 (Climate Council 2022). A gas storage water heater with an efficiency of 0.7 (Renew 2018) uses five times the energy of a heat pump with a CoP of 3.5 (ACT Sustainable Household Scheme).

This analysis is conservative, as it assumes that hydrogen or biomethane could be delivered to homes at the same cost as fossil gas. However, as discussed elsewhere in this report, there are likely to be significant additional costs incurred to use existing gas infrastructure to transport these fuels.

The value proposition of electrification is of course strongest for the 3.4 million Australia households – about one in three dwellings – that generate their own electricity from rooftop solar.[36] The rise of electric vehicles will offer a world of potential for greater utilisation of that home solar, as many of these households will have a large battery attached to their home throughout most of the day.

Electrification could also incur increased electricity network costs, but under a summer-peaking electricity demand profile such as Victoria’s, there is likely to be considerable headroom to electrify a large portion of the current fossil gas load, which is predominantly for winter heating, under the current network’s capacity.[37] The need for new electricity infrastructure can be reduced further if electrification is coupled with improved energy efficiency.[38]

> **Whole-of-system studies consistently show electrification, coupled with energy efficiency improvements, to be the lowest-cost option for decarbonising the built environment.**

Whole-of-system studies consistently show electrification, coupled with energy efficiency improvements, to be the lowest-cost option for decarbonising the built environment.[39] State and territory governments are recognising this; the ACT[40] and Victorian[41] governments have now both banned gas connections to new residential developments. The Victorian government is also offering significant incentives for households to replace their gas appliances with electric appliances.[42]

Electric appliances are already in widespread use, while biomethane and hydrogen face significant constraints

Electric home appliances are technologically mature, readily available, affordable and reliable. Millions of households across Australia today already do not use any fossil gas, instead relying on electricity to heat their homes and water as well as for cooking their food. Furthermore, many homes that are connected to the gas distribution network use electric appliances to meet one or more of their cooking, space heating or water heating needs. While there are some circumstances where

[36] Clean Energy Council. Clean Energy Australia Report 2023. Page 53.
[37] Grattan Institute. Getting off gas: why, how, and who should pay? June 2023. Page 46.
[38] Climate Council. Smarter energy use: How to cut energy bills and climate harm. 2023. Page 9.
[39] For example: CSIRO & Climateworks Centre for AEMO. Multi-sector energy modelling 2022. December 2022. Page 9; ANZ & EEC. Putting Energy Efficiency to Work. May 2023. Page 13; DEECA. Victoria’s Gas Substitution Roadmap. 2022. Page 12; Australian Sustainable Built Environment Council (ASBEC). Unlocking the pathway: Why electrification is the key to net zero buildings. December 2022. Page 5.
[40] ACT Minister for Water, Energy and Emissions Reduction Shane Rattenbury. ACT reaches milestone preventing new fossil fuel gas connections. 8 June 2023.
[41] Premier of Victoria. New Victorian Homes To Go All Electric from 2024. 28 July 2023.
[42] DEECA. Electrification and home energy rating assessment updates. 18 May 2023.

households may need to upgrade their electrical wiring to switch from fossil gas to electricity, a full upgrade to three-phase power is likely to only be necessary for particularly energy-intensive homes.[43]

By contrast, deploying biomethane and hydrogen at scale to replace fossil gas faces significant barriers.

Biomethane is heavily supply-constrained

Once biogas is processed to concentrate the methane and remove other components such as carbon dioxide (at present only one demonstration facility in Australia is capable of this),[44] it can be accepted by gas transmission and distribution networks, which already transport a chemically equivalent gas.

However, biomethane is currently available in very limited quantities that are insufficient to replace fossil gas. Australia’s total domestic consumption of fossil gas at present is 1,167 petajoules (PJ), of which 214 PJ is in Victoria.[45] By comparison, current total production of biogas in Australia is estimated to be around 12 PJ[46]. None of this to date has been used in the gas distribution network, instead being consumed on the site where it was produced to generate electricity and sometimes useful heat.

A recent exception is a plant in Malabar, New South Wales (NSW), operated by Jemena. This is the only plant in Australia capable of upgrading biogas to biomethane. It has started operating this year, but at its maximum capacity can only inject up to 95 terajoules per year of biomethane into the local gas distribution network.[47] This is equivalent to 0.7% of NSW’s annual fossil gas demand.[48]

To date the vast majority of biogas has come from landfill and wastewater treatment plants, which avoid incurring feedstock collection costs (in fact they are paid to collect the feedstock). Methane is a natural by-product in the breakdown of these wastes. Since 2015, electricity generation from biogas has only grown slowly at around 1.5% per annum on average.[49]

A range of studies suggest there are feedstocks available to expand the production of biogas, such as agricultural crop residues. However, in reality, these require the creation of vast new collection and transport systems and infrastructure.

[43] Australian Financial Review. If I go all electric, do I need to upgrade my grid connection? 20 April 2023.
[44] Jemena. Malabar Biomethane Injection Plant.
[45] Total excluding consumption in the gas extraction industry. DCCEEW. Australian Energy Update 2022 – Table F. 2 September 2022.
[46] ENEA Consulting. Biogas opportunities for Australia. March 2019 quantifies total biogas supply based on its annual electricity generation of 1,200GWh. The International Energy Agency (IEA), notes converting biogas to electricity is 35% efficient. This suggests around 12 PJ of thermal energy within the biogas would be used.
[47] Jemena. Malabar Biomethane Injection Plant.
[48] Based on 129.66 PJ in 2022. AEMO. National Electricity & Gas Forecasting. Gas – annual consumption – Total – New South Wales – Actual – 2022.
[49] Based on total electricity generation from Biogas in Australia, 2015-16 to 2020-21 from DCCEEW. Australian Energy Update 2022 – Table O. September 2022.

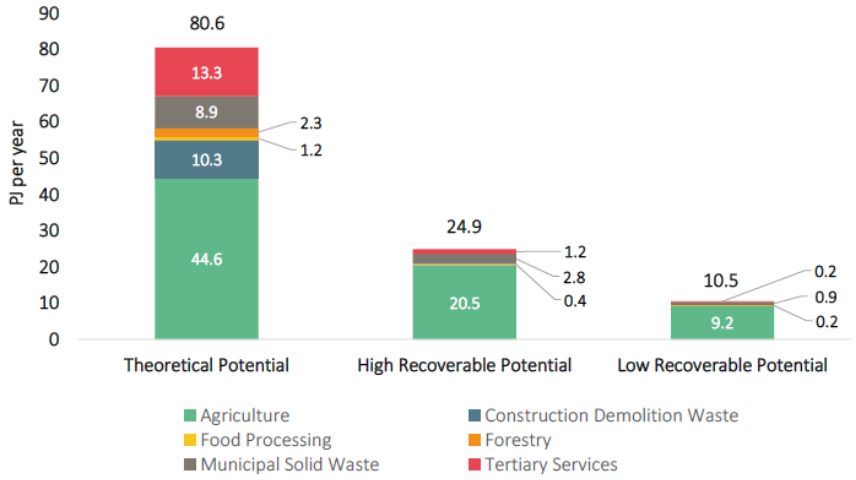
In a 2017 study commissioned by a gas network industry group, Deloitte estimated there were feedstocks available nationally capable of providing 371 PJ per annum.[50] However, a subsequent study co-authored by specialist energy researchers Enea Consulting as well as Bionenergy Australia – Biogas Opportunities for Australia – observed in relation to the Deloitte estimate that:

“… future work is required to assess the proportion of this potential that could be realised. Moreover, the estimated biogas potential is highly variable state by state. For instance, the estimated biogas potential in Victoria represents only 27 per cent of the state’s gas consumption from the distribution network. As the distance between the feedstock and the chosen location of a project is critical, detailed mapping of resource availability is necessary to facilitate project development.”[51]

In other words, though the resource may be available, it may not be feasible to collect and transport it to a location where it can be processed and then delivered to a customer.

Enea undertook a subsequent study for Sustainability Victoria, which identified that, while Victoria’s theoretical biogas potential was 80.6 PJ/yr[52], after considering organic residues that were not suitable to anaerobic digestion, and applying low and high recovery rate scenarios, Victoria’s recoverable biogas potential is more likely to be between 10.5 and 24.9PJ/yr (Figure 3). This represents between 5% and 12% of Victoria’s annual fossil gas usage.[53]

Figure 3. Sector breakdown of Victoria’s recoverable biogas potential from anaerobic digestion



Source: Enea Consulting – Sustainability Victoria – Assessment of Victoria’s biogas potential. December 2021. Page 3.

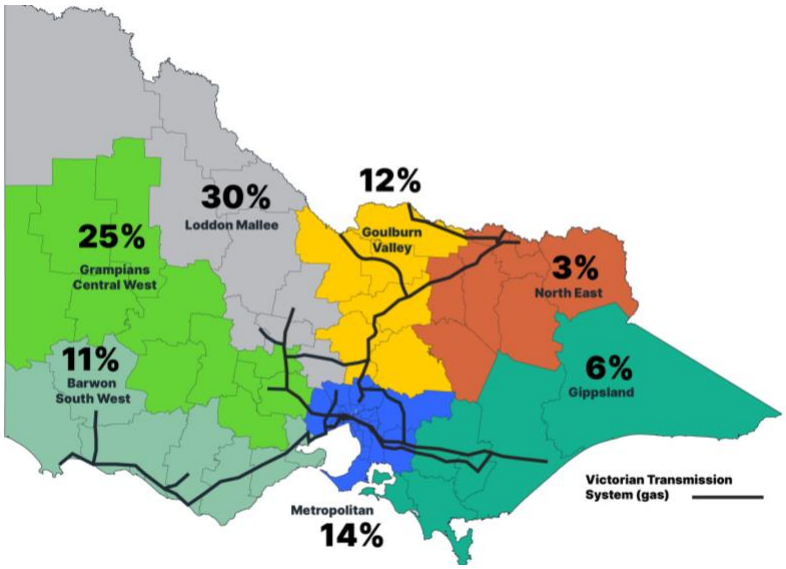
Additionally, well over half of this recoverable biogas is located in the Loddon Mallee and Grampians Central West regions. As Figure 4 shows, most of these areas are not currently accessible from

[50] Deloitte. Decarbonising Australia’s gas distribution networks. November 2017. Page 88.
[51] Enea Consulting and Bioenergy Australia. Biogas opportunities for Australia. March 2019. Page 33.
[52] Enea Consulting. Sustainability Victoria – Assessment of Victoria’s biogas potential. December 2021. Page 2.
[53] Ibid Page 2

Victoria’s existing gas transmission network.[54] As this network is designed to transport fossil gas from Gippsland basins, it would need reconfiguring to connect to these new supply locations, which would be costly.[55]

The heavy supply constraints on biomethane don’t exclude its use in targeted applications. For example, biomethane in small volumes could perform a transitional or longer-term role in buildings that are particularly challenging to electrify. However, it is difficult to see how biomethane supply could be expanded to a level comparable to the amount of fossil gas currently supplied in Victoria’s distribution networks.

Figure 4: Victoria’s biogas sources don’t align to its gas transmission network.



Source: Enea Consulting and Geoscience Australia.
Percentages refer to proportion of biogas feedstock available in each region.

Hydrogen is technically difficult to introduce to pipelines, and incompatible at high blends with current appliances

Fully replacing just Victoria’s residential fossil gas supply with hydrogen would require more than 760,000 tonnes of hydrogen a year.[56] This is more than 2,600 times higher than the capacity of all of Australia’s current hydrogen blending projects[57], and does not include hydrogen required for other sectors, such as industry, where it is expected to play a more critical role[58].

[54] Enea Consulting. Sustainability Victoria – Assessment of Victoria’s biogas potential. December 2021. Page 3.
[55] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Page 20.
[56] Based on 108 PJ residential fossil gas consumption in 2020-21 (DCCEEW. Australian Energy Update 2022. Table F. September 2022.), no assumed efficiency difference from switching to hydrogen, and an energy density for Hydrogen of 142 MJ/kg (Ulf Bossel and Baldur Eliasson. Energy and the Hydrogen Economy. Page 5.)
[57] 286 tonnes. DCCEW. State of Hydrogen 2022. Page 24.
[58] Michael Liebreich. The Clean Hydrogen Ladder. 15 August 2021.

Hydrogen is not a simple drop-in replacement for fossil gas in existing gas networks because it has very different physical characteristics. It has a much lower energy density, and smaller molecular size that can lead to increased leakages. It is more flammable[59] and can embrittle and weaken steel where it is used in parts of the network (particularly in transmission pipelines)[60]. Put simply, existing infrastructure, appliances and safety protocols are often unsuitable for higher levels of hydrogen. The low energy density is a particular problem, as gas volumes would need to be increased by 3.2 times in networks to deliver the same amount of energy from hydrogen as from fossil gas.[61]

These challenges make hydrogen a particularly costly and difficult pathway for residential buildings, as noted in an international meta-review of 32 studies, which found:

“Existing independent research so far suggests that, compared to other alternatives such as heat pumps, solar thermal and district heating, hydrogen use for domestic heating is less economic, less efficient, more resource intensive, and associated with larger environmental impacts.”[62]

Australian modelling by CSIRO and Climateworks Centre for the Australian Energy Market Operator (AEMO) in 2022 found that even under a scenario targeted at exploring the potential of “alternative gases” in the energy system[63], a major role for hydrogen in the residential sector was only possible if significant barriers, which were not costed, were assumed to be overcome[64] – and that electrification consistently presented as the most cost-effective pathway.

> **It is far less efficient to use electricity to produce hydrogen that is then piped to homes and burned, than it is to simply transport electricity to homes directly.**

This outcome recurs in modelling studies because it is far less efficient to use electricity to produce hydrogen that is then piped to homes and burned, than it is to simply transport electricity to homes directly. These losses are greatly magnified when you consider that direct electrification results in significant energy efficiency improvements that are not realised if homes stay on gas (of any form). On average, it would take five times the amount of electricity to heat a home with renewable hydrogen when compared with an electric heat pump.[65]

[59] Jeff Koestner, Power Engineers. 6 Things to Remember about Hydrogen vs Natural Gas. 12 August 2021.
[60] Mariano Kappes and Teresa Perez. Hydrogen blending in existing natural gas transmission pipelines: a review of hydrogen embrittlement, governing codes, and life prediction methods. Corrosion Reviews. March 2023
[61] Ulf Bossel and Baldur Eliasson. Energy and the Hydrogen Economy. Page 5.
[62] Joule. Is heating homes with hydrogen all but a pipe dream? An evidence review. 19 October 2022. Volume 6, Issue 10. Pages 2225-2228.
[63] CSIRO, Climateworks Centre. Multi-sector energy modelling 2022: Methodology and results – Final report. December 2022. Page 8
[64] Ibid. Page 11.
[65] Joule. Is heating homes with hydrogen all but a pipe dream? An evidence review. 19 October 2022. Volume 6, Issue 10. Pages 2225-2228.

The use of hydrogen in gas distribution networks is limited to small-scale pilots even at a global level. Few pilots have attempted blends of more than 20% hydrogen by volume in existing distribution networks.[66] In Australia trials are yet to go beyond 10% hydrogen by volume (3% by energy).

Analysis from the Australian Pipelines and Gas Association (APGA) suggests that fully repurposing gas infrastructure to transport hydrogen may require investment equivalent to around 28% of the cost of building a brand new gas pipeline network.[67] However, estimates vary wildly, with Infrastructure Victoria suggesting that in some cases, it may be cheaper to fully replace infrastructure rather than repurposing it.[68]

> **Fully repurposing gas infrastructure to transport hydrogen may require investment equivalent to around 28% of the cost of building a brand new gas pipeline network**

Even if hydrogen can be piped to homes, there are substantial barriers at the point of consumption. Current gas appliances in Australian homes are likely compatible only for blends of up to 10% hydrogen by volume (3% by energy).[69] It is unknown whether they function safely and reliably beyond that level, with current trials in the United Kingdom examining the feasibility of 20% blends.[70] However, it is clear that a largely or entirely hydrogen gas supply would need specially designed appliances suited to its particular characteristics.[71] Such appliances are not available in the Australian market[72] and it is highly uncertain when they would become available, and at what cost[73]. To present a reasonable value case for consumers, they would need to be cost-competitive with electric appliances, which are already well established in the markets.

Furthermore, a full switch over from fossil gas to hydrogen presents an enormous logistical challenge. If networks wish to exceed the current hydrogen limits of what appliances and pipelines can manage, an abrupt switch would be required for all users to switch from a fossil gas-based energy supply to a new hydrogen-based energy supply.

A household cannot upgrade to hydrogen ready appliances while the gas network remains primarily based on fossil gas, because those appliances won’t work. Meanwhile if the gas network switches over to equipment delivering mainly hydrogen, but some households stick with their fossil gas appliances, they will be left without heating, warm showers and cooking, or face a potential safety risk. Millions of households, in conjunction with gas network operators and hydrogen producers, may

[66] National Renewable Energy Laboratory. Hydrogen Blending into Natural Gas Pipeline Infrastructure: Review of the State of Technology. October 2022. Page 39.
[67] APGA. Retail renewable gas forecast to cost customers less than retail renewable electricity. Page 1.
[68] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Page 94.
[69] GPA Engineering. Hydrogen Impacts on Downstream Installations and Appliances: COAG Energy Council Technical Review. 11 December 2019. Page i.
[70] EPRI. Safety Considerations of Blending Hydrogen in Existing Natural Gas Networks.
[71] Infrastructure Victoria. Towards 2050: Gas infrastructure in a net zero emissions economy, final report. Page 119.
[72] Energy Networks Australia. Gas Vision 2050: Delivering the pathway to net zero for Australia – 2022 Outlook. April 2022. Page 21.
[73] Infrastructure Victoria. Towards 2050: Gas infrastructure in a net zero emissions economy, final report. Page 119.

need to make multi-billion-dollar investments in new equipment simultaneously and within a narrow time window to make this switch.

Such a switch would be akin to the switchover from analogue to digital television, except:

- with no interim period where both options are available – one day the gas supply would be almost entirely fossil gas, then it would have to abruptly switch to almost entirely hydrogen;
- there would be no equivalent to a low-cost set-top box to gradually transition without an investment in entirely new appliances; and
- replacing a gas central heater, cooktop and water heater all at the same time will cost households far more than a new digital television.

Networks’ interactions with energy regulator suggest lack of confidence in ‘renewable gas’

Gas distribution networks’ investments in hydrogen to date are very small

Multiple studies (for example by Infrastructure Victoria[74] and Energy Networks Australia[75]) agree that a significant short-term scale-up in activity is needed to make a future hydrogen network a reality. However, progress so far has been limited. The federal Department of Climate Change, Energy, the Environment and Water’s (DCCEEW) State of Hydrogen 2022 report has downgraded the department’s view on progress in the hydrogen blending space to “advancing slowly”, noting that “there has been limited progress in terms of projects reaching a Final Investment Decision”.[76]

Gas distribution networks’ efforts to integrate hydrogen in their network are very modest. These have involved blending very low amounts of hydrogen into small, regional gas distribution networks – nowhere near the scale needed to seriously abate Victoria’s emissions from residential fossil gas.

Two of Victoria’s distribution networks – Multinet and AGN – are owned by parent company Australian Gas Infrastructure Group (AGIG). AGIG has already made exploratory investments into hydrogen. This includes establishing the A$4.15 million Australian Hydrogen Centre, co-funded with the Australian Renewable Energy Agency (ARENA), state governments and other energy businesses.[77] One of AGIG’s pilot plants in South Australia (costing A$14.5 million)[78] has successfully commenced injecting 5% blends by volume (approximately 1.5% by energy)[79] of hydrogen into the

[74] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Page 26.
[75] Energy Networks Australia (ENA). 2023 Energy insider: How renewable gas policies can help Australia achieve its 2030 emissions target. February 2023.
[76] DCCEEW. State of Hydrogen 2022. Page 24.
[77] AGIG. Australian Hydrogen Centre.
[78] AGIG. Hydrogen Park South Australia.
[79] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Pages 98-99.

local network. A second project in Albury-Wodonga (costing A$53.2 million) plans to introduce 10% blends by volume (3% by energy) into the local network.[80]

Victoria’s other gas distribution network, AusNet, is yet to commit to any project to inject ’renewable gas’ into its pipelines. Instead, its activity has been constrained to feasibility studies to assess the ability to produce and distribute hydrogen in regional towns[81], and it is also a supporter of the Australian Hydrogen Centre[82].

Networks have proposed modest expenditure on ‘hydrogen readiness’, which they scaled back amid stakeholder concerns

Victoria’s distribution networks recently commenced a new five-year “access arrangement” period. This is a normal part of their regulatory cycle, which involves the Australian Energy Regulator (AER) having to determine whether or not to approve distribution networks’ proposed reference tariffs and the underlying costs. The AER’s remit is to ensure network investments reflect the long-term interests of customers, in line with the National Energy Objectives.[83] The AER’s final decisions for this period were published in June 2023.[84]

All three Victorian distribution networks included proposed capital expenditure on hydrogen initiatives in their draft plans, before substantially cutting those costs in the proposals they submitted to the AER.

AGIG’s Multinet and AGN draft plans included A$21 million[85] and A$25 million[86] respectively to be spent on ‘hydrogen readiness’. This was slashed in the actual proposals to the AER, to A$9 million[87] and A$10 million[88] respectively (Figure 5).

AGIG attributed the reduction to “more information received through the Australian Hydrogen Centre”,[89] an initiative established by AGIG itself to investigate the feasibility of hydrogen blending in distribution networks[90]. However, the reduction occurred after significant stakeholder hesitancy:

[80] AGIG. Hydrogen Park Murray Valley.
[81] Australian Hydrogen Centre. Final Regional Towns Study Ballarat: Public Report. July 2022
[82] CSIRO. HyResource – Australian Hydrogen Centre.
[83] Australian Energy Market Commission (AEMC). National Energy Objectives.
[84] AER. AER decision supports Victorian gas consumers in energy transition. 2 June 2023.
[85] Multinet Gas Networks. Five year plan for our Victorian distribution network July 2023 – June 2028: Draft plan. January 2022. Page 97.
[86] Australian Gas Networks. Five year plan for our Victoria and Albury distribution networks July 2023 – June 2028: Draft plan. January 2022. Page 96.
[87] Multinet Gas Networks. Five year plan for our Victorian distribution network: Final Plan. July 2022. Page 99.
[88] Australian Gas Networks. Five year plan for our Victoria and Albury distribution networks July 2023 – June 2028: Final Plan. July 2022. Page 99.
[89] Ibid. Page 94.
[90] ARENA. Australian Hydrogen Centre.

“Stakeholders welcome the reduction in our proposed hydrogen readiness expenditure […] but struggle to support our plans given policy uncertainty.”[91]

> **Stakeholders welcome the reduction in our proposed hydrogen readiness expenditure […] but struggle to support our plans given policy uncertainty.**

AusNet’s draft plan included a smaller A$11.2 million allowance for hydrogen readiness activities.[92] However, it chose to cut this completely from its proposal to the AER, citing stakeholder feedback that “spending on hydrogen readiness [should] be minimised in this access arrangement period in the context of widespread pessimism”.[93] (Figure 5)

It is worth noting that AusNet owns electricity transmission and distribution assets in Victoria alongside its gas distribution network.[94] Therefore, in comparison with AGIG, its business may be more insulated from the impacts of an electrification pathway compared with a biomethane- or hydrogen-focused pathway.

The proposed hydrogen readiness expenditure under both AGIG’s proposals was for minor improvements, such as replacing incompatible parts, improving hazardous area classifications and revising welding procedures.[95] Minor modification works can enable blending of 10% hydrogen by volume (3% by energy) in low- and medium-pressure sections of the distribution networks at the most.[96] This implies that the networks’ proposed expenditure was at best aimed towards enabling low hydrogen blends.

It is unclear whether the combined A$19 million is enough expenditure to deliver on AGIG’s ambition of delivering a ‘renewable gas’ blend to all homes by 2030.[97] By comparison, the HyDeploy2 project in the United Kingdom, a demonstration initiative that has delivered blends to less than 700 homes and several industrial sites, is operating under a budget of £15 million (A$29 million).[98]

[91] Australian Gas Networks. Five year plan for our Victoria and Albury distribution networks July 2023 – June 2028: Final Plan. July 2022. Page 34.
[92] AusNet Services. Draft regulatory proposal: Gas access arrangement review FY 2024-28. January 2022. Page 32.
[93] AusNet Services. Access Arrangement Information: Gas access arrangement review 2024-28. July 2022. Page 94.
[94] AusNet Services – About.
[95] Australian Gas Networks. Five year plan for our Victoria and Albury distribution networks July 2023 – June 2028: Final Plan. July 2022. Page 100.
[96] Advisian. Asset Life and Adaptability Review – IV 126. For Infrastructure Victoria. October 2021. Page 99. Table 6-3
[97] AGN, MGN, Jemena & ENA. Renewable Gas: When will I get renewable gas?
[98] HyDeploy. HyDeploy2 Project: Gas Network Innovation Competition – Cadent 4th Project Progress Report (PPR). January 2023. Page 21.

In its final decisions, the AER decided that Multinet[99] and AGN’s[100] proposed hydrogen readiness expenditure was likely non-conforming, meaning that it is not compliant with the expenditure criteria set out in the National Gas Rules.[101] It noted that:

- “Generally, stakeholder submissions were not supportive of the proposed expenditure”;[102] and
- “The AEMC’s [Australian Energy Market Commission] view is that a safety case is not sufficient to justify expenditure on hydrogen readiness where a service provider has voluntarily decided to introduce hydrogen into its network. The expenditure would need to pass a positive economic benefits test to be conforming capex. [Multinet and AGN have] not, at this stage, provided evidence that the proposed expenditure meets such a test.”[103]

Despite this, the AER approved Multinet[104] and AGN’s[105] full proposed capital expenditure, on the basis that alternative forecasts that excluded the A$19 million in hydrogen readiness costs would not lead to material differences with the networks’ forecasts.

This decision leaves uncertainty as to whether any non-conforming expenditure on hydrogen readiness would be added to the networks’ capital base in the next access arrangement period: “Any actual/estimated capex incurred by [Multinet or AGN] for the 2023-28 period (including any expenditure for non-conforming hydrogen readiness […]) would be added to the 1 July 2028 capital base if it meets [the NGR] criteria.”[106]

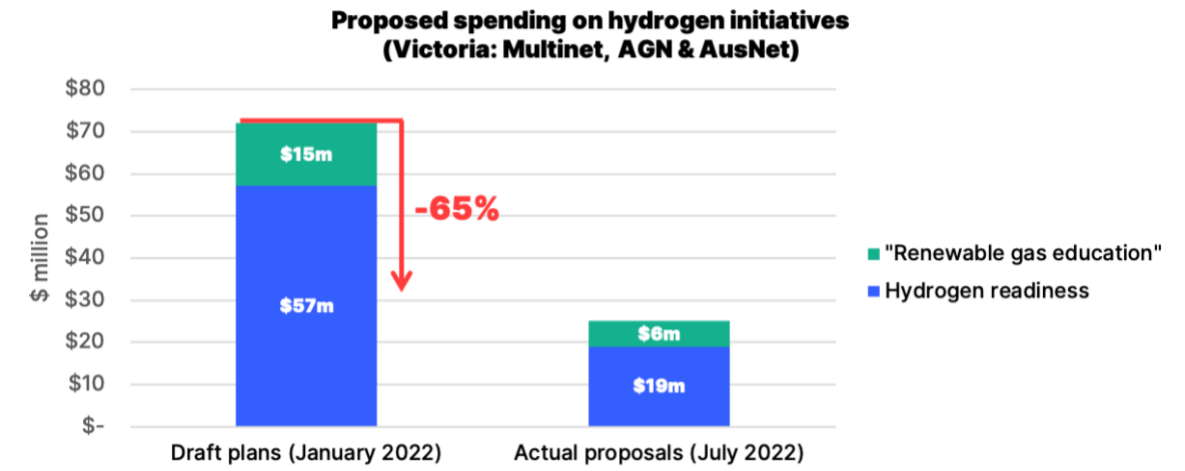
The networks may use their total approved capital expenditure at their discretion, and this decision may allow Multinet and AGN the capacity to make modest investments in hydrogen readiness. However, they must do so under the knowledge that the regulator views them as non-conforming, and there is a risk that the expenditure will not be included in their regulated asset base. A continued policy push towards electrification could lead to hydrogen ready assets becoming stranded very early in their usable life.

[99] AER. Final decision: Multinet Gas Networks Gas distribution access arrangement 1 July 2023 to 30 June 2028. Attachment 5 – Capital expenditure. June 2023. Page 7.
[100] AER. Final decision: Australian Gas Networks (Victoria & Albury) Gas distribution access arrangement 1 July 2023 to 30 June 2028. Attachment 5 – Capital expenditure. June 2023. Page 7.
[101] AEMC. National Gas Rules. Rule 79 – New capital expenditure criteria.
[102] AER. Draft Decision: Multinet Gas Networks Access Arrangement 2023 to 2028. Attachment 5 – Capital expenditure. December 2022. Page 19.
[103] AER. Draft Decision: Australian Gas Networks (Victoria and Albury) Access Arrangement 2023 to 2028. Attachment 5 – Capital expenditure. December 2022. Page 17.
[104] AER. Final decision: Multinet Gas Networks Gas distribution access arrangement 1 July 2023 to 30 June 2028. Attachment 5 – Capital expenditure. June 2023. Page 11.
[105] AER. Final decision: Australian Gas Networks (Victoria & Albury) Gas distribution access arrangement 1 July 2023 to 30 June 2028. Attachment 5 – Capital expenditure. June 2023. Page 10.
[106] Ibid. Page 11.

A quarter of Victorian networks’ hydrogen expenditure is allocated to promotion, charged to consumers

Multinet[107] and AGN[108] also included a combined A$14.8 million of operating expenditure in their draft plans for ‘renewable gas communications and education programs’, including advertising campaigns, online content, community activities and a school education program.[109] The networks’ draft plans originally intended to charge these full costs to their customers via tariffs. However, their actual proposals to the AER reduced this to a combined A$6 million to be covered by customers, with the difference to be funded by the businesses themselves (Multinet,[110] AGN[111]) (Figure 5).

Figure 5: Victorian gas distribution networks have cut their proposed expenditure on hydrogen initiatives



Source: Multinet, AGN and AusNet.

In its draft decision, the AER decided that AGIG’s ‘renewable gas education program’ expenditure was non-conforming as it was: not a necessary initiative; that it was comparable to marketing; and that it was “unclear to us whether it is efficient to use children/students to distribute information to current consumers”.[112]

[107] Multinet Gas Networks. Five year plan for our Victorian distribution network July 2023 – June 2028: Draft plan. January 2022. Page 77.
[108] Australian Gas Networks. Five year plan for our Victoria and Albury distribution networks July 2023 – June 2028: Draft plan. January 2022. Page 76.
[109] Multinet Gas Networks. Five year plan for our Victorian distribution network July 2023 – June 2028: Draft plan. January 2022. Page 87.
[110] Multinet Gas Networks. Five year plan for our Victorian distribution network: Final Plan. July 2022. Page 78.
[111] Australian Gas Networks. Five year plan for our Victoria and Albury distribution networks: Final Plan. July 2022. Page 78.
[112] AER. Draft Decision: Australian Gas Networks (Victoria and Albury) Access Arrangement 2023 to 2028. Attachment 6 – Operating expenditure. December 2022. December 2022. Pages 34-35.

However, once again the AER approved the networks’ full proposed operating expenditure, including these promotional costs, which passed through to their final decisions (Multinet[113], AGN[114]). This too was justified on the basis that removing the A$6 million was not considered materially different to the networks’ estimate of total required expenditure.

Victoria’s gas distribution networks are telling the regulator electrification is the likely future, and the regulator agrees

Gas distribution businesses’ proposals to the AER suggest an awareness that the useful lives of their pipelines is at risk of being significantly shorter than previously assumed, due to a large-scale consumer switch to electricity. They have proposed to increase charges to consumers in the short term to enable them to recover the cost of their pipelines over a shorter time period, via accelerated depreciation.

AGIG first asked for accelerated depreciation in January 2020, for its Dampier Bunbury pipeline in Western Australia. AGIG argued to the Economic Regulator of Western Australia that the changing energy landscape raised significant stranded asset risks for gas infrastructure, and that the assumed useful economic life of the pipeline was many decades longer than it should be.[115] AGIG argued that it should be allowed to increase its charges to customers to recover the cost of the pipeline faster from customers. Specific factors it cited as impacting future demand for fossil gas included:

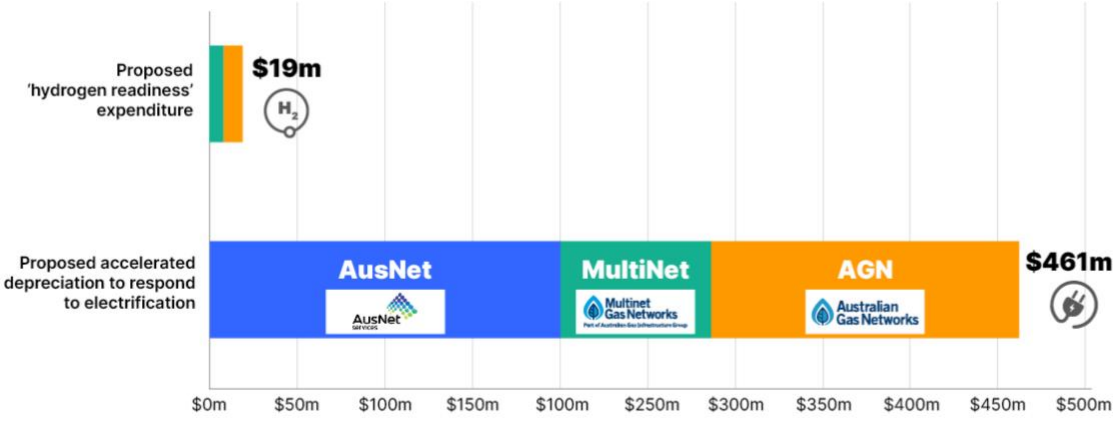
- Emissions reduction policies implemented by Australian governments;
- Global emission reduction policies that are likely to drive innovation in alternative technologies to fossil gas, impacting the Australian market; and
- Rapid reductions in the cost of renewable electricity and storage technologies, particularly at a distributed scale, that are more cost-competitive than fossil gas

Since AGIG raised these arguments in 2020, advances have been made across many of these areas. For example, the federal government has upgraded its 2030 emission reduction targets and set a target of net zero emissions by 2050.[116] Annual heat pump sales in Europe have also increased by 39% due to ambitious policies to decarbonise household heating, and a response to the crisis in Ukraine.[117]

[113] AER. Final Decision: Multinet Gas Networks gas distribution access arrangement 1 July 2023 to 30 June 2028. Attachment 6 – Operating expenditure. June 2023. Page 9
[114] AER. Final Decision: Australian Gas Networks (Victoria & Albury) Gas distribution access arrangement 1 July 2023 to 30 June 2028. Attachment 6 – Operating expenditure. June 2023. Page 9.
[115] Dampier Bunbury Pipeline. Five year plan for Dampier to Bunbury Natural Gas Pipeline 2021-2025. Attachment 9.2 – Assessment of the Economic Life of the DBNGP. January 2020. Page 1.
[116] Prime Minister of Australia. Australia Legislates Emissions Reduction Targets. September 2022.
[117] European Heat Pump Association. European heat pump market and statistics report 2023: Executive Summary. June 2023. Page 5.

Although they have different physical characteristics to the Dampier Bunbury pipeline, the three Victorian networks (AusNet,[118] Multinet[119] and AGN[120]) have pursued accelerated depreciation allowances in a similar manner, to recover their asset value over a shorter timeframe. The networks proposed a combined A$461 million worth of accelerated depreciation over the next five years, far higher than the capital expenditure they proposed on ‘hydrogen readiness’ activities (Figure 6). The AER ultimately granted A$333 million of this (AusNet,[121] Multinet[122] and AGN[123]). This is equal to nearly 7% of these pipelines’ total asset value.[124]

Figure 6: Victorian gas distribution networks’ accelerated depreciation proposals far exceed their proposed ‘hydrogen readiness’ spending



Based on proposed costs for full 2023-28 Access Arrangement period, from networks' final proposals.
Source: AusNet, Multinet & AGN

Networks have also proposed charging abolishment fees to customers who permanently leave the network, at up to A$950 per abolishment.[125] The AER has accepted these costs, but decided that only a portion (A$220) will be charged directly to departing customers. The remainder will be socialised across customers who remain on the network.[126]

Gas network stakeholders have understandably found it difficult to reconcile the tensions between networks exhibiting confidence in the future use of their networks for hydrogen, while including large amounts of accelerated depreciation in their proposals to respond to asset stranding risks.[127] In their

[118] AusNet Services. Access Arrangement Information: Gas access arrangement review 2024-28. Revised AA Proposal. January 2023. Page 5.
[119] Multinet Gas Networks. Revised five year plan for our Victorian distribution network July 2023 – June 2028. January 2023. Page 7.
[120] Australian Gas Networks. Revised five year plan for our Victoria and Albury distribution networks July 2023 – June 2028. January 2023. Page 7.
[121] AER. Final decision: AusNet Gas Services Gas distribution access arrangement 1 July 2023 to 30 June 2028. June 2023. Page 8.
[122] AER. Final decision: Multinet Gas Networks Gas distribution access arrangement 1 July 2023 to 30 June 2028. June 2023. Page 8.
[123] AER. Final decision: Australian Gas Networks (Victoria & Albury) Gas distribution access arrangement 1 July 2023 to 30 June 2028. June 2023. Page 8.
[124] A$4.9 bn; AER. State of the Energy Market 2022. September 2022. Page 162.
[125] AER. Final decision: Multinet Gas Networks Gas distribution access arrangement 1 July 2023 to 30 June 2028. June 2023. Page 29.
[126] AER. AER decision supports Victorian gas consumers in energy transition. 2 June 2023.
[127] Multinet Gas Networks. Five year plan for our Victorian distribution network: Final Plan. July 2022. Page 57.

submission to the networks’ proposals, Brotherhood of St. Laurence noted that: “Accelerated depreciation is not consistent with a hydrogen future. There is no equity argument for today’s customers to pay down the network early so that future customers can enjoy a hydrogen network.”[128]

The networks have built the case for their accelerated depreciation proposals by jointly commissioning a set of scenarios to represent plausible futures for gas in Victoria.[129] These scenarios were then tested under different accelerated depreciation options, with the aim being for each network to select an amount of accelerated depreciation that is effective at mitigating risks under the most pessimistic scenario for networks, while minimising price impacts to consumers, including under more optimistic scenarios.[130]

The most optimistic scenario produced, and the only scenario where gas networks have continued growth, was *Hydrogen Hero*, in which networks are fully utilised to deliver hydrogen to homes, commerce and industry, supported by government subsidies.[131] This scenario is described as the “closest to a business-as-usual scenario, with a different gas”.[132]

Revealingly, the networks have not considered a scenario where biomethane plays a substantial role in keeping their assets relevant. It is included only as a minor mention in the *Muddling Through* scenario, which sees the second-highest network utilisation after *Hydrogen Hero* but depicts an unco-ordinated future with prolonged fossil fuel use and a future mix of electrification and ‘renewable gas’.[133]

While *Hydrogen Hero* paints a rosy picture for the future of gas networks, it is far from a likely scenario, as even the networks themselves admit. In response to the release of Victoria’s Gas Substitution Roadmap, the networks published addendums to their draft access arrangement proposals. AusNet’s addendum conceded that

“the Roadmap provides more certainty around the primacy of the electrification pathway to decarbonise […] We consider […] Hydrogen Hero and Muddling Through are no longer likely outcomes.”[134]

[128] Brotherhood of St. Laurence. 2023-2028 Victorian Gas Distributors’ Access Arrangement: Submission from Brotherhood of St. Laurence. September 2022. Page 17.
[129] KPMG. Future of Gas: Development of Future Scenarios Co-Design Summary Report. October 2021. Page 4.
[130] AGIG and AusNet Services. Future of Gas Deep Dive #2. 31 March 2022. Page 4.
[131] KPMG. Future of Gas: Development of Future Scenarios Co-Design Summary Report. October 2021. Page 23.
[132] Australian Gas Networks. Five year plan for our Victoria and Albury distribution networks July 2023 – June 2028: Draft plan. January 2022. Page 61.
[133] KPMG. Future of Gas: Development of Future Scenarios Co-Design Summary Report. October 2021. Page 22.
[134] AusNet Services. Access Arrangement Information: Gas access arrangement review 2024-28. Addendum to proposal. 2 September 2022. Page 7.

Meanwhile, Multinet and AGN’s stakeholders “questioned whether [AGIG] were reconsidering hydrogen readiness expenditures, given the strong push towards electrification under the Gas Substitution Roadmap”.[135]

The Victorian government’s recent announcement to ban gas connections in new homes from 2024 validates the distribution networks’ interpretation of the Gas Substitution Roadmap, sending a clear signal that Victoria is moving towards an electrified future.[136]

Networks’ campaigns to promote ‘renewable gas’ do not reflect its likely future prospects

Despite the weight of evidence and pushback from the regulator and consumer groups against a shift to ‘renewable gas’, as well as the networks’ own acknowledgement that such a scenario is unlikely, the gas industry is still promoting ‘renewable gas’ as a likely future to consumers.

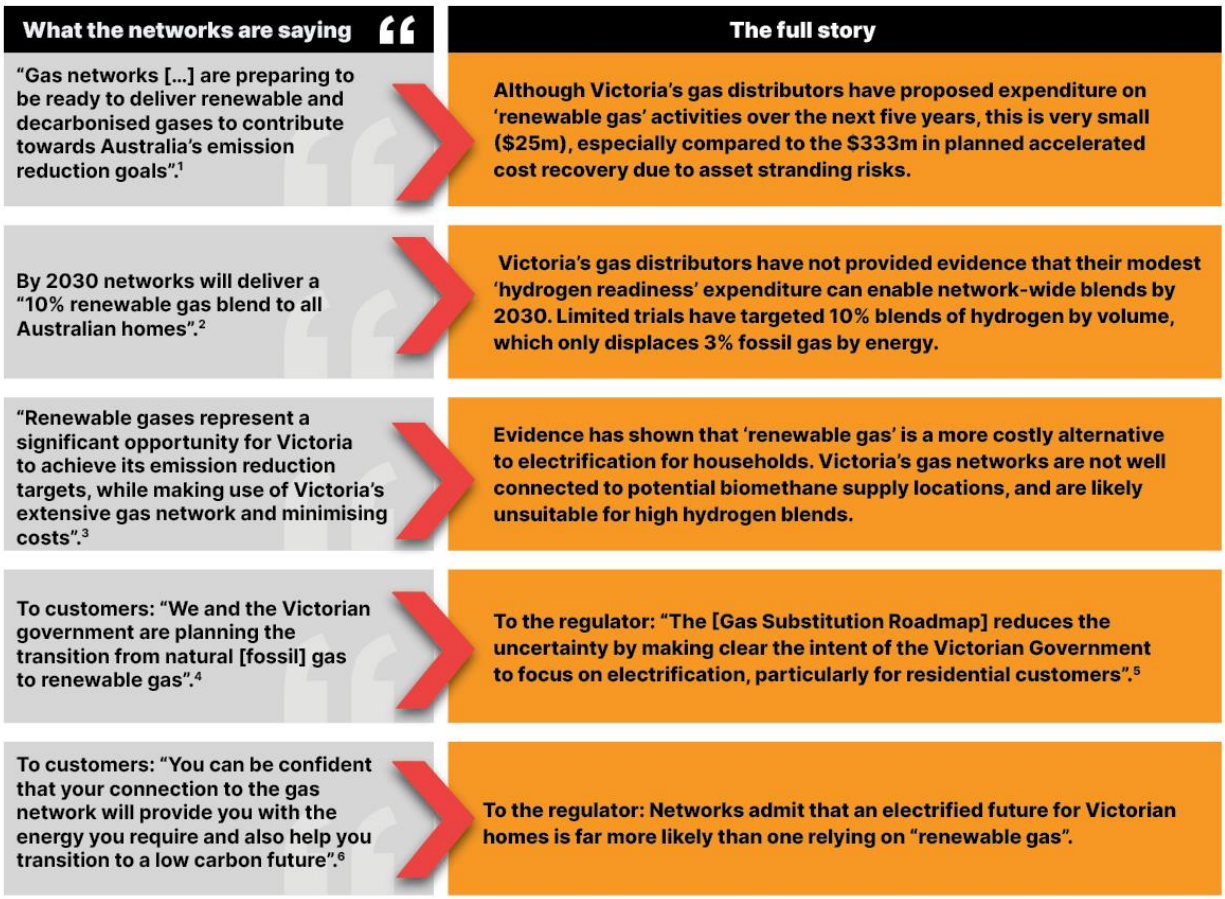
Figure 7 summarises some of the ‘renewable gas’ promotional claims made by Victoria’s gas distribution networks, and how they compare to the evidence presented in this report.

Recent advocacy and communications work from gas networks in Australia would imply a strong belief in a ‘renewable gas’ future. Jemena is offering customers in NSW an A$500 rebate for replacing a non-gas heater with ducted gas heating and an A$400 rebate to replace electric hot water with gas.[137] Jemena is combining its electric-to-gas campaign with promises that ‘renewable gas’ is the future for household gas consumption. On its website, Jemena says: “Investing in renewable gas now could provide a new renewable energy solution for homes and businesses into the future – helping Australia to lower carbon emissions quickly and efficiently.”[138]

AGIG’s Renewable Gas website[139] is targeted at consumers, conveying the message that they will have access to 10% hydrogen blends by volume (3% by energy) across all their networks by 2030, and a 100% ‘renewable gas’ network by 2050. The website’s Frequently Asked Questions page promotes information on the costs of getting off gas published by Frontier Economics [140], a consultancy firm working for the gas industry that has been repeatedly criticised for using unrealistic modelling assumptions to overstate the costs of electrification.[141] [142]

[135] Australian Gas Networks. Revisions to our five year plan for our Victoria and Albury distribution networks: Response to Victorian Gas Substitution Roadmap. September 2022. Page 13.
[136] Premier of Victoria. New Victorian Homes To Go All Electric From 2024. 28 July 2023.
[137] Renew Economy. Cash for gas: Networks offer rebates, cash bonuses to keep home fossils burning. 9 June 2023.
[138] Jemena. Renewable gas, supporting the energy transition.
[139] AGIG. Renewable Gas - We're changing gas, for good. .
[140] Frontier Economics. The benefits of gas infrastructure to decarbonise Australia: A report for the Australian gas industry. 17 September 2020. Page 5.
[141] Australian Financial Review. $299 to $2099: switching off gas at home is harder than it should be. 22 September 2022.
[142] Renew Economy. “Bad faith:” Gas lobby’s desperate attacks on electrification don’t stack up. 14 April 2023.

Figure 7: Gas networks’ public communications on ‘renewable gas’ don’t tell the full story.



Sources: [1]ENA and Australian Pipelines and Gas Association (AGPA). Gas Vision 2050: 2022 Outlook. Page 4.
[2]AGIG, Jemena & ENA. When will I get renewable gas?
[3]AGIG. Response to Victoria's Gas Substitution Roadmap consultation. Page 4.
[4]AGIG. Response to Victoria's Gas Substitution Roadmap consultation. Attachment B, page 2.
[5]Multinet Gas Networks. Revisions to our five year plan for our Victorian distribution network: Response to Victorian Gas Substitution Roadmap. September 2022. Page 8
[6]AGN. Blended Renewable Gas FAQs: What does this mean for customers?

Multinet tells its customers: “The Gas Substitution Roadmap highlights the importance of […] renewable gases such as green hydrogen and biomethane.” It adds that, “we and the Victorian government are planning the transition from natural [fossil] gas to renewable gas.”[143] This is in stark contrast to the company’s interpretation of the Roadmap delivered to the AER, which said that, “the Gas Substitution Roadmap focuses on electrification as the primary means of achieving emissions reductions in the residential sector”; and that, “the Gas Substitution Roadmap [makes] clear the intent of the Victorian Government to focus on electrification”.[144]

[143] Multinet Gas Networks. Natural Gas: Separating the Myths and Realities.
[144] Multinet Gas Networks. Revisions to our five year plan for our Victorian distribution network: Response to Victorian Gas Substitution Roadmap. September 2022. Page 8.

AGIG claims that it is delivering on the Gas Vision 2050 – a collaboration with five peak gas bodies to lay out a roadmap to a 100% ‘renewable gas’ future by 2050, and 10% hydrogen blends by volume (3% by energy) across all networks by 2030.[145] However, it is difficult to see how networks intend to deliver on this vision given the substantial cuts they have made to proposed hydrogen expenditure in their latest access arrangements, and warnings from the AER that this expenditure may not conform with the National Gas Rules.

‘Renewable gas’ promotion campaigns may be risky in light of Australian consumer law

One of the most significant risks of these ‘renewable gas’ campaigns is that, if they are effective, consumers may continue to make investments in gas appliances under the assurance that there is a long-term future for their gas distribution network. Such investments could be well over A$10,000 per household, with the expectation that these appliances will last up to 20 years.[146]

Although this stranded asset risk may not eventuate in the next few years, the risk increases as time goes on, particularly as jurisdictions move closer towards their emissions reduction goals. The potential useful life of gas appliances being installed today is already within the time window when fossil gas will need to be largely phased out. Even if gas distribution networks were to successfully transition to hydrogen, households would still be left with unusable appliances. This is not being disclosed to households in ‘renewable gas’ promotion campaigns.

In a recent submission to the Senate Inquiry into Greenwashing, Professor Allan Fels, former chair of the Australian Consumer and Competition Commission (ACCC), observed that the coverage of the Trade Practices Act ban on misleading and deceptive conduct is quite broad, and included the following: “Misleading conduct can include false predictions if the maker had no reasonable grounds for making them or if the prediction should have been qualified and was not.”[147]

In IEEFA’s opinion, Victoria’s gas distribution networks would appear to be at risk if they were to be investigated under the Trade Practices Act, given that:

- Statements they have made to the AER acknowledge that fossil gas in Victoria is much more likely to be phased out via electrification, rather than with ‘renewable gas’;
- Their current investments to prepare their networks for hydrogen are modest, and not in line with either the targets they promote, or government emission reduction targets; and
- Their ‘renewable gas’ campaigns and appliance rebate schemes fail to disclose to consumers the risk that these appliances may become unusable under legislated emissions targets, regardless of whether networks successfully transition to hydrogen.

[145] Energy Networks Australia. Gas Vision 2050.
[146] Based on costs from Grattan Institute. Getting off gas: Why, how, and who should pay? June 2023. Page 21; and appliance lifetime assumptions from EnergyConsult. 2021 Residential Baseline Study for Australia and New Zealand. November 2022
[147] Prof. Allan Fels AO. Inquiry into Greenwashing: Submission and Recommendations. Page 2.

There are recent precedents for the gas industry facing scrutiny under Australia’s consumer protection laws. Australia’s advertising watchdog recently banned an advertisement from the Australian Petroleum and Exploration Association (APPEA) based on a failure to substantiate claims around the ‘cleanliness’ of fossil gas.[148]

Consumer investment in gas appliances is very significant. Currently in Victoria, IEEFA estimates that up to 100,000 gas cooktops, 150,000 gas water heaters and 65,000 gas ducted heating systems are sold each year.[149] This involves a collective investment across households of roughly A$1.5 billion.[150] The annualised costs, if financed at the current home loan rate of 6.6%[151] and repaid over a 14-20 year appliance lifetime[152], would equal A$173 million, or 24% of the annual revenue of Victoria’s gas distribution networks (A$710 million)[153].

Every year that a new group of households purchase new gas appliances, this amount accumulates. Over a period of five years, the total investments could add up to A$7.5 billion (or annualised costs up to A$865 million; more than 20% higher than the networks’ annual revenue).

It is not unreasonable to expect customers who have suffered a financial loss after purchasing gas appliances based on the information provided by their gas networks may seek legal options for recovering their costs. In IEEFA’s opinion, distribution network businesses should be mindful of the significant stranded asset risks their customers are facing, and that there are avenues for these risks to be transferred back to the network businesses. The sums of money that may be at stake are material, and would accumulate as investment continues to occur.

Implications

Implications for financiers

The majority of evidence, including statements made by Victoria’s gas distribution networks to the AER, suggests that electrification – not ‘renewable gas’ – is the most likely pathway for decarbonisation of residential energy supply in Victoria. If governments, particularly in Victoria, stay on track to meet their emissions reduction targets, then residential demand for gas of any form is likely to decline dramatically. Victoria’s recent announcement to ban gas connections in new homes by 2024 is already sending a signal that the state government is serious about an electrified future.

[148] B and T. Natural gas ad spiked over misleading environmental claims. July 2023.
[149] Based on IEEFA analysis of EnergyConsult. 2021 Residential Baseline Study for Australia and New Zealand for 2000-2040; Equipment Energy Efficiency Program. Product Profile: Gas Ducted Heaters; Equipment Energy Efficiency Program. Regulatory Impact Statement: Proposal to introduce a minimum energy performance standard for gas water heaters.
[150] Assuming average purchase plus installation cost of A$2,000 for a gas cooktop, A$1,700 for a gas hot water system and A$8,500 for a gas ducted heating system based on Grattan Institute. Getting off gas: Why, how, and who should pay? June 2023. Page 21.
[151] Overall average for owner-occupier principal+interest loans from Canstar. What are the average interest rates on home loans? July 2023.
[152] Based on sources used by EnergyConsult. 2021 Residential Baseline Study for Australia and New Zealand for 2000-2040, we assume a 20-year lifetime for gas ducted heating systems, and a 14-year lifetime for gas cooktops and hot water systems.
[153] AER. State of the Energy Market 2022. September 2022. Page 170.

Financiers are already responsible for incorporating this risk into their risk management practices. They should also be conscious of the flow-on risks from a large consumer base who may be investing in gas appliances based on the information provided to them about the future of the gas distribution network, as promoted by distribution networks’ ‘renewable gas’ campaigns. The potential sunken investments by Victorian consumers are large relative to the scale of Victorian gas distribution businesses’ revenues.

Implications for governments

There is a very large gap between Victoria’s gas distribution networks’ marketing campaigns to customers about ‘renewable gas’, what they are saying to the AER, and what they are actually doing to prepare their networks for ‘renewable gas’. This presents serious risks for energy consumers, that governments have a responsibility to pay attention to.

Gas appliances have been the default choice for Victorian home consumers for several decades, and objective information on the relative merits of gas versus electrification is not always accessible to consumers. Consumers are therefore vulnerable to information that implies they can invest in gas appliances without any concern about future carbon emission constraints.

State governments, the federal government and regulators are aware that it is unlikely that gas networks will play a significant future role in delivering ‘renewable gases’ to consumers. However, so far, they have taken little action to protect consumers against overly optimistic information about the long-term future of gas networks. Consumers are at risk of locking in stranded investments in gas appliances, which may leave them to rely on future options such as litigation to remedy their position. Prevention would be much easier and less costly.

The AER ruled that expenditure on hydrogen readiness and ‘renewable gas education programs’ was non-conforming with respect to the National Gas Laws. Yet it allowed the expenditure anyway.

The ACCC has issued warnings for businesses engaging in misleading conduct, and said in March 2023 it would take enforcement action on false green claims by companies.[154] In IEEFA’s opinion, Victoria’s gas distribution networks appear to be at risk if their campaigns were scrutinised under the Trade Practices Act. These campaigns fail to address the fact that electrification is the least costly pathway for customers to move away from fossil gas, and is the most likely pathway being pursued by the Victorian government.

Finally, both federal and state governments need to communicate more clearly and prominently to householders about the type of changes in fossil fuel use that will need to unfold in order for them to meet their emissions reduction commitments. The Victorian government’s recent decision to ban gas connections in new homes in 2024 signals a push towards electrification; however, there are still too few protections for existing households who may be purchasing new gas appliances, risking future stranded assets.

[154] Australian Competition and Consumer Commission (ACCC). ACCC ‘greenwashing’ internet sweep unearths widespread concerning claims. 2 March 2023.

Conclusion

Despite significant supply-side constraints and an absence of planning for biomethane at scale, clear policy signals away from hydrogen in homes, and networks’ admission that a hydrogen scenario is unlikely, the gas industry is still promoting ‘renewable gas’ as a likely future for household energy. This information goes to consumers and other network stakeholders, who may be making investment decisions contingent on the assumed future usage of gas networks.

Biomethane in the home is costly and supply-constrained, and international and Australian evidence consistently shows that hydrogen is an inefficient and ultimately highly costly solution for decarbonising residential energy consumption.

As signs increasingly point to an electrified future in Victorian homes, gas network assets are not necessarily serving the best interests of energy consumers. However, the owners of those assets have a commercial interest in recovering their past investments, by continuing to supply some form of gas to their customers. In this context, Victoria’s gas distribution networks have launched ‘renewable gas education programs’ and cash rebates for new gas appliances, which can lead consumers into making poor financial decisions. Moreover, the cost of these programs is in part being charged back to consumers in their bills.

Electrification continues to present as the most cost-effective pathway for the majority of homes to decarbonise their energy consumption. It is highly unlikely that ‘renewable gas’ will play a mainstream role in residential energy supply. However, there is a risk that continued campaigns promoting ‘renewable gas’ from distribution networks will block progress on the orderly transition to an electrified future, and will lock in higher energy costs for consumers – and potentially the expense of stranded investments in obsolete gas appliances.

In the likely event that the gas distribution networks fail to deliver on their ‘renewable gas’ promises, consumers who purchased gas appliances under the advice of those campaigns will be left with significant sunk costs. If customers were to look to legal means to recover these costs, the consequence could be highly substantial for gas distribution networks.

In IEEFA’s view, financiers should be mindful of the risks described in this report. In addition, IEEFA believes that governments should act to protect consumers’ interests by ensuring that promotional campaign activities by the gas distribution networks comply with Australian consumer law. Regulators should also ensure that decisions on gas networks are made in the best long-term interests of energy consumers, and do not lock them into unnecessary expenditure.

Glossary of terms

Biogas	A gas produced from biological feedstocks, comprised of methane, carbon dioxide and other impurities.
Biomethane	Methane produced from biological sources, generally by removing impurities from biogas.
Fossil gas / Natural gas	Methane extracted from fossil sources, including undersea reservoirs or coal seams.
Gas / Gaseous fuels	A term used to refer to gaseous fuels generally – historically mainly fossil gas, but could include biomethane or hydrogen.
Gas distribution network	Local network of pipelines that delivers gaseous fuels (currently, mainly fossil gas) from transmission pipelines to end-use consumers under low pressure.
Hydrogen	A gas consisting of molecules that contain two hydrogen atoms, which is chemically distinct from methane but can be combusted as a fuel.
Methane	Chemical term for the combustible gas that is the primary component of fossil gas or biomethane. Methane is a greenhouse gas when released directly into the atmosphere, and also produces carbon dioxide when combusted.
‘Renewable gas’	A term used by the gas industry to describe the use of biomethane and/or hydrogen, which are often blended with fossil gas.
Renewable hydrogen / Green hydrogen	Hydrogen produced using renewable electricity, with no net production of greenhouse gas emissions.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute’s mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

About the Authors

Jay Gordon

Jay Gordon is a Research Analyst at IEEFA focusing on the Australian electricity sector. He brings experience in modelling Australia’s energy system transition, including investigating the role of the electricity sector in helping the broader economy transition towards a net-zero future.
jgordon@ieefa.org

Kevin Morrison

Kevin Morrison is an energy finance analyst focusing on Australian LNG and Gas. Kevin works closely with the global oil and gas team to examine issues facing the Australian LNG and gas sector.
kmorrison@ieefa.org

Institute for Energy Economics and Financial Analysis