Institute for Energy Economics and Financial Analysis
ieefa.org

91 Percy Street
Warwick, QLD 4370
aus_staff@ieefa.org

6 October 2023

To: Victorian Department of Energy, Environment and Climate Action

RE: Victoria's Renewable Gas Consultation Paper

The Institute for Energy Economics and Financial Analysis (IEEFA) thanks the Victorian Government for the opportunity to comment on *Victoria's Renewable Gas Consultation Paper*.

IEEFA has recently published an analysis on this topic, in our report *'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk*.

In IEEFA's view, it is critical that any policy involving hydrogen and biomethane is targeted towards delivering the lowest-cost pathway for all energy users, recognising the unique technical and economic characteristics of each potential solution. Different solutions are likely needed for different end uses.

The first section of our response outlines several general comments and concerns, and the second section responds directly to several of the consultation questions.

Please do not hesitate to contact us if you would like to discuss these responses further.

Regards

Jay Gordon – Research Analyst, Australian Electricity – IEEFA

91 Percy Street
Warwick, QLD 4370
aus_staff@ieefa.org

Overall comments

Victoria should carefully consider the intended goal of 'renewable gas' policies

IEEFA sees two broad roles that hydrogen and biomethane could play in Victoria's future energy economy:

1. As a substitute for fossil gas in appropriate end uses (for example decarbonising high-temperature heat); or
2. As a new energy source in future green industries (for example green iron or ammonia production).

IEEFA's understanding based on the Issues Paper is that the Victorian government is focusing on the former role. However, we recommend that this is clarified, as the policies required to support either outcome could be very different.

For example, if a target is set based on an absolute quantity of hydrogen production per year, it may not be possible to guarantee that this displaces existing fossil gas consumption. It may, however, help to incentivise growth of new green industries.

A broad-based 'renewable gas' target carries risks

Hydrogen and biomethane are likely to play critical roles in decarbonising specific end-use sectors. For example, in IEEFA's recent submission to the review of Australia's National Hydrogen Strategy, we noted that there are promising opportunities for the use of hydrogen for domestic production of ammonia or green iron. By contrast, other propositions such as direct hydrogen exports or blending it into gas distribution networks do not make financial sense.[1]

The 'Clean Hydrogen Ladder' by Liebrech Associates presents a broader set of use cases for hydrogen on a scale from 'unavoidable' to 'uncompetitive'.[2]

Biomethane could play a key role as a drop-in fuel for particularly hard-to-electrify use cases. However, it is significantly supply-constrained.[3]

A targeted approach is needed to ensure that supplies of hydrogen and biomethane are not depleted by low-priority end uses. This could not be guaranteed by a target that focuses on overall supply of hydrogen and/or biomethane.

For this reason, IEEFA does not support the implementation of a broad-based renewable gas target. Any future hydrogen or biomethane policy should be targeted specifically towards key end-use sectors where those gases are expected to play a critical role.

Grouping hydrogen and biomethane together as 'renewable gas' does not recognise their unique characteristics

Hydrogen and biomethane are distinct fuels with unique physical and economic characteristics that are often not directly interchangeable.

[1] IEEFA. Submission to the Review of the National Hydrogen Strategy. August 2023.
[2] Liebrech Associates. The Clean Hydrogen Ladder. August 2023.
[3] IEEFA. 'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk. August 2023. Page 12.

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aus_staff@ieefa.org

For this reason, IEEFA recommends against classifying hydrogen and biomethane under a unified title such as 'renewable gas'. Hydrogen is likely to be more expensive to produce and deliver than biomethane.[4] Conversely, biomethane is likely to be more supply-constrained.[5]

Certain infrastructure, including large parts of Victoria's gas networks, are likely to be compatible with biomethane, but not with hydrogen without significant capital investment.[6] A similar situation exists for end-use equipment such as consumer appliances.[7]

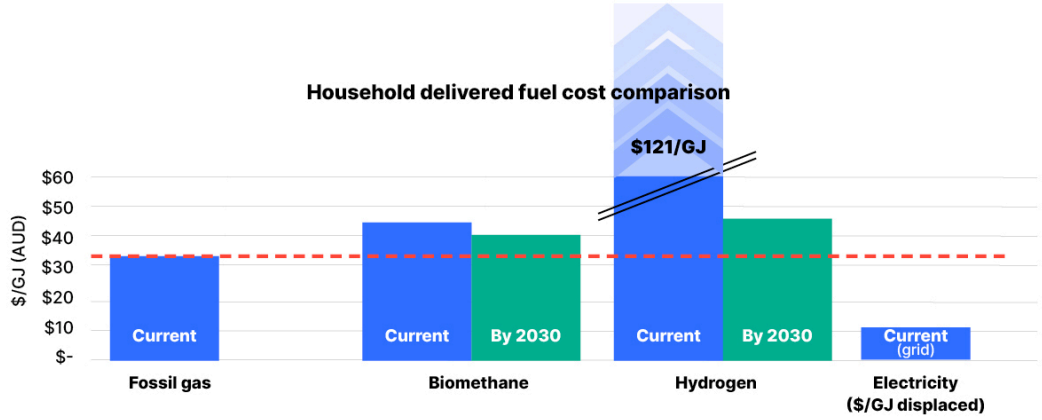
Additionally, hydrogen and biomethane are not like-for-like replacements in some end uses. For example, fossil gas is commonly used to produce hydrogen as an intermediate step in ammonia production. There are pathways to either replace fossil gas in this process with biomethane or utilise renewable hydrogen directly.[8] However, both involve very different technical processes with their own associated costs.

A targeted suite of policies that aim to develop hydrogen and biomethane for economically sensible use cases is more appropriate than a policy that aims to increase the combined supply of both gases.

It does not make sense for most residential consumers to pay for hydrogen or biomethane

The issues paper states that: "Renewable gas is also unlikely to have a role in residential and most commercial buildings"; and that: "Any policy mechanism should ensure that renewable gases are reserved for the hard-to-abate industrial sector".[9] This is consistent with IEEFA analysis that found electrification is a far more cost-effective option for most Victorian households than hydrogen or biomethane (**Figure 1**).

Figure 1: 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.
Source: IEEFA. 'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk. August 2023.

[4] IEEFA. 'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk. August 2023. Page 10.
[5] Ibid. Page 12.
[6] Infrastructure Victoria. Towards 2050: Gas infrastructure in a net zero emissions economy. December 2021. Page 94.
[7] ENA and APGA. Delivering the pathway to net zero for Australia – 2022 Outlook. April 2022. Page 21.
[8] Royal Society. Ammonia: zero-carbon fertiliser, fuel and energy store. February 2020.
[9] DEECA. Victoria's Renewable Gas Consultation Paper. September 2023. Page 6.

91 Percy Street
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aus_staff@ieefa.org

However, Section 3.5 of the issues paper lists residential customers, including vulnerable households, among the consumer groups who may be most impacted by new hydrogen or biomethane policies. Modelling in Section 4 of the issues paper finds that some of the costs of developing hydrogen and biomethane supply would be borne by residential customers.

We acknowledge that some residential customers may be considered hard to electrify, and therefore they may benefit from a targeted supply of biomethane. More work is needed to study this cohort; however, we note it is likely to be a minority of households.

Proactive efforts should be made to prevent residential customers from bearing unnecessary costs of developing hydrogen or biomethane supply, where electrification is a far more cost-effective and likely option for them.

Gas distribution networks are not suited to deliver hydrogen or biomethane at scale

The issues paper states that: "Renewable gas does not necessarily need to be supplied through the existing gas distribution network"; and that: "The future of the reticulated gas distribution network is uncertain, as there could be a rapid change in its utilisation this decade."[10]

This is consistent with IEEFA's understanding, particularly given that:

- Gas distribution networks have communicated to the Australian Energy Regulator (AER) that they are at risk of a significant decrease in utilisation[11];
- Gas distribution networks in Victoria recover 93% of their revenue from residential customers[12];
- Upgrading gas networks to accept high blends of hydrogen may cost between 28%[13] and over 100%[14] of the cost of an entirely new network; and
- Accepting even low blends of 3% hydrogen by energy content incurs costs for gas distribution networks.[15]

However, the issues paper also states that its focus is "to substitute fossil gas delivered through transmission and distribution pipelines in Victoria"[16], and identifies "sales to distribution-connected customers only" as a potential basis for a hydrogen and/or biomethane target[17].

Hydrogen or biomethane injected into distribution networks will predominantly impact residential customers, for whom electrification is generally a more cost-effective solution. It therefore does not make sense to target distribution-connected sales in hydrogen and/or biomethane policies.

Some industrial customers are connected to the distribution network. However, these are characterised by a much smaller number of large loads, and it therefore may not be viable to supply them via the current distribution networks. For example, Australian Gas Networks (AGN)

[10] DEECA. Victoria's Renewable Gas Consultation Paper. September 2023. Page 12.
[11] IEEFA. 'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk. August 2023. Page 22.
[12] AER. Gas Network Performance Report. December 2022. Page 107.
[13] APGA. Retail renewable gas forecast to cost customers less than retail renewable electricity. Page 1.
[14] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Page 94.
[15] For example, see Australian Gas Networks. Renewable Gas Network Adaptation Plan – AGN Victoria and Albury. Final Plan 2023/24 – 2027/28. July 2022.
[16] DEECA. Victoria's Renewable Gas Consultation Paper. September 2023. Page 26.
[17] Ibid. Page 23.

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aus_staff@ieefa.org

has suggested a 'tube and trailer' network, or a network of main trunk lines, may be more suitable.[18]

As part of planning for a managed phase-down of gas networks, governments should investigate the least-cost way of delivering energy to these customers.

More information is requested regarding the modelling in the issues paper

IEEFA requests further information regarding the modelling in Section 4 of the issues paper.

Renewable hydrogen costs appear very low

The Department of Climate Change, Energy, the Environment and Water (DCCEEW)'s State of Hydrogen 2022 report noted a current cost of hydrogen varied between $10-15/kg, which is equivalent to $83.33-$125/GJ.[19] This is more than 2-3 times the base cost of $40/GJ assumed in the issues paper. We request further detail on the derivation of costs in the issues paper.

The treatment of infrastructure costs is unclear

Existing infrastructure in Victoria is not fully compatible with high blends or pure streams of hydrogen.[20] Costs will be incurred to upgrade gas networks to accept hydrogen, which are likely to be borne by energy consumers.

There are also challenges associated with connecting biomethane supplies to the existing network.[21]

It is not clear if and how the modelling considers these costs. The degree to which they are included are material, as they would impact:

- The final cost of each pathway;
- The optimal mix of hydrogen and biomethane in each pathway; and
- Energy consumers' bills.

The feasibility of switching gas networks over to high blends of hydrogen is also unclear, given the logistical challenge and associated costs of organising an instantaneous switch-over of all end-use equipment to hydrogen-ready alternatives.[22]

The assumed biomethane supply appears high

The modelling assumes 29 PJ/yr biomethane is assumed to be available from Tranche 1 and 2 sources. However, a 2021 report by Enea for Sustainability Victoria assessed Victoria's recoverable biogas potential to be between 10.5 and 24.9 PJ/year.[23]

More detail is requested on the biomethane supply assumptions made in the Issues Paper modelling.

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[18] Australian Gas Networks. SA revised Final Plan July 2021 – June 2026. Attachment 9.6 – Future of Gas. January 2021. Page 10.
[19] DCCEEW. State of Hydrogen 2022. 2022. Page 18.
[20] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Page 94.
[21] Ibid. Page 20.
[22] Ibid. Page 16.
[23] Enea Consulting. Sustainability Victoria – Assessment of Victoria's Biogas Potential. December 2021. Page 3.

91 Percy Street
Warwick, QLD 4370
aus_staff@ieefa.org

It is unclear why cost impacts are modelled for residential customers

Section 4.3 presents bill impacts for residential consumers, and notes that "Costs were assumed to be recovered from different customer classes based on their proportion of the overall usage of that source of energy."[24]

This appears inconsistent with the scope of the issues paper, which is focused on hard-to-abate industry uses.[25]

There may be a targeted role for biomethane in a minority of hard-to-electrify households. However, if a policy mechanism is assumed to be targeted towards industrial gas users, IEEFA expects costs would not be recovered from the majority of residential customers.

[24] DEECA. Victoria's Renewable Gas Consultation Paper. September 2023. Page 36.
[25] Ibid. Page 4.

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aus_staff@ieefa.org

Response to consultation questions

2.1 Key considerations of biomethane and hydrogen

a. Do you agree with the use cases this paper has set out for biomethane and hydrogen?

IEEFA agrees that biomethane and hydrogen do not make economic sense for the majority of residential buildings. One exception may be a minority of hard-to-electrify households, for whom biomethane could present a viable short- or long-term solution. More work is needed to identify the size of this cohort.

IEEFA agrees that biomethane and hydrogen may have a role in key industrial sectors. As electrification is also an option for some industry end uses, further research would be valuable to understand the specific opportunities for each subsector.

Regarding the role for hydrogen and/or biomethane in power generation, we note that nationally, gas consumption for power generation has declined by 46% between 2014 and 2023, and the Australian Energy Market Operator (AEMO)'s 2023 Gas Statement of Opportunities (GSOO) forecasts a further decline of 64% between now and 2025.[26]

It is incorrect to include aluminium production as an end-use candidate for hydrogen. Aluminium smelting relies on electricity as an energy source.[27] Hydrogen may have a role in alumina production, a separate upstream process that does not currently have a presence in Victoria.[28]

b. Are there any other use cases that should be incentivised through a policy mechanism?

In our submission to the review of Australia's National Hydrogen Strategy, IEEFA identified that there is economic value in prioritising hydrogen for ammonia production and green iron production. By contrast, using hydrogen in gas distribution networks and directly exporting hydrogen do not make economic sense.[29]

The Victorian government should consider whether it aims to utilise hydrogen or biomethane to develop the growth of new green industries, as this is likely to require a different type of policy support compared with decarbonising existing fossil gas demand.

3.1 Policy objectives

a. Regarding specific technology development, do you think the objective should be to: (i) consider all renewable gases neutrally; or (ii) target specific technologies?

Policy objectives should follow option (ii), and target specific technologies.

Hydrogen and biomethane have unique characteristics and are not interchangeable. Grouping them under a single category such as 'renewable gas' may fail to recognise these characteristics.

[26] AEMO. National Electricity & Gas Forecasting. Gas Annual Consumption GPG.
[27] Australian Aluminium Council. Aluminium Smelting.
[28] Australian Aluminium Council. Australian Alumina.
[29] IEEFA. Submission to the Review of the National Hydrogen Strategy. August 2023.

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Warwick, QLD 4370
aus_staff@ieefa.org

There are likely to be unique costs and benefits for deploying hydrogen and biomethane in different end-use sectors, and therefore each technology should be considered on its individual merits.

3.2 Market-based approach

a. Should a renewable gas policy in Victoria be government-funded or market-based? Why?

Effective hydrogen and/or biomethane policy should result in those gases being supplied to high-priority end uses where viable, cost-effective alternatives are not available.

Policy should also consider that biomethane is heavily supply-constrained in Victoria,[30] and that based on electrolyser cost forecasts, modelling for AEMO's Integrated System Plan (ISP) does not see hydrogen production begin to scale in earnest until the 2030s.[31] A purely market-based approach could see this supply depleted for low-value use cases such as injection into gas distribution networks.

An approach that targets critical end uses is more appropriate than a broad market-based approach.

b. Have we captured the advantages and disadvantages of a market-based approach? Are there any missing?

Given the different characteristics of hydrogen and biomethane, and the diversity of end-use applications, it is unclear that a broad market-based policy would result in the most efficient means of producing the required supply.

Delivery mechanisms for hydrogen, biomethane and fossil gas also need to be considered in a market-based approach. There are cost implications for introducing different levels of hydrogen and biomethane into Victoria's current gas infrastructure, which is not designed to deliver different blends of gases to different consumer groups.

Victoria's current energy market features inequities that may be inherited or compounded by a market-based hydrogen or biomethane policy. For example, many residential consumers cannot freely respond to market signals and choose the lowest-cost household fuel. This includes renters, or households without adequate access to capital.[32]

3.3 Types of policy mechanisms

a. Have we captured the potential policy options (and their advantages and disadvantages) to drive the uptake of renewable gas?

A feed-in tariff policy does not make sense, as it is designed around a model of injecting hydrogen and/or biomethane into centralised gas networks.

Under this approach, it may be difficult to plan for the infrastructure and end-use equipment upgrades required to support different potential blends of hydrogen and biomethane in the gas supply, as the blend proportions will be determined by the market.

[30] IEEFA. 'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk. August 2023. Page 12.
[31] CSIRO and Climateworks Centre. Multi-sector energy modelling 2022: Methodology and results Final report. Page 79.
[32] Grattan Institute. Getting off gas: Why, how, and who should pay? June 2023. Pages 26-22.

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Warwick, QLD 4370
aus_staff@ieefa.org

Alternatively, incurred infrastructure costs would need to be factored into feed-in tariffs, which may be challenging.

b. Which policy mechanism would be best suited to deploy renewable gas in Victoria? Why?

Policies should be targeted to drive hydrogen and/or biomethane uptake in high-priority end uses where viable, cost-effective alternatives are not available. They should also be designed with supply constraints in mind.

Policies that focus on a targeted supply of hydrogen and/or biomethane may not guarantee those gases are delivered to high-priority end uses.

c. What are the critical factors or policy design elements that are needed for successful project investment?

For policies to be successful relative to Victoria's emissions reduction targets, there should be measurable evidence that shows they contribute to a lowest-cost solution to avoiding fossil gas.

To assess this, having oversight over the end use of hydrogen and/or biomethane from new projects is just as important as supply.

Victoria may also wish to consider the future role of hydrogen to support the development of new green industries, which is likely to require a targeted policy approach.

3.4 Managing consumer impacts

a. Do you agree with the energy consumer types most impacted above? Are any user types, or potential impacts, missing?

It is unclear why residential customers represent the majority of impacted consumer types, given that the issues paper states: "Renewable gas is also unlikely to have a role in residential and most commercial buildings."[33]

Neither hydrogen nor biomethane are cost-effective solutions for residential customers at scale, and it would be inappropriate for residential customers to subsidise costs for other sectors.[34]

IEEFA's view is that cost impacts on the majority of residential consumers from any hydrogen/biomethane policy can and should be avoided.

b. What potential consequences should we consider in analysing the impact of potential policy costs?

The consequences for gas infrastructure should be considered.

The costs of upgrading gas networks to accept high blends of hydrogen could be between 28%[35] and over 100%[36] of the costs of an entirely new network.

[33] DEECA. Victoria's Renewable Gas Consultation Paper. September 2023. Page 6.
[34] IEEFA. 'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk. August 2023. Page 9.
[35] APGA. Retail renewable gas forecast to cost customers less than retail renewable electricity. Page 1.
[36] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Page 94

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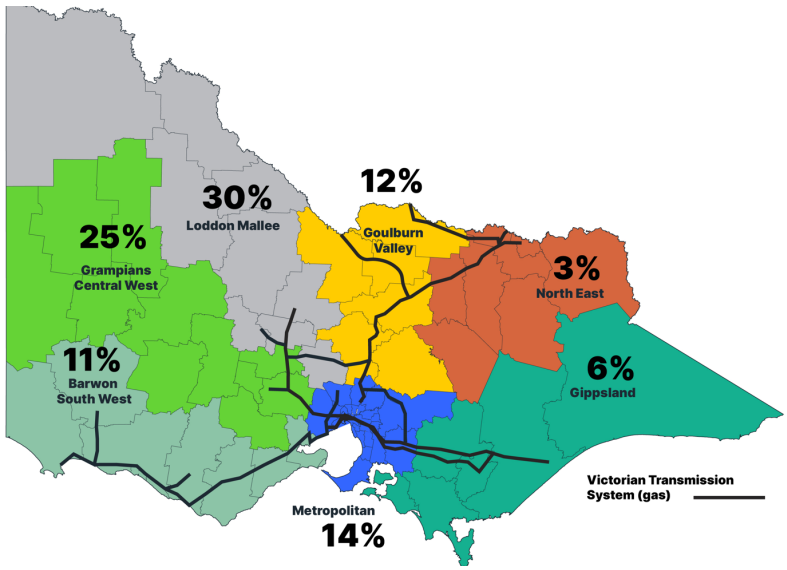
Warwick, QLD 4370
aus_staff@ieefa.org

Furthermore, Victoria's gas distribution networks currently recover 93% of their revenue from residential customers.[37] There is a risk that incurred infrastructure costs could be borne by households who do not benefit from hydrogen or biomethane supply. As highlighted above, these impacts can and should be avoided.

Accessing supplies of biomethane is likely to require new infrastructure, as biomethane feedstock is not located in areas immediately accessible to Victoria's gas transmission system (**Figure 2**).

These costs may mean it is infeasible to use Victoria's current gas infrastructure to deliver hydrogen or biomethane to critical end users, and that alternative energy transport options should be considered.

Figure 2: 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.

c. What are the best support policies for the different energy consumer types?

Policies that displace fossil gas use should target lowest-cost opportunities for different energy consumer types. For most residential customers, this is far more likely to be electrification rather than hydrogen and/or biomethane.[38]

For a minority of residential customers, biomethane could play a niche drop-in role to displace fossil gas, either as a short- or long-term solution. Targeted support may be needed to identify the least-cost way of delivering biomethane to these consumers, for instance via bottled gas or significantly smaller networks.

While hydrogen is likely to have a role in certain industries, a growing body of evidence is pointing to unrealised energy efficiency and electrification opportunities in industry. For example,

[37] AER. Gas Network Performance Report. December 2022. Page 107.
[38] IEEFA. 'Renewable gas' campaigns leave Victorian gas distribution networks and consumers at risk. August 2023. Page 9.

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Warwick, QLD 4370
aus_staff@ieefa.org

the Australian Industry Energy Transitions Initiative found that electricity could provide up to 58% of final energy in industry by 2050, up from 17% today.[39]

Modelling by Northmore Gordon found that energy efficiency opportunities could make a significant contribution towards reducing emissions in manufacturing and mining industries, with a negative marginal abatement cost. Hydrogen and biomethane opportunities were found to play a role, but at higher costs.[40]

It makes sense to explore the potential of energy efficiency and electrification opportunities in industry first, allowing hydrogen and biomethane to be reserved for the most high-value use cases.

3.5 Target design

a. Have we captured the relevant considerations for target design? If not, what aspects are missing?

Any target should clearly contribute to the lowest-cost pathway for displacing fossil gas consumption in line with Victoria's emissions reduction targets.

It is unclear how a target that focuses primarily on increasing hydrogen and/or biomethane supply will achieve this. There is a risk that this could incentivise developments that are not part of the lowest-cost energy supply solution.

For this reason, IEEFA does not support a broad-based hydrogen and/or biomethane target.

Instead, specific policy support should be developed to ensure that supply of biomethane and/or hydrogen is available for those sectors where it is most critical, in line with a least-cost pathway towards Victoria's emission targets.

b. What are your views on:

i. The final target year and scheme duration?

Locking in a set target year and duration may reduce the capacity of the scheme to respond to:

- Changes in the relative economics of hydrogen, biomethane and electrification; and
- Any future technical developments, such as greater electrification opportunities being developed in heavy industry.

An ideal policy would be nimble enough to respond to these external factors, and to ensure Victoria stays on a least-cost pathway.

ii. Target levels, including in intervening years?

While we do not support a broad-based target, IEEFA agrees that hydrogen and/or biomethane policies should be implemented based on energy content rather than volumes. As both gases have different energy densities, volume is not a useful metric to quantify their ability to abate fossil gas consumption or emissions.[41]

[39] Climateworks Centre and CSIRO. Pathways to industrial decarbonisation: Phase 3 technical report. February 2023. Page 73.
[40] Northmore Gordon. Energy Efficiency Scenario Modelling. Client: Energy Efficiency Council, ANZ. May 2023. Pages 25-26.
[41] Bossel & Eliasson. Energy and the Hydrogen Economy. Page 5.

91 Percy Street
Warwick, QLD 4370
aus_staff@ieefa.org

iii. Target design?

A target based on an absolute amount of hydrogen and/or biomethane delivered each year is not appropriate for an end goal of displacing fossil gas demand. Such a target could be met by expanding production of hydrogen and/or biomethane for new end uses. This could be suitable for incentivising growth of new green industries; however, IEEFA understands this is not the intended goal of the issues paper.

iv. Target basis, including whether the target should be based only on distribution-connected sales or include transmission (i.e. Victoria-wide) sales?

A target based on distribution-connected sales is not appropriate, and is inconsistent with the scope of the issues paper.

Most distribution network customers are residential customers, for whom electrification is generally a far more cost-effective option than hydrogen and/or biomethane.

High-priority consumers of hydrogen may not necessarily be connected to regulated networks, particularly if the future of gas networks is uncertain. It is not appropriate to exclude those users from the target.

3.6 Hydrogen sub-target

b. Should there be a renewable hydrogen sub-target in any policy design?

While IEEFA does not support the implementation of a broad-based hydrogen and/or biomethane target, we agree that hydrogen and biomethane should be treated separately in any proposed policy.

This is due to the significant technical and economic differences between the two fuels, which mean they cannot be considered interchangeably. Hydrogen and biomethane both come with their own infrastructure and end-user challenges.

c. Does hydrogen have a greater role in the decarbonisation of the gas network following the announcement of recent Australian and international policies?

Victoria's gas distribution networks primarily serve residential customers, for whom electrification is a far more cost-effective option than hydrogen.

Recent Australian and international policies do not change the fact that hydrogen is likely to have a very limited role in decarbonising gas networks.

Policy goals should be focused on the lowest-cost pathway to decarbonising total energy supply, rather than focusing on decarbonising one section of the energy system such as gas networks, which may have a diminishing role in the future.

3.7 Project eligibility

a. Have we captured all the potential end uses of renewable gases? and b. Have we captured the advantages and disadvantages of broad project eligibility?

A policy that focuses on substituting fossil gas delivered through distribution pipelines is not appropriate, for reasons discussed elsewhere in this response.

91 Percy Street
Warwick, QLD 4370
aus_staff@ieefa.org

Some small industrial loads are connected to current distribution networks, and careful planning is needed to ensure they have a viable supply of energy (electricity, hydrogen or biomethane) if those networks are wound down.

Onsite production and utilisation of renewable hydrogen may represent a least-cost means of delivering hydrogen to some industrial loads, particularly if the role of centralised gas networks is diminished. This is not reflected in the current list of advantages.

Other large industrial loads are directly connected to the transmission network and should not be excluded from any hydrogen and/or biomethane policy.[42]

c. Should any Victorian renewable gas policy allow behind-the-meter, transport and/or electricity firming projects to be eligible?

Any Victorian hydrogen/biomethane policy should allow behind-the-meter projects to be eligible.

Hydrogen may not be economically viable for certain transport end uses such as light vehicles, which are given low emphasis in Australia's current hydrogen strategy.[43] However, consideration should be given to non-road use cases such as aviation and shipping, where hydrogen may form part of the long-term solution.[44]

It is currently unclear whether hydrogen electricity firming is likely to be a cost-effective option, particularly given declining cost trends in utility-scale storage[45], and the declining role of GPG forecast by AEMO[46]. We also note that the $600 million Kurri Kurri gas power plant in New South Wales was approved under the assumption that it would initially run on 30% hydrogen, but is now expected to initially run on 100% fossil gas, given the difficulties in securing a supply of hydrogen.[47] This highlights the importance of reserving hydrogen for high-priority end uses in the coming decade.

3.8 Benefits of a policy mechanism

a. Have we captured the co-benefits of a renewable gas policy mechanism?

i. What is missing or needs to be changed?

There is insufficient evidence that a policy to target an increased supply of hydrogen and/or biomethane would guarantee reduced consumption of fossil gas, and subsequent emissions reductions.

There is insufficient evidence to support the co-benefit "Promotion of sustainable land and water use". It is not clear for example why fertilisers produced using renewable hydrogen would promote more sustainable land and water use than existing fertilisers.

[42] APA. Victorian transmission system – Victorian metering business.
[43] DCCEEW. State of Hydrogen 2022. 2022. Page 4.
[44] Rocky Mountain Institute. Shipping and Aviation Plan to Go to Net Zero. How? October 2021.
[45] CSIRO. GenCost 2022-23: Final report. July 2023. Page 16.
[46] AEMO. National Electricity & Gas Forecasting. Gas Annual Consumption GPG.
[47] AFR. No green hydrogen for Kurri Kurri on start-up: Snowy. November 2022.

91 Percy Street
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aus_staff@ieefa.org

The environmental co-benefit "Reduction in fossil gas resulting in air quality improvements" would not be fully realised for any reductions in fossil gas that are substituted with biomethane. Biomethane is chemically equivalent to fossil gas and will also release pollutants when burned.[48]

The economic co-benefit "Creation of renewable industries that rely on renewable gas as a feedstock production" may be a beneficial outcome. However, it does not contribute to the displacement of current fossil gas consumption and is likely to require a separate policy focus.

The economic co-benefit "Avoided Safeguard Mechanism costs for safeguard entities" is conditional on those entities being able to switch to hydrogen and/or biomethane at a lower cost per tonne of carbon dioxide equivalent (tCO2-e) compared to the costs incurred under the Safeguard Mechanism. This is not guaranteed.

3.9 Barriers to increasing the uptake of renewable gas

a. Have we captured the barriers to increasing the uptake of renewable gas? What is missing or needs to be changed?

The costs associated with upgrading gas infrastructure to support hydrogen are a significant missing barrier. Estimates suggest this could be between 28%[49] and over 100%[50] of the cost of an entirely new network.

Regarding the barrier 'Lack of current cost incentive to switch to renewable gases'; we note a cost incentive does not make economic sense in cases where electrification is a more cost-effective option than hydrogen or biomethane.

With regard to the barrier 'Lack of clear information regarding environmental, health and economic impacts of fossil gas in Victoria', we note a wide body of research on this topic exists by groups including but not limited to Grattan Institute[51], Climate Council[52], Renew[53], ASBEC[54] and Environment Victoria[55]. However, a barrier is that information is not commonly accessible to households.

The barrier 'Perceived high cost of switching from fossil to renewable gas' is not only a social license and community support barrier. Currently, it reflects a real cost barrier (**Figure 1**).

5.2 Interaction with the Commonwealth Safeguard Mechanism

a. Should a Victorian renewable gas target and/or certificate be additional to an Australian Carbon Credits Units?

A Victorian renewable gas target and/or certificate would not be like-for-like with Australian Carbon Credits Units.

[48] Proceedings of the National Academy of Sciences of the United States of America. *Carey, J.* While some tout "renewable natural gas" as a way to mitigate climate change, others see a false solution. July 2023. 120(28).
[49] APGA. Retail renewable gas forecast to cost customers less than retail renewable electricity. Page 1.
[50] Infrastructure Victoria. Towards 2050: gas infrastructure in a net zero emissions economy. December 2021. Page 94
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91 Percy Street
Warwick, QLD 4370
aus_staff@ieefa.org

Certificates issued simply based on a volume of hydrogen and/or biomethane produced could not reliably guarantee that a certain amount of fossil gas was displaced, as opposed to incentivising a new demand for hydrogen and biomethane. Therefore, it may not be possible to price them reliably in $/tCO$_2$-e terms.

Any Victorian certificate scheme should therefore be considered separate to Australian Carbon Credits Units.

b. To what extent would, for current gas distribution companies, the Safeguard Mechanism create an incentive to implement renewable gases?

In their recent Access Arrangements, Victoria's gas distribution networks proposed to pass on any incurred Safeguard Mechanism costs to consumers via a cost pass-through mechanism, which was approved by the AER.[56]

This implies that the Safeguard Mechanism is unlikely to incentivise distribution companies to implement hydrogen or biomethane, as the risks of increased costs are currently borne by customers, not networks.

Unrelated to the Safeguard Mechanism, gas distribution networks have already demonstrated a willingness to implement hydrogen and/or biomethane projects, but only where they are backed by significant public funding such as from ARENA or state governments.[57]

These projects predominantly impact residential consumers, for whom hydrogen and/or biomethane are generally not cost-effective solutions. The use of public funding has allowed for the additional costs of these gases to be absorbed by the networks for the time being.[58]

[56] For example, AER. Final decision: Australian Gas Networks (Victoria & Albury) Gas distribution access arrangement 2023 to 2028. Attachment 10 – Reference tariff variation mechanism. June 2023. Page 6.
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