ACF Community Geelong

Independently organised ACF group

Submission to AEMO

Re Draft 2022 Forecasting Assumptions Update of December 2021

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For
ACF Community Geelong

We thank AEMO for the opportunity to comment on the Update. The matter for consultation we address is:

> "Would a low-emissions gas-focused scenario complement the existing suite of scenarios for use in some or all of AEMO's forecasting and planning publications?"

Introduction

The objective of AEMO scenario modelling is to explore plausible energy futures. As will be discussed in this submission, there is no value in a new fifth scenario that focuses on biogas and green hydrogen.

A fifth scenario is plausible only in a narrow sense of being a potentially feasible way of extending the life of gas pipelines and other gas infrastructure. We can also question whether it is even technically feasible, given how hydrogen leads to embrittlement of certain types of steel pipelines.

Such a scenario is not required to address the needs of consumers and gas industry workers. As electrification is pursued, this should be a focus of government policy and programs.

This fifth scenario does not add value, in fact the reverse. In a broad sense, adopting such a scenario would blunt efforts to decarbonise as rapidly and cheaply as renewable technology is increasingly allowing. It is abundantly clear that such a pathway is not in the public interest.
Given the climate imperative, and rapidly changing government climate and energy policy, AEMO should start a broader more independent review of the gas transmission and distribution issue for reasons that are outlined here. As part of this or separately, we urge you to seek peer review of reports and submissions prepared by or for the gas industry by independent energy experts like Bruce Mountain and Hugh Saddler.

Vision of the gas industry

It is important to understand the gas industry's perspectives and objectives.

In 2017, the industry published its views on energy futures in the

https://www.energynetworks.com.au/projects/gas-vision-2050/

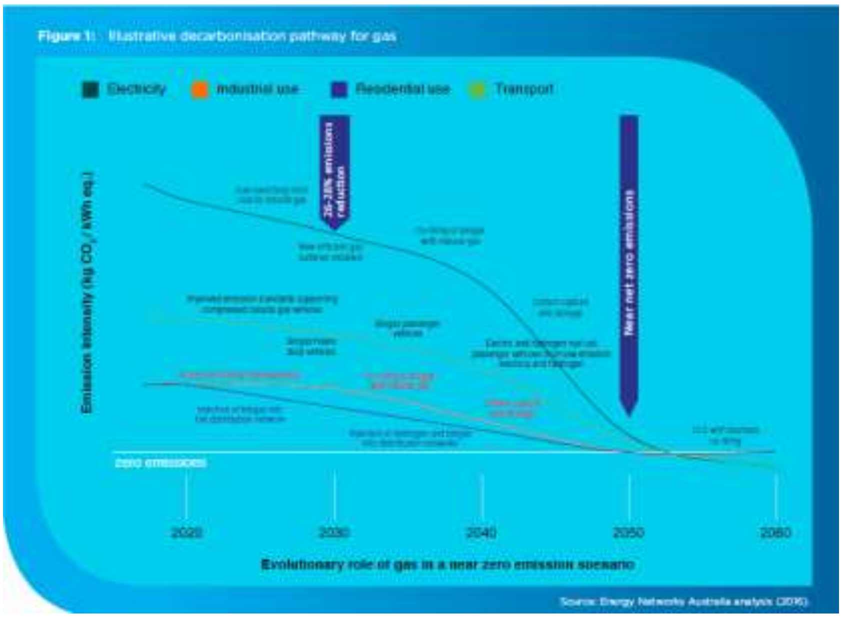
Released in 2020 by a partnership of energy associations

1. Energy Networks Australia (ENA),
2. Australian Gas Infrastructure Trust (AGIT)
3. Australian Pipelines and Gas Association (APGA)
4. Australian Petroleum Production and Exploration Association (APPEA)
5. Gas Appliance Manufacturers Association of Australia (GAMAA)
6. Gas Energy Australia

first version of *Gas Vision 2050*.[1] This report and its 2020 update were endorsed by five gas industry associations. The perceived role of gas out to and beyond 2050 is laid out. Biogas and hydrogen are seen as central to Australia's move towards net zero emissions. The pipeline network will still operate, but over time, emissions will be greatly reduced and in part sequestered.

The industry knows that residential users account for a big proportion of gas use in Australia. The pipeline network is primarily to deliver gas to these users, as well as to business. Here we focus on industry thinking about residential users because much of their gas use is for winter heating, which can be readily reduced through a strong push for energy efficiency and electrification (see later discussion about peak demand reduction).

In the graph from the 2017 *Gas Vision 2050*, the lower blue line highlights the emissions intensity of residential gas use over time. The industry saw the big change out to 2030 as being adding biogas to methane in the gas mix. It seems that the industry expects a drop in in emissions intensity (CO2e/KWh) of roughly 50%, though quantities are not specified. From 2030 to 2040, injecting hydrogen becomes important to reducing emissions intensity.



Source: ENA Gas Vision 2050, as first released in 2017

Although not shown on the line for residential use, the industry clearly sees a major role for carbon capture and storage in reducing emissions associated with burning methane in households.

All three technologies have serious limitations. None are proven to be able to reach significant scale in this decade. Cost-competitiveness is another barrier. The relative cost of other energy sources is dropping dramatically. Until truly green hydrogen is available, production of brown hydrogen will generate large emissions. Carbon capture and storage helps to neutralise emissions from gas produced with 'brown' technology, when other technologies don't produce those emissions in the first place.

The gas industry and the Australian Energy Regulator are worried about the future use of gas infrastructure, how to recover the capital invested but not yet recouped, and avoid the risk of stranded assets.[2] As indicated below, investing in future gas infrastructure is not the pathway forward.

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[1] Available along with the 2020 update and a report on hydrogen at https://www.energynetworks.com.au/projects/gas-vision-2050/. Accessed 29.1.22.

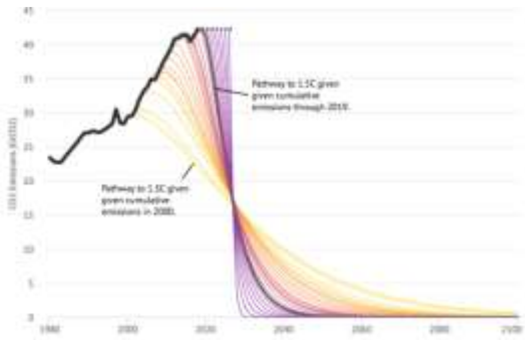
[2] See the AER's 2021 information paper Regulating Gas Pipelines under Uncertainty - https://www.aer.gov.au/news-release/aer-tackles-gas-pipeline-regulation-in-an-uncertain-future, and also documents submitted by APA for its 2023-2027 Access Arrangement for its regulated pipelines in the Victorian Transmission System https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/apa-victorian-transmission-system-access-arrangement-2023%E2%80%9327

1Image: Carbon Brief Nov 2019

Counting emissions

Emissions from such a fifth scenario would be significantly higher than in other scenarios.

For many years, perhaps 20, methane would be the main gas in the mix in our pipelines. Injections of hydrogen and biofuels at scale are many years away. Until green hydrogen is produced at a massive scale, we need to focus on natural gas and the methane emissions it produces.



Reducing emissions is now seen globally as imperative if global warming is to be kept below 2.0° and at least close to the target of 1.5°. So it is important to address the impacts of emissions in the next 20 years.

The relative contribution of each unit of methane compared to CO^2 is staggering, as shown in the following figure.

Comparative effect of methane and CO2 emissions over 20 years

Picture the effect over 2030 – 2050 of another 10 years of emissions

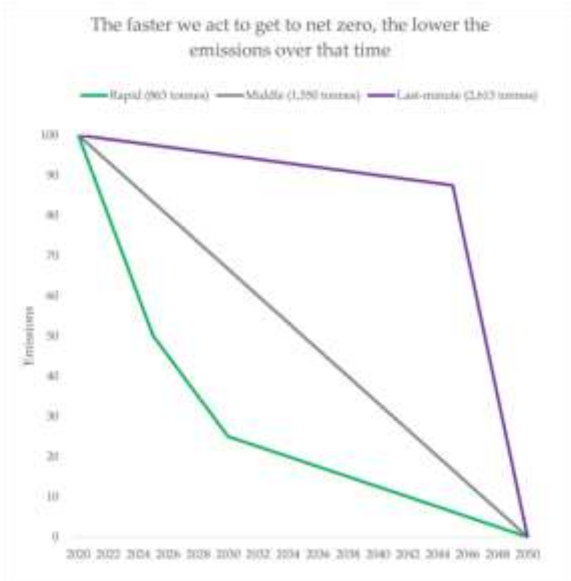
Source: author, based on Myhre, G. et al., 2013 as cited in Carbon Brief 'Scientists concerned by 'record high' global methane emissions' *Carbon Brief* 14.7.2020.

Emissions to be counted include Scope 3 emissions, as well as Scope 1 & 2 emissions. Scope 3 emissions are increasingly relevant in an era when medium-term competitive forces and government policy are leading away from fossil fuels. Research is increasingly showing that Scope 1 & 2 emissions are much higher than previously thought – these emissions occur during production of the gas, deliberate flaring, and leaks in the system.

The emissions contribution is even higher if we account for fossil fuel used in

- production and regasification of LNG,
- production of biofuels and hydrogen.

Finally, emissions are cumulative. Each year of fossil fuel use contributes to growth in atmospheric pollution, and counters efforts to bring down overall emissions. This figure by Ketan Joshi starkly captures the choices that we have.



Source: Ketan Joshi

Modelling demand reduction in gas use

Huge potential of Peak Demand Reduction

It is winter gas use that drives the sizing of much of the gas infrastructure. Peak demand reduction has huge potential, and should be modelled seriously. The reduction is unlikely to be achieved through market forces alone. A point reinforced by NSW government initiatives on electricity (see below), and by the importance that the Victorian government places on its Victorian Energy Upgrades initiative.

The peak demand for residential gas use is primarily associated with winter heating of old leaky houses with old, leaky and inefficient ducted heating.

Big reductions in demand could be achieved in two ways.

Firstly, by targeted at the small proportion of residential users who use significantly more gas than others. Alan Pears says 5% of users accounted for 15% of residential gas use in one survey (see his submission to the Gas Infrastructure 2050 inquiry.[3] Can we project that 20% of residences are responsible for 40% of residential gas use? The gas distribution companies have this information.

Secondly, by targeting days of peak demand. Using AEMO data, we have identified days where winter gas use exceeds 1000 TJ per day. Looking back over recent years, there are only 20-30 days a year.[4] Such days can put stress on the supply system, particularly when there are consecutive days of over 1,000TJ per day.

While the specifics are not directly relevant to gas, the NSW government has embarked on a mission to greatly reduce electricity demand. This is in anticipation of coal-fired generation winding down, and increasing demand for electricity to run electric vehicles. AEMO is incorporating this direction into its scenario modelling for electricity.

Whether or not requested by governments, AEMO could be doing similar modelling for reduction of peak demand for gas. This is a critical task for three reasons.

Firstly, residential gas use is ‘optional’ in the sense that there are clear alternatives to heating old leaky houses with old, leaky and inefficient ducted heating. There are fewer immediate alternatives for industry that relies on a steady flow of gas throughout the year.

Secondly, modelling reductions in peak residential use is also important so policy makers and AEMO managers can be clearer about availability of gas for Gas-Powered Generation – if it is really needed into the future to complement other sources as coal-fired power winds down.

Finally, modelling demand reduction in a much stronger way is also critical to determining whether new supply options and augmentation of infrastructure are really needed. Our analyses, which we can discuss with you, show that they are not, contrary to the views of the ACCC, AER and AEMO. Authorities like Rod Sims from the ACCC have focused unrelentingly on supply issues for the last five years, with little attention to demand as the other side of the supply-demand equation. In Victoria,

[3] AEMO may benefit by following up Infrastructure Victoria’s research into likely gas infrastructure costs
[4] Our spreadsheets are available to AEMO on request.

there was a strong focus on demand management by the Gas & Fuel Corporation until at least the late 1980s, which was lost during its privatisation (Alan Pears pers. comm.). The focus on demand was related to the Bass Strait resource having a finite life.

We argue that demand reduction and proactive management of the Bass Strait supply to cover Victoria's needs during the transition to electrification are crucial to avoid "locking in" the state into gas and to rapidly reduce emissions.

Modelling other reductions in residential use of gas

Separating out different types of gas use is important in order to set priorities and pathways to end gas use. Some modelling of reductions that could be targeted over 10 years has been done by Northmore Gordon (2019) for Environment Victoria.

After space heating, the largest residential use of gas is for hot water heating. In Victoria it accounts for about 30% of residential gas use. Modelling possible reductions in gas use for this purpose is important. Policy initiatives to shift households to using heat pumps to generate hot water are increasingly likely. Heat pumps for this purpose are growing in use. Hot water services have an average life of 10-12 years, creating an opportunity to influence the replacement choice. By 2035, nearly every hot water service (HWS) in Australia will be replaced. In 2014, ABS found an estimated 3,388,300 HWS in Australia running on mains gas, and another 387,900 running on LPG/bottled gas.[5]

Other residential uses of methane are less consequential, and are not as critical for modelling demand reductions as space heating and hot water. These include cooking with gas indoors and heating outdoor swimming pools. There are also portable devices - gas barbeques and 'pavement heaters' for outdoor living areas.

Hydrogen in our pipelines

Technical feasibility of hydrogen in our pipeline network

Any modelling of gas futures needs to account for which parts of the pipeline network can carry hydrogen. Yes, there are examples of 100% hydrogen being carried in pipelines in Australia, but not at scale or across a whole network.

APA owns the high-pressure Victorian Transmission System (VTS) that supplies gas to the spaghetti-like distribution system that brings gas direct to homes and businesses. APA is proposing a $30 million to investigate the suitability of its pipelines in the Victorian Transmission System (VTS) to carry hydrogen. APA is seeking agreement from the AER for this investment as part of its 2023-2027 Access Arrangement.

The proposed hydrogen evaluation and relevant issues are outlined in the relevant document 'Business Case 200 – Hydrogen Safety and Integrity' in the documents that APA has filed with the AER.[6] In this document, APA makes clear that only some of its steel pipelines in the VTS are suitable

[5] ABS (2014) found that 75% of Melbourne households relied on gas for hot water, as did over 60% of households in Adelaide and Perth and 46% in the ACT, falling to 35% in Sydney and 13% in Brisbane. In regional Victoria, 45% were estimated to use mains gas, and 7% used LPG/bottled gas.

[6] The document itself is titled in 'Evaluating and Mitigating Hydrogen Safety and Integrity Risks on the VTS'. https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/apa-victorian-transmission-system-access-arrangement-2023%E2%80%9327/proposal

for hydrogen. APA states that embrittlement of its other pipes could occur even with a gas mix that included just 10% hydrogen. APA also expresses concern about leakage of hydrogen from one part of the network to another, and acknowledges concern from stakeholders about implications for tariffs.

Doris Engineering in its report commissioned as the part of Gas Infrastructure 2050 inquiry highlights another issue. Hydrogen is lighter that methane – and delivery of the same volume of gas would require much higher pressure or larger pipes.

If the fifth scenario is adopted, the economic cost of including hydrogen in our pipelines should also be modelled for comparison with alternatives. The cost is potentially huge.

Green hydrogen

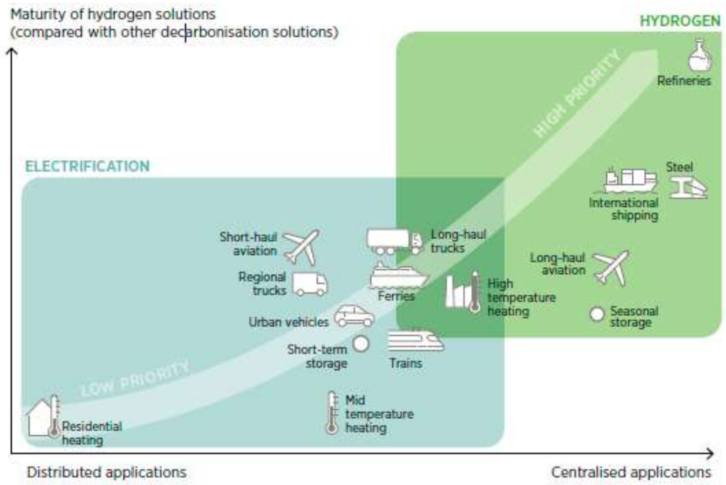
Development of green hydrogen is in its infancy. By the time it is available in quantity, its delivery to households and businesses via existing pipelines will not be economic by comparison to the alternative of electrification. Reasons include:

- rapidly falling costs of renewable energy [7]
- prices for gas now about $8/GJ compared to $2.50GJ before exports began from the east coast gas market.
- energy losses in producing green hydrogen including 30-35% in electrolysis and 13-25% in liquefying or converting to ammonia.[8]
- Greater heat produced per unit of energy input using electricity. Gas and hydrogen can produce about 0.9 kWh from 1.0 kWh energy equivalent. Heat pump technology has advanced and can now produce roughly 4kWh of heat from 1 kWh of electricity (a COP of 4.0).

We focus here on Victoria, which has the most extensive network of pipelines distributing gas to small business and households.

This graph from IRENA captures the very low priority that should be given to delivery of hydrogen for residential heating. Availability of gas from Bass Strait led Victoria to rely heavily on gas for residential heating, more so than other states. In Victoria, consumption of gas is three times as high in winter as in summer.

Figure S.3 Clean hydrogen policy priorities



Source: Irena 2022 Geopolitics of the Energy Transformation: The Hydrogen Factor. [9]

[7] IRENA cites "steadily improving technologies, economies of scale, competitive supply chains and improving developer experience. Costs for electricity from utility-scale solar photovoltaics (PV) fell 85% between 2010 and 2020." https://www.irena.org/publications/2021/Jun/Renewable-Power-Costs-in-2020
[8] See information from the World Economic Forum https://www.weforum.org/agenda/2021/06/4-technologies-accelerating-green-hydrogen-revolution/
[9] https://www.irena.org/publications/2022/Jan/Geopolitics-of-the-Energy-Transformation-Hydrogen

Conclusion

There are compelling reasons to reject a fifth scenario focused on gas. It does not reflect a realistic future for Australia.

The risk of stranded assets is real. This should not be handled by creating a scenario that implies a long-term future for gas. It should be dealt with in separate processes, such as the Australian Energy Regulator.

It is crucial that there be independent peer review of any proposals that would mean an extended life of gas infrastructure. AEMO should recognise the efforts of state governments to reduce energy demand. In this spirit, AEMO should review its long-standing support for projects like the Western Outer Ring Mains in Victoria, and put its weight into investigating alternatives centred on demand reduction.

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