30 November 2022

Submission: Australia's transition to a green energy superpower

The Australian Pipelines and Gas Association (APGA) represents the owners, operators, designers, constructors and service providers of Australia's pipeline infrastructure, connecting natural and renewable gas production to demand centres in cities and other locations across Australia. Offering a wide range of services to gas users, retailers and producers, APGA members ensure the safe and reliable delivery of 28 per cent of the end-use energy consumed in Australia and are at the forefront of Australia's renewable gas industry, helping achieve net-zero as quickly and affordably as possible.

APGA welcomes the opportunity to contribute to the Joint Standing Committee on Trade and Investment Growth's Inquiry into Australia's transition to a green energy superpower and highlight the role that pipeline infrastructure can play in securing this transition.

APGA supports a net zero emission future for Australia by 2050[1]. Renewable gases represent a real, technically viable approach to lowest-cost energy decarbonisation in Australia. As set out in Gas Vision 2050[2], APGA sees renewable gases such as hydrogen and biomethane playing a critical role in decarbonising gas use for both wholesale and retail customers. APGA is the largest industry contributor to the Future Fuels CRC, which has over 80 research projects dedicated to leveraging the value of Australia's gas infrastructure to deliver decarbonised energy to homes, businesses, and industry.

Scale of gas

Gas is fundamental to the Australian economy today. Gas use accounted for 24 per cent of Australia's final energy consumption in FY2020-21 with an additional 4 per cent being supplied by gas power generation[3]. Gas infrastructure transports more energy than electricity infrastructure and provides around 2.3TWh of energy storage capacity.

---

[1] APGA Climate Statement, available at https://www.apga.org.au/apga-climate-statement

[2] APGA, 2020, *Gas Vision 2050: Delivering a clean energy future*, available at https://www.apga.org.au/sites/default/files/uploaded-content/website-content/gasinnovation_04.pdf

[3] Department of Climate Change, Energy, the Environment and Water, 2022, Australian Energy Statistics 2022 https://www.energy.gov.au/publications/australian-energy-update-2022

As seen in Figure 1, gaseous energy is versatile, and used in a range of sectors of the Australian economy. Across these sectors, gaseous energy is able to be used as thermal energy or motive force through combustion, or as an industrial feedstock for use in chemical processes. Gaseous energy is both energy dense and compressible, making it a simple, flexible and economically efficient form of energy to move, storage and handle.

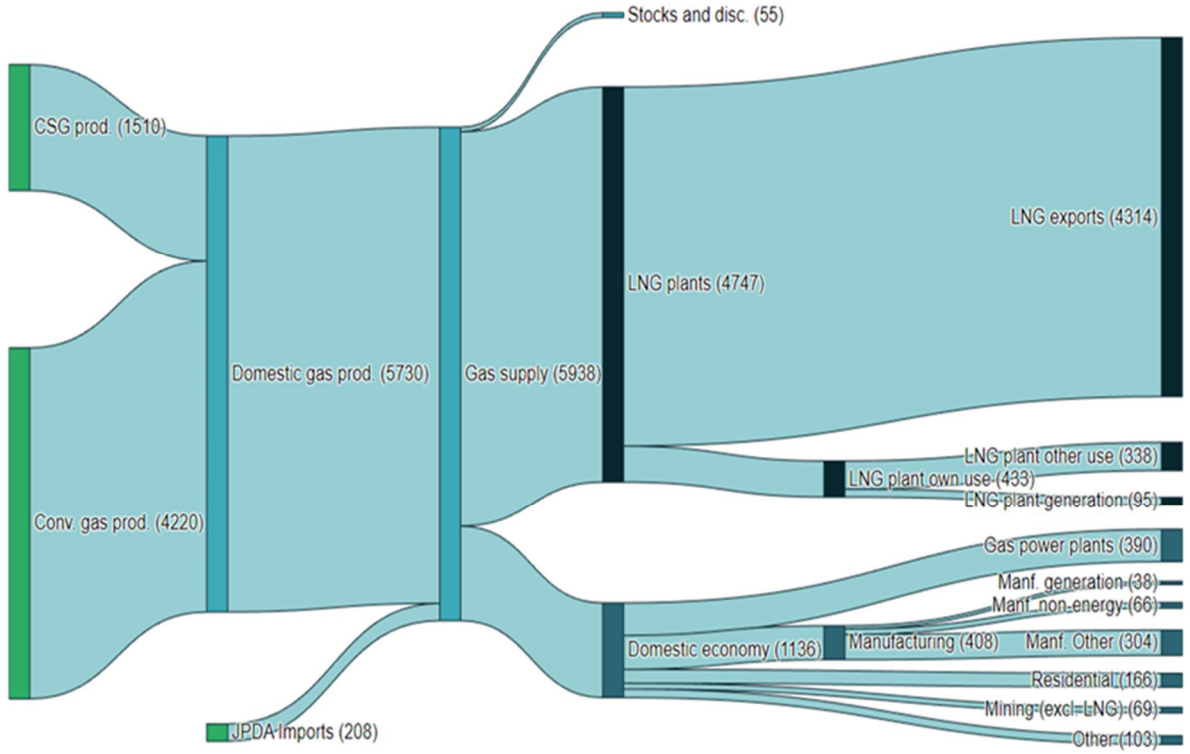

Figure 1. Australian gas flows 2020-21. *Source: Department of Climate Change, Energy, the Environment and Water, 2022, Australian Energy Statistics*

When considering energy decarbonisation and Australia's opportunities as a green energy superpower, opportunities stretch beyond energy export. The gaseous energy supply chain represents a highly integrated energy supply chain, which is capable of delivering more energy to domestic customers than the electricity supply chain of today. This makes the gaseous energy supply chain a valuable asset in Australia's transition to a green energy superpower, in particular if natural gas is able to be substituted by a zero-emission alternative to natural gas.

Renewable gases represent a zero-emission alternative to natural gas

Use of renewable gases such as green hydrogen and biomethane in thermal and chemical processes does not contribute carbon emissions. Biomethane and other renewable forms of methane behave exactly the same as natural gas once produced where hydrogen behaves similarly, requiring some modification to supply chains and customer appliances. The development of an Australian renewable gas supply chain, operating alongside Australia's renewable electricity supply chain, can help optimise Australia's renewable energy transition both domestically and as a global energy export superpower.

Green hydrogen is produced through electrolysis, using renewable electricity to split water molecules into hydrogen and oxygen. This hydrogen can then be combusted similarly to

natural gas today without producing carbon emissions. CSIRO projects hydrogen production costs between $1.40 and $2.30 per kilogram (between $9.86 and $16.20 per gigajoule) by 2030, bringing wholesale hydrogen prices into proximity of natural gas prices across the past decade.[4] For more information on the opportunity to produce hydrogen in Australia, APGA refers to the expertise of the Australian Hydrogen Council.

Biomethane is produced through upgrading biogas (or land fill gas) to comply with natural gas quality specification. In turn, biogas is predominantly produced through the anerobic digestion of biomass. Australia's national bioenergy roadmap projects sufficient sustainable biogas feedstock to provide around 50 per cent of Australia's current domestic gas demand. Analysis by the Future Fuels CRC indicates a current biomethane production cost range of between $15 and $29 per gigajoule.[5]

These and other renewable gas technologies are being actively developed domestically and internationally. Australian residential customers in three suburbs are using blends of hydrogen and natural gas today, and Sydney residents will be using a blend of biomethane in the near future. The European Union is in the process of capitalising upon the opportunity of renewable gas uplift with combined targets amounting to 22 per cent total gas demand being supplied by renewable gases by 2030.

Australia can capitalise on this opportunity through renewable gas exports, but also through domestic renewable gas uptake. This is especially true if renewable gas supply chains are able to deliver cost competitive renewable energy outcomes for Australian energy customers.

Cost competitiveness of renewable gas supply chains

Research on renewable gas supply chain components in Australia is indicating that renewable gas supply chains are likely cost competitive with renewable electricity supply chains in a net zero energy future. This possibility was first indicated in the 2018 Frontier Economics report *The benefits of gas infrastructure to decarbonise Australia* which indicated that gas use decarbonisation through 100 per cent green hydrogen uptake would cost less than through 100 per cent electrification of gas demand,[6]

Wholesale energy cost

While renewable electricity supply chains may be more energy efficient, research indicates that each piece of renewable gas supply chains could be more economically efficient especially when all components are considered together. As seen through the solar PV production revolution, the most energy efficient solution is not necessarily the most economically efficient solution.

As mentioned above, wholesale biomethane costs today range between $15 and $29 per gigajoule, and wholesale hydrogen cost projections for 2030 are in the range of $10 to $16

[4] CSIRO, 2021, A *Perspective on Hydrogen Investment, Deployment and Cost Competitiveness*, https://hydrogencouncil.com/en/hydrogen-insights-2021/
[5] Please engage with Future Fuels CRC to access CRC research, https://www.futurefuelscrc.com/
[6] Frontier Economics, 2020, *The benefits of gas infrastructure to decarbonise Australia*, https://www.apga.org.au/sites/default/files/uploaded-content/field_f_content_file/frontier-2020-decarbonise-australia_0.pdf

per gigajoule. While greater than natural gas costs today, it is more appropriate to compare these costs to net zero electricity. These renewable gas prices equate to $54 to $104 per megawatt hour for biomethane today and $36 to $58 per megawatt hour for hydrogen in 2030.Comparing these to the wholesale net zero electricity cost projections by the CSIRO or The Grattan Institute ($75 and $100 per megawatt hour respectively[7,8]) demonstrates the relative wholesale net zero energy cost competitiveness of renewable gases.

Infrastructure cost

Currently in Victoria, gas infrastructure delivers more energy at lower cost, lower emissions intensity and greater reliability than Victoria's electricity infrastructure, as advised by the APGA (Figure 2) in a submission to the Victorian Gas Substitution Roadmap.[9] In 2019 Victorian gas infrastructure delivered 56% more energy than electricity infrastructure and supplied a peak energy demand of 268% that supplied by electricity infrastructure, at a cost of six times less to deliver each unit of energy.

Transmission and Distribution Infrastructure	Regulated Asset Base ($m)	Actual Annual Revenues ($m)	Actual Energy Delivered (GWh)	Max Demand Capacity (MW)
Electricity	17,329	2,825	41,480	8,684
Gas	5,631	774	64,722	23,250

Figure 2. Costs and deliveries of Victoria's energy infrastructure (2019). *Source: Australian Pipelines and Gas Association, 2021, APGA Submission: Victorian Gas Substitution Roadmap Consultation Paper*

This trend of gas infrastructure costing customers less than electricity infrastructure is set to continue. To demonstrate this, APGA engaged GPA Engineering to deliver the *Pipelines vs Powerlines* study in 2022[10]. This study demonstrated that pipelines provide lower cost energy transport and storage in comparison to powerlines and other forms of electricity energy storage. Pipelines are considerably cheaper than powerlines to build, and existing pipelines can be repurposed to carry hydrogen or hydrogen blends (note: no modification is required for biomethane).

---

[7] CSIRO, 2022, *GenCost 2021-22 Final Report* https://publications.csiro.au/publications/publication/PIcsiro:EP2022-2576

[8] The Grattan Institute, 2021, *Go for Net Zero* https://grattan.edu.au/wp-content/uploads/2021/04/Go-for-net-zero-Grattan-Report.pdf

[9] See Table 1 and 2, APGA 2021, *Submission to the Victorian Gas Substitution Roadmap*, https://www.apga.org.au/sites/default/files/uploaded-content/field_f_content_file/210816_apga_submission_to_the_victorian_gas_substitution_roadmap_consultation_paper.pdf; also AER 2019 operational reports for electricity and gas and AEMO's various energy demand reports.

[10] Australian Pipelines and Gas Association, 2022, *Pipelines vs Powerlines: A Summary,* https://www.apga.org.au/sites/default/files/uploaded-content/field_f_content_file/pipelines_vs_powerlines_-_a_summary.pdf
GPA Engineering, 2022, *Pipelines vs Powerlines*: *A Technoeconomic Analysis in the Australian Context,* https://www.apga.org.au/sites/default/files/uploaded-content/field_f_content_file/pipelines_vs_powerlines_-_a_technoeconomic_analysis_in_the_australian_context.pdf

Appliance cost

Gas appliances are also cheaper than electric heat pump appliances. This is especially true for households which use gas today. The cost of converting from gas to electricity includes a range of rectification costs which don't apply to converting to hydrogen appliances or simply replacing with natural gas appliances which can consume biomethane.

A 2022 report by Frontier Economics report confirmed this, identifying combined costs of electrifying heating in a free-standing Victorian home running from around $13,000 to $41,500, compared to conversion costs for hydrogen appliances of around $10,500 - $15,500.

Combined impact

APGA anticipates that the combined impact of the above three economic efficiencies will result in renewable gas supply chains being cost competitive with renewable electricity supply chains in a net zero future. If renewable electricity and renewable gas supply chains are cost competitive, then both pathways must be pursued in parallel to ensure Australia's least cost, most rapid transition to a renewable energy superpower.

Opportunities of Australia's renewable gases industry

These factors combined mean renewable gases present a tremendous opportunity for the Australian economy, over and above its cost-effectiveness as a zero-emissions energy source.

In electricity

The direct use of renewable gases means increasingly constrained renewable electricity development supply chains can focus on delivering upon electricity sector decarbonisation. Renewable gas power generation, combined with low-cost pipeline transport and storage, can help here too by initially supplementing and ultimately supplanting natural gas power generation in a net zero energy future. Through both of these means, renewable gases can go beyond providing export revenue for the nation by supporting a least cost renewable energy transition domestically.

In industry

Renewable gases can support commercial and industrial gas users currently reliant on natural gas. Where switching to electrification for heat generation is not practical, or where gas is a critical industrial feedstock, renewable gases are key to the energy transition.

In transport

The opportunity for transport decarbonisation through hydrogen vehicle uptake has been well documented within the National Electric Vehicles Strategy. APGA provided a submission to this strategy, noting that hydrogen electric vehicles can play a valuable role in the future of long-distance haulage and private vehicles in rural areas.[11] Hydrogen electric vehicles have considerable use cases, as they are lighter in weight, have greater range and

[11] Australian Pipelines and Gas Association, 2022, *APGA Submission: National Electric Vehicle Strategy Consultation*, https://www.apga.org.au/sites/default/files/uploaded-content/field_f_content_file/221031_apga_submission_to_national_electric_vehicle_strategy_consultation.pdf

faster refuelling capabilities than equivalent battery electric vehicles. In support of hydrogen vehicles, APGA's submission demonstrated the value of hydrogen pipelines to supply hydrogen refuelling stations.[11]

In the home

Renewable gases can also play a valuable role in providing net zero energy for residential heating and cooking. While heat pumps are highly efficiency, they are also costly in both appliance and home retrofit costs as noted above. "Cooking with gas" is still a preference for many domestic and commercial cooks. In addition to biomethane being able to replace natural gas without the need for new equipment, there is considerable development in hydrogen-ready appliances underway internationally. More cost competitive options for gas use decarbonisation in the home must ultimately deliver upon Australia's renewable energy superpower ambitions.

Renewable gas leaders domestically and abroad

Australian Gas Infrastructure Group, Jemena, APA Group and ATCO each operate independent renewable gas injection trials delivering renewable gas blends to Australian gas customers today. These trials represent the leading edge of renewable gas ambition in Australia, developed to demonstrate technical capability and lead the way for future renewable gas producers.

Consultation on renewable gas targets have been undertaken in New South Wales and Western Australia, with more rumoured to be on the way. Tasmania is also leading as a state, with Tasmania's Draft *Future Gas Strategy* demonstrating what a phased transition from natural gas to renewable gases in the economy might look like (Figure 3).

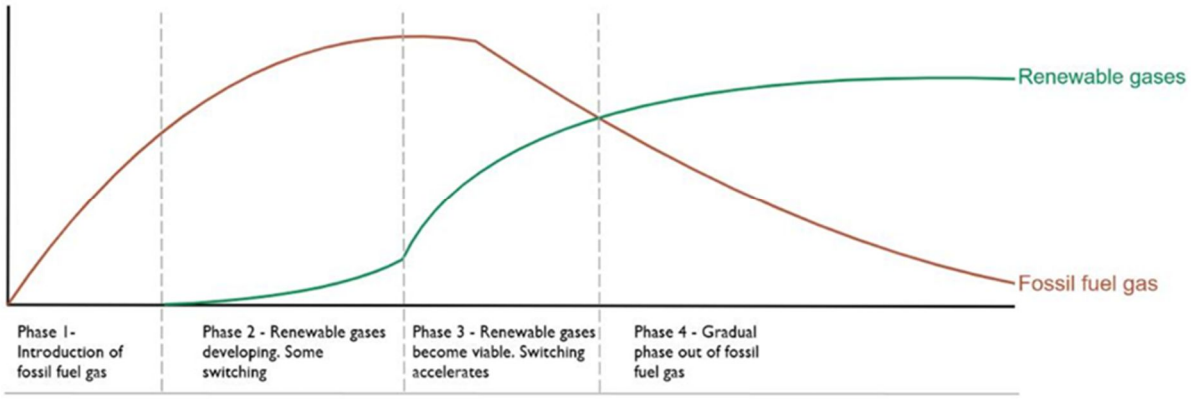

Figure 3. Phased gas transition in Tasmania. *Source: Tasmanian Department of State Growth, 2022, Draft Future Gas Strategy*

Finally, the Australian Renewable Energy Agency (ARENA) has been leading energy export market development, flagging renewable gases are recognised as a key future energy export. ARENA estimated in 2018 that Australia would be in a good position to competitively supply renewable gas import markets in Singapore, Japan, China and South Korea by 2025.[12]

[12] ACIL Allen, 2018, *Opportunities for Australian Hydrogen Exports*, commissioned by ARENA, https://arena.gov.au/assets/2018/08/opportunities-for-australia-from-hydrogen-exports.pdf

Australian Government support for renewable gases

Australia must focus on renewable gas uplift in both the domestic and export contexts in order to transition to a green energy superpower. In the same way the renewable electricity industry required Federal Government intervention to mature commercially, so will the domestic renewable gas market.

Much of the work in preparing for a renewable gas economy is occurring at the state and territory level. Beyond state investigation into renewable gas targets, state hydrogen and biomethane strategies, and numerous initiatives such as hydrogen hubs[13] and hydrogen[14] and biomethane[15] pilot projects are all in development. Other initiatives, such as renewable gas electricity generation targets[16] aim to both bolster the market in its early stages and provide the necessary legislative frameworks. While APGA is glad to see state and territory ambition, it notes that national consistency will support more effective outcomes nationally.

APGA proposes three key focus areas for government policy to deliver a renewable gas supply chain which supports Australia's transition to a renewable energy superpower.

Support of renewable gases to deliver a second renewable energy supply chain for Australia

APGA recommends the Federal Government support parallel renewable energy pathways in renewable electricity and renewable gases, and ensure existing emissions frameworks do not disincentivise the contribution of renewable gases:

- A national Renewable Gas Target, similar in form to the Renewable Energy Target
- Base a national Renewable Gas Target upon a Renewable Gas Certification scheme, similar to the Large Generation Certification scheme
- Reform the National Greenhouse Emissions Reduction Scheme to recognise renewable gas and renewable electricity certificates in reporting zero emission energy use
- Reform the Emissions Reduction Fund to enable capture of all emissions-reduction opportunities
- Investigate a step change in gas appliance regulation to mandate all gas appliances sold in Australia exceed a 5 Star energy rating and are hydrogen-ready by 2026.

Investigate a medium-term solution to high east coast gas prices

To address the current natural gas price issues in the medium term, investment is required to produce the additional supply necessary to decouple the east coast gas market from

[13] CSIRO 2022, *HyResource: Regional Hydrogen Hubs Program*, https://research.csiro.au/hyresource/regional-hydrogen-hubs-program/
[14] Australian Gas Infrastructure Group, 2022, *Hydrogen Park South Australia*, https://www.agig.com.au/hydrogen-park-south-australia
[15] Jemena, 2022, *Malabar Biomethane Project,* https://jemena.com.au/about/innovation/malabar-biomethane-project
[16] Energy Policy Western Australia, 2022, *A renewable hydrogen target for WA,* https://www.wa.gov.au/government/document-collections/renewable-hydrogen-target-western-australia

international prices; there is opportunity for renewable gas production to be a significant part of this supply uplift.

- Federal Government should investigate ways of facilitating increased natural gas and renewable gas production in order to address shortness of supply in the east coast gas market.

Support electric vehicles (EVs), including fuel cell electric vehicles (FCEVs), through refuelling infrastructure uplift

Both electricity transmission and hydrogen pipeline infrastructure can be used to support development of battery EVs and FCEV refuelling. Optimised refuelling infrastructure will support least cost vehicle decarbonisation for Australia but will require:

- The Federal Government to support refuelling infrastructure for battery EVs and FCEVs through energy transport and storage infrastructure development.

APGA would be pleased to provide additional detail on any of the above proposals and how the gas industry can support Australia's transition to a green energy superpower. To discuss any of the above feedback further, please contact me on +61 422 057 856 or jmccollum@apga.org.au.

Yours sincerely,

JORDAN MCCOLLUM
National Policy Manager
Australian Pipelines and Gas Association