

2 August 2021

Gas Task Force

Department of Industry, Science, Energy and Resources

Via: <https://consult.industry.gov.au/>

The role of gas infrastructure to decarbonise the economy

Energy Networks Australia is the national industry body representing Australia's electricity transmission and distribution and gas distribution networks. Our members provide more than 16 million electricity and gas connections to almost every home and business across Australia.

To date, the focus of decarbonisation has been on the electricity sector, but gas networks are on their own decarbonisation journey. Customers tell us that they are seeking a clean energy future and are engaged in achieving emission reductions from gas use. New renewable fuels, such as hydrogen and biomethane, have the potential to become mainstream and complementary energy solutions that will use existing energy infrastructure. Our gas networks businesses are leading the development of renewable gas projects and blending renewable hydrogen in the Adelaide and Sydney gas distribution networks, with further projects under development for Victoria, Western Australia and Queensland.

Key Points

- 1. Gas infrastructure is essential to deliver lowest cost decarbonisation.** Decarbonising the end use of gas can be achieved by using gas infrastructure at half the cost of electrifying those end uses of gas.
- 2. Pipelines deliver more energy at lower cost.** Natural gas pipelines are generally characterised by being able to deliver higher volumes of energy (on a unit cost basis) compared to high voltage electricity lines. This advantage needs to be confirmed for renewable gases.
- 3. Pipelines need to connect renewable gas sources.** Renewable gas sources are likely to occur in different geographical regions of existing natural gas pipelines so new connections into existing pipelines or new pipelines will be required to deliver this renewable gas to customers.
- 4. Pipeline materials and capacity needs to be confirmed.** Hydrogen has the potential to reduce the design life of steel pipelines developed for natural gas. Individual pipeline owners are best equipped to validate the role of their assets to supply renewable gases.
- 5. Market development is needed.** A renewable and decarbonised gas market will be key to enabling the development of green gas uptake through gas networks and pipelines

Gas Vision 2050

Australia's gas industry associations have developed Gas Vision 2050, the industry's response to the Paris agreement on climate change. The vision outlines how transformational technologies will be deployed to reach net-zero emissions from using gaseous fuels in Australia.

The technologies include:

- » Hydrogen,
- » Biomethane,
- » Renewable methane, and
- » Carbon Capture and Storage (CCS).

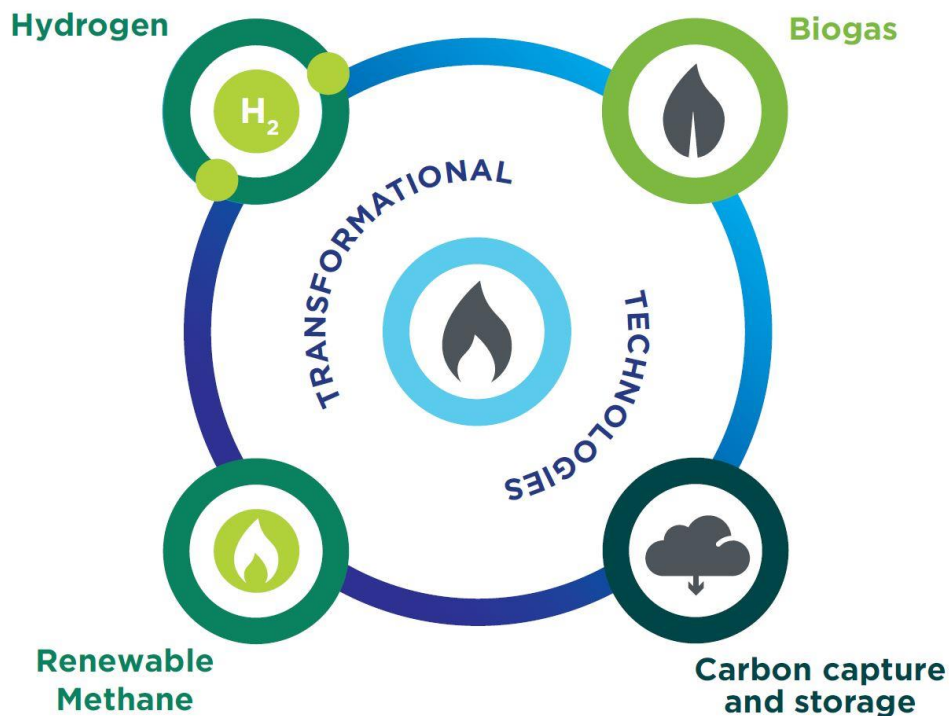


Figure 1: Transformational technologies (Source: Gas Vision 2050)

Gas infrastructure – both transmission pipelines and distribution networks will be essential to be able to deliver these fuels to customer. The cost of decarbonising the gas sector using the above technologies was found to be half that compared to electrifying the end use of gas.

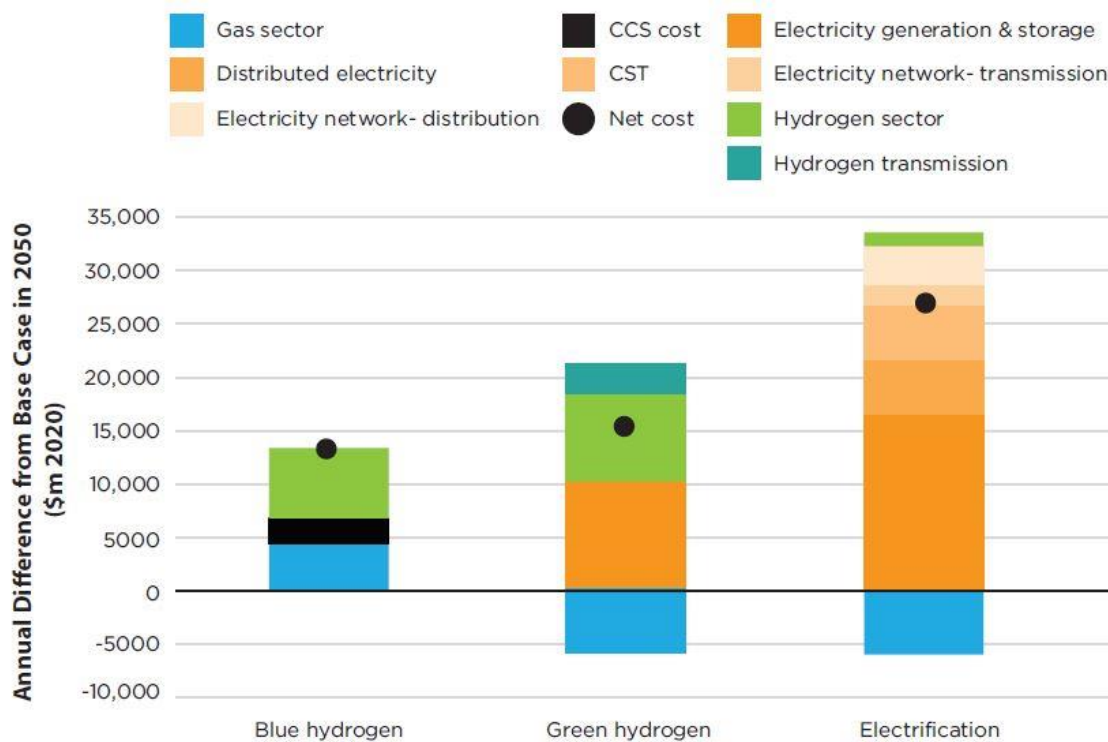


Figure 2: Cost of decarbonising the gas sector (Source: Frontier Economics (2020), *The benefits of gas infrastructure to decarbonise Australia*)

Gas distribution network businesses are currently leading the demonstration of renewable gases, including hydrogen and biomethane. The initial projects¹ are based in metropolitan areas, relatively small scale and directly connected to the gas distribution networks. These projects are demonstrating renewable gas technology, engaging customer and working with regulators.

As larger volumes of renewable gases are produced, the roles of transmission pipelines will become important to move large volumes of renewable gas, access gas storage facilities and provide in-line storage, known as line pack.

The role of high pressure pipelines and high voltage electricity lines

Natural gas pipelines delivered 1,555 PJ of primary energy in 2017/18 with 39 per cent of this used for power generation and the remaining 943 PJ as direct end-use².

Australia's high voltage electricity transmission provides 835 PJ of electricity. The current relationship between gas and electricity infrastructure is limited to providing natural gas for power generation.

¹ For example, Australian Gas Networks Hydrogen Park SA project in Adelaide, or Jemena's Western Sydney Green Gas Project.

² Gas Vision 2050

As Australia moves towards renewable gases, especially hydrogen, the relationship between the gas and electricity sectors becomes more complicated. Renewable hydrogen needs electricity to be produced via electrolysis. This electrolysis can either be powered via grid electricity or via dedicated renewable electricity generation. If grid connected, the electrolysis plant can be switched on and off (within reason) to help manage the electricity demand on the grid. If the electrolyser is linked to a dedicated renewable electricity site, the produced hydrogen will be transported to the end used via pipelines.

In either case, the delivery means – via high voltage transmission lines or high-pressure transmission pipelines – needs to be considered on its own merits. While it is readily accepted that natural gas pipelines are able to transport more energy at a lower capital and operating cost compared to high voltage transmission lines, this needs to be tested for hydrogen, where water also may need to be transported. The role of storage within pipelines will be important.

The cost differential between grid supplied electricity and that from a direct connection, as well as the utilisation of the electrolyser will also impact on the decision on the best way to deliver that energy from its source to the demand centre.

Suitability of pipeline locations

Existing gas transmission pipelines connect natural gas basins to customers. It is likely that the source of renewable gases does not coincide with existing natural gas basins. For example, most of Victoria's natural gas comes from the offshore Gippsland basin in offshore Eastern Victoria. On the other hand, the renewable energy zones, which are likely contenders for hydrogen production are located in the north west of the state.

The National Gas Infrastructure Plan could identify the potential of pipeline suitability to deliver renewable gases from the identified Renewable Energy Zones (see figure 3).

Suitability of pipeline materials

Australia's National Hydrogen Strategy outlines 57 strategic actions to support the development of Australia's hydrogen economy. Action 3.15 states:

Agree to not support the blending of hydrogen in existing gas transmission networks until such time as further evidence emerges that hydrogen embrittlement issues can be safely addressed. Options for setting and allowing for ongoing updates of safe limits for hydrogen blending in transmission networks will form part of the review in 2020.

This has resulted in claims that transmission pipelines are unsuitable to carry hydrogen, which is in fact not the case. Natural gas pipelines have been designed according to Australian Standards. Converting these pipelines to hydrogen would require a re-evaluation of the carrying capacity of that pipeline and would need to consider the potential of hydrogen embrittlement that may potentially reduce the operating pressure or the lifetime of the pipelines. Individual pipeline owners are best equipped to validate the role of their assets to supply renewable gases. Future Fuels

CRC has a dedicated research program to better understand the impacts of future fuels on gas transmission infrastructure.

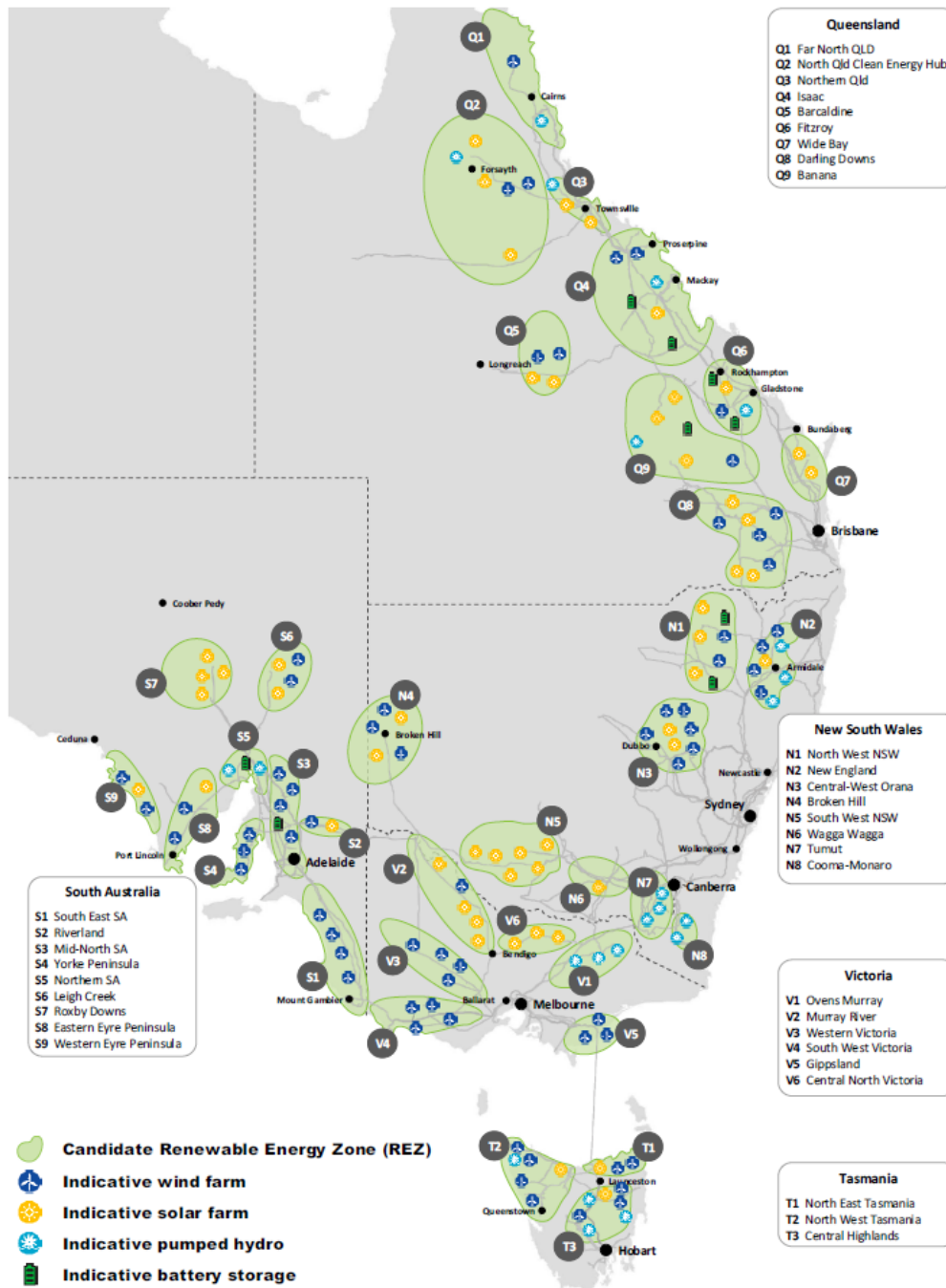


Figure 3: Proposed Renewable Energy Zones in Australia (Source: AEMO (2021), *Draft 2021 Inputs, Assumptions and Scenarios Report*)

Similar issues of pipeline embrittlement are not a concern for biomethane once it has meets gas specifications.

Market development

A renewable and decarbonised gas market will be key to enabling the development of green gas uptake through gas networks and pipelines, and key actions include:

- **Certification:** Green gas certification schemes are required to ensure customer with confidence that they are purchasing a green product.
- **Renewable gas target:** A starting point would be to implement a target for renewable and decarbonised gas, similar to the existing renewable energy target. This would help to underpin investment in renewable and decarbonised methane and hydrogen, and support the market creation activities below.
- **Market access:** Market access is needed to enable renewable and decarbonised gas demand to access supply through pipelines and networks, and includes the development of green gas standards and tradeable certificates.
- **Early asset financing:** Early market supply can be seeded through existing government financing frameworks, including Emission Reduction Fund, ARENA project funding and Clean Energy Finance Corporation (CEFC) equity and debt. Access to lower risk financing will be key to enabling first supply into potential renewable and decarbonised gas markets, after which market forces can take over.
- **Market incentives:** If the renewable and decarbonised gas market does not take off in line with emissions reduction targets, focus should turn to developing financial incentives for customers purchasing renewable and decarbonised gas, including tax or retail price incentives.

If you have any questions or would like a to discuss this further, please do not hesitate to contact our Head of Gas – Dr Dennis Van Puyvelde on dvanpuyvelde@energynetworks.com.au.

Yours sincerely,



Andrew Dillon
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