5 February 2020

Vanya Kumar
Executive Director, Commercial and Investment Attraction
Department of Environment, Land, Water and Planning
8 Nicholson St, East Melbourne VIC 3002
Via website: engage.vic.gov.au

Energy Networks Australia's Green Hydrogen Investment Priorities

Dear Ms Kumar

Energy Networks Australia welcomes the opportunity to respond to Victoria's Green Hydrogen Discussion Paper.

Energy Networks Australia is the national industry body representing businesses operating Australia's electricity transmission and distribution and gas distribution networks, with 21 member companies providing more than 16 million electricity and gas connections to almost every home and business across Australia.

Our gas distribution businesses manage over five million connections to Australian households and businesses. The gas supplied through these networks provides 44 per cent of the annual energy consumption to homes around the country. In Victoria, gas networks provide almost 70 per cent of energy to homes.

To date, the global focus of decarbonisation has been on the electricity sector. Gas networks, however, are on their own decarbonisation journey. New renewable gases, such as biogas and hydrogen, have the potential to become mainstream and complementary energy solutions that will use existing energy infrastructure.

Gas Vision 2050[1] outlines industry's journey to decarbonise the use of natural gas in homes, businesses and industry. Since the launch of the document in March 2017, many hydrogen related activities have commenced. Energy Networks Australia believes that hydrogen represents cross sectoral opportunities, where existing infrastructure can be utilised to support domestic and export industries. We support hydrogen development for export and domestic use, but as gas networks our focus is on hydrogen's use domestically for household heating and cooking, its use in industrial applications and energy storage to back up renewable generation.

Replacing natural gas with renewable gas will deliver a safe, reliable and zero-emissions fuel for customers. This also creates opportunities for renewable gas to contribute to the Victorian renewable energy target.

Energy Networks Australia has also been involved in the development of the National Hydrogen Strategy and will continue to be involved in the next steps in relation to gas networks. To contribute to the National Hydrogen Strategy, we developed a policy

[1] Gas Vision 2050: https://www.energynetworks.com.au/projects/gas-vision-2050/

scheme to support and facilitate the introduction of renewable gases into domestic gas networks. Work on this scheme is ongoing,

In this submission, we identify some potential investment areas that represent the greatest opportunities for the Victorian Hydrogen Investment Program.

Investment priority 1: Victorian demonstration of blending hydrogen in networks

Energy Networks Australia has been involved in the development of hydrogen policy and innovation in Australia. Last October, we published a summary document identifying that since the launch of Gas Vision 2050, more than $180 million has been allocated to hydrogen innovation projects led by our members and industry partners around the country. Gas networks are leading with four hydrogen production projects located in WA, ACT, NSW and SA. Two of these are operational and two more will commence this year and test the blending of renewable hydrogen into the gas network.

A priority for the Victorian Hydrogen Investment Program could be to support a project to demonstrate blending into the Victorian gas networks. This will provide an opportunity for Victoria to gain first-hand experience in blending hydrogen in networks and to test the regulatory regime to facilitate larger scale projects in the longer term.

Investment priority 2: facilitate lower cost renewable generation

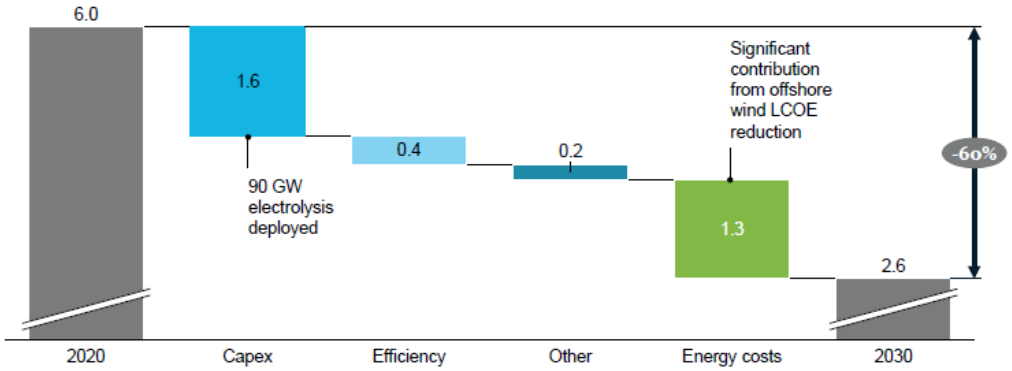
The main commercial challenge that should drive hydrogen investment is the production cost. At present, renewable hydrogen is not competitive with natural gas. With investments into the technology and demonstration of its applicability, the cost of hydrogen is expected to decrease over time. As recently reported by the Hydrogen Council[2], hydrogen production costs can decrease by 60% by 2030. This is mostly driven by the reduction in capital costs for electrolysis plants (mainly from large scale manufacturing) and from lowering the costs of renewable energy. The example below provides details of projected cost reduction in Europe based on offshore wind farm. While the capex decreases will be largely driven by global uptake of hydrogen, the cost of renewable electricity is a local factor.

The Victorian Hydrogen Investment Program could focus on projects enabling low cost renewable energy production for hydrogen production.

[2] Hydrogen Council (2020), *Path to hydrogen competitiveness – a cost perspective*

Exhibit 13 | Renewable hydrogen from electrolysis cost trajectory

Cost reduction lever for hydrogen for electrolysis[1] connected to dedicated offshore wind in Europe (average case)
USD/kg hydrogen



1. Assume 4,000 Nm3/h (~20 MW) PEM electrolysers connected to offshore wind, excludes compression and storage
2. Germany assumed

SOURCE: H21; McKinsey; Expert interview

Capex decreases ~60% for the full system driven by scale in production, learning rate, and technological improvements.

Increasing system size from ~2 MW to ~90MW.

Efficiency improves from ~65% to ~70% in 2030.

Other O&M costs go down following reduction in parts cost and learning to operate systems.

Additionally, storage may become cheaper (not included).

Energy costs[2] offshore wind LCOE decreases from 57 to 33 USD/MWh, and is assumed to be dedicated to hydrogen production.

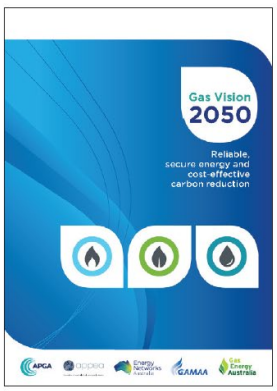
Grid fees decrease from ~15 to 10 USD/MWh.

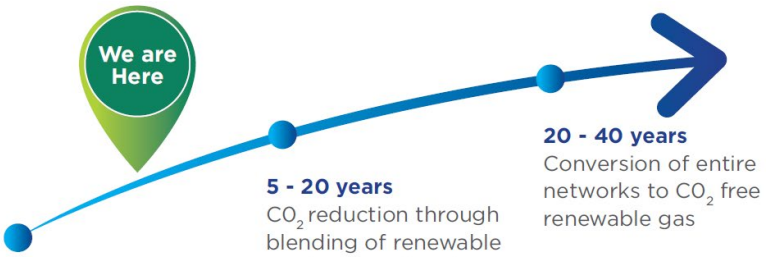
Load factor of 50%, i.e. ~4,400 full load hours equivalent.

Source: Hydrogen Council (2020), *Path to hydrogen competitiveness – A cost perspective.*

Investment priority 3: Support blending of hydrogen in networks

The next step in the journey is to deploy hydrogen at scale through blending at significant volumes within networks to complement natural gas, moving towards full decarbonisation of networks through replacing natural gas with 100 per cent renewable gas (which can be a blend of hydrogen, biogas or renewable methane).





Next 5 years
Beginning of renewable gas innovation and pilot projects

5 - 20 years
CO_2 reduction through blending of renewable gas in gas networks

20 - 40 years
Conversion of entire networks to CO_2 free renewable gas

The National Hydrogen Strategy 10 per cent kick start project[3] has identified that there are no significant regulatory and technical barriers for injecting up to 10 per cent hydrogen in gas distribution networks. This represents over 3 PJ of hydrogen. This is a significant volume of gas requiring over 150 MW of electrolyser capacity supported by renewable electricity from the grid.

Victorian gas network businesses are firmly committed to participating in renewable gas blending projects to demonstrate that gas distribution networks are a viable choice in storing and using renewable gases.

A blending target could facilitate this blending and also support the Victorian renewable energy target. A blending target would also create secondary markets for hydrogen and provide flexibility to the primary markets of exports and mobility.

The Victorian Hydrogen Investment Program could support the best approach for introducing a hydrogen blending target for Victoria.

Investment priority 4: support development of a state-wide plan to decarbonise Victoria's gas grid

Victoria's gas grid services over 2 million households and small businesses as well as industrial sites and plays a critical role in power generation. In 2017/18, gas provided a total of 213 PJ of energy in Victoria while electricity provided 154 PJ. The gas network provides different energy services and the installed infrastructure provides flexibility to meet daily and seasonal peaks in gas demand.

While the focus to date has been on renewable energy for power generation, industry is on a pathway to decarbonise the gas networks. For Victoria, this will require a state-wide plan to identify the different options for renewable gas. Converting to 100% hydrogen in the networks will require, over time, a step change associated with an upgrade in gas appliances as hydrogen has different burning characteristics compared to natural gas. The conversion of the network across the state will take many years and require careful planning by government, networks companies, energy retailers, energy consumer groups and regulators.

The approach in the UK is to focus on industrial clusters and then use networks to provide flexibility. This would allow large hydrogen production facilities to be constructed to provide hydrogen to industrial clusters. Some of this extra capacity could be used to blend hydrogen into the network, up to a level of around 10 per cent by volume. Over time, replacement gas appliances could be replaced with hydrogen ready appliances, which are currently under development. One of the concerns about moving to hydrogen is that existing natural gas appliances will need to be replaced. Hydrogen ready appliances are designed to operate on hydrogen but can also work on natural gas. To switch between the fuels will require a minor technical adjustment. This will allow a changeover to hydrogen to occur more easily.

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[3] COAG Energy Council (2019), *Hydrogen in the gas distribution networks – a report by FFCRC, GPA Engineering and the SA Government*

A plan to decarbonise Victoria's gas networks would need to account for the unique characteristics of the use of gas in Victoria. The best approach may not be the same as the one adopted by the UK.

The Victorian Hydrogen Investment Program could support the development of a state-wide plan to decarbonise Victoria's gas networks

Investment option 5: support the development of a national renewable gas certification scheme

Australia's National Hydrogen Strategy has identified four actions related to hydrogen certification. A certification program is required to enable the trade of renewable hydrogen and could also be applied to other renewable gases, such as biomethane.

Such a scheme will facilitate a renewable gas market and allow renewable gases to compete fairly with renewable electricity and to support end customer green gas purchasing options.

The Victorian Hydrogen Investment Program could support the development of a national renewable gas certification scheme to allow renewable gases to compete fairly.

Summary

The gas industry is actively working on decarbonising gas networks and has invested $180 million to demonstrate new technologies and approaches, mainly related to hydrogen.

We welcome the Victorian Hydrogen Investment Program and have provided some investment priorities that could be considered as part of the program. These priorities will support the development of a hydrogen market by lowering costs and supporting the development of hydrogen production technologies.

If you have any other queries, please contact Dr Dennis R Van Puyvelde, Head of Gas on dvanpuyvelde@energynetworks.com.au or on 02 6272 1548.

Yours sincerely,

Andrew Dillon
Chief Executive Officer