

Jemena Gas Networks (NSW) Ltd

Application for Distributor's Licence

Supporting Information



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Annexure A: Project Overview

Annexure B: ARENA media release October 2018

Overview

Under the *Gas Supply (Safety and Network Management) Amendment (Hydrogen Gas) Regulation 2020* (NSW) (**Regulation**) network operators conveying a mixture of natural gas and hydrogen require a distributor's licence under section 34 of the *Gas Supply Act 1996* (NSW) (**Act**).

Jemena Gas Networks (NSW) Limited (**JGN**) is currently developing the Western Sydney Green Gas Project (**Project**) at Horsley Park in western Sydney. The Project will involve the injection of small quantities of hydrogen into the part of JGN's natural gas distribution network located downstream of the Project in the local government areas of Liverpool, Penrith, Camden, Fairfield and Bankstown. As required under the Regulation, JGN is applying for a distributor's licence. This document provides supporting information in relation to that application.

JGN also holds a reticulator's authorisation under Part 2 of the Act, in relation to the same distribution districts, which will remain in place.

1. Description of the project

The Project is being undertaken by JGN with the support of the Australian Renewable Energy Agency (**ARENA**). It involves the design and construction of a facility at Horsley Park in western Sydney which will convert renewably-sourced electricity into oxygen and hydrogen via electrolysis.

The hydrogen will be captured and then injected, blended and stored in JGN's natural gas distribution network. The renewable hydrogen stored in the network will provide enough energy to meet the cooking, heating and hot water requirements of approximately 250 homes.

In addition, some of the hydrogen produced through the Project will be stored underground, to supply a gas engine generator and fuel cell to export electricity to demonstrate the potential two-way interconnectivity between the gas and electric grids.

The Project is Australia's most comprehensive hydrogen fuel study to date and, over the next five years, will test how we develop affordable energy storage to complement renewable energy when the sun doesn't shine and the wind doesn't blow.

Further information on the Project is contained in:

- **Annexure A**, Western Sydney Green Gas Project – Project Overview 28 August 2019.
- **Annexure B**, ARENA Media Release 22 October 2018.

2. Impact on markets

2.1 Consumers

The Project is considered an important stepping stone to support the decarbonisation of Australia's energy market by demonstrating a long term storage solution for intermittent renewable energy (both within gas distribution networks as well as conversion to a clean fuel for hydrogen vehicles).

The JGN natural gas distribution network is capable of storing as much energy as 8 million Powerwall batteries for weeks or months rather than minutes or hours typical of lithium-ion battery storage. By demonstrating successful hydrogen storage in existing infrastructure, the Project is likely to support further renewable investments, to the overall benefit of consumers.

The Project will inject up to 2% by volume of hydrogen into the existing natural gas stream. The resulting blended gas stream will remain within the allowable limits defined by the Australian Standard for reticulated natural gas AS4645 and there will be no, or only minimal, impact on the performance of consumers' gas appliances¹. Hydrogen is not being delivered directly to customers' premises.

A Formal Safety Assessment for the proposed injection of hydrogen has been conducted by JGN in consultation with both the Department of Planning, Industry and Environment (**DPIE**) and the NSW Office of Fair Trading to validate that the safety risks to community and consumers from distribution and utilisation of a hydrogen/natural gas blend are as low as reasonably practicable..

2.2 Gas market and Jemena's market power

The JGN network delivers gas to approximately 1.5 million customers across metropolitan Sydney and regional NSW. The Project is a trial and is expected to produce sufficient hydrogen to meet the equivalent gas needs for cooking, heating and hot-water requirements of approximately 250 homes. It is not expected to have any impact at all on the market.

As a natural monopoly gas distribution network, JGN's network is regulated as a 'distribution pipeline' under the National Gas Law and National Gas Rules. This means that the Australian Energy Regulator approves the prices, terms and conditions on which JGN provides network transportation services to retailers and large self-contracting users. The Project will not have any impact on this.

Furthermore, the Project will not impact the NSW gas wholesale market as the quantity of hydrogen injected annually will be less than 0.05% of the total gas transported by JGN.

2.3 Security, safety and reliability of the NSW supply system for gas

JGN is an authorised reticulator under Part 2 of the Act and as such is subject to the provisions of the Act and associated regulations, including the obligation under the *Gas Supply (Safety and Network Management) Regulation 2013* to lodge and implement a safety and operating plan. JGN has updated its existing safety and operating plan to incorporate the Project, and provided the updated version to DPIE, the technical regulatory authority for gas safety in NSW.

As noted previously, JGN holds a reticulator's authorisation which covers the whole of its network, including the proposed licence area, and this will remain in place going forward.

The Project is not expected to have any impact on the security, safety or reliability of the NSW gas supply system. A key objective of the Project is confirm operational characteristics of reticulating a mixture of hydrogen and natural gas, which will provide further assurance as to the safety of future

¹ The injection of hydrogen into the natural gas stream may result in a slight reduction in the heating value of the gas. It is not expected that this will have any discernible impact on the operation of appliances.

hydrogen distribution. In the longer term, development of alternative sources of energy supply, such as renewable hydrogen, will support the security and reliability of the system by providing an additional source of gas.

2.4 Insurance

JGN's insurances will apply to the conveyance of the natural gas/hydrogen mixture, consistent with condition 5 of the conditions of JGN's reticulator's authorisation.

Jemena Gas Networks (NSW) Ltd

Western Sydney Green Gas Project

Project Overview

Public

28 August 2019



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History

Rev No	Date	Description of changes	Author
0	28 Aug 19	Released	Mike Davis

Owning Functional Area

Business Function Owner:	Gas Distribution – Commercial and Strategy
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OVERVIEW

Jemena's Western Sydney Green Gas Project (**GGP**) involves designing and constructing a Power-to-Gas (**P2G**) facility which will convert renewably sourced electricity into hydrogen via electrolysis. A portion of the hydrogen produced will be injected into the gas network, providing enough energy to meet the cooking, heating and hot-water requirements of approximately 250 homes. Another portion of the hydrogen will be stored in an underground buffer store which will feed a gas engine generator for electricity generation back to the grid.

The project is also considering an onsite Hydrogen Refuelling Station (HRS) for Fuel Cell Electric Buses.

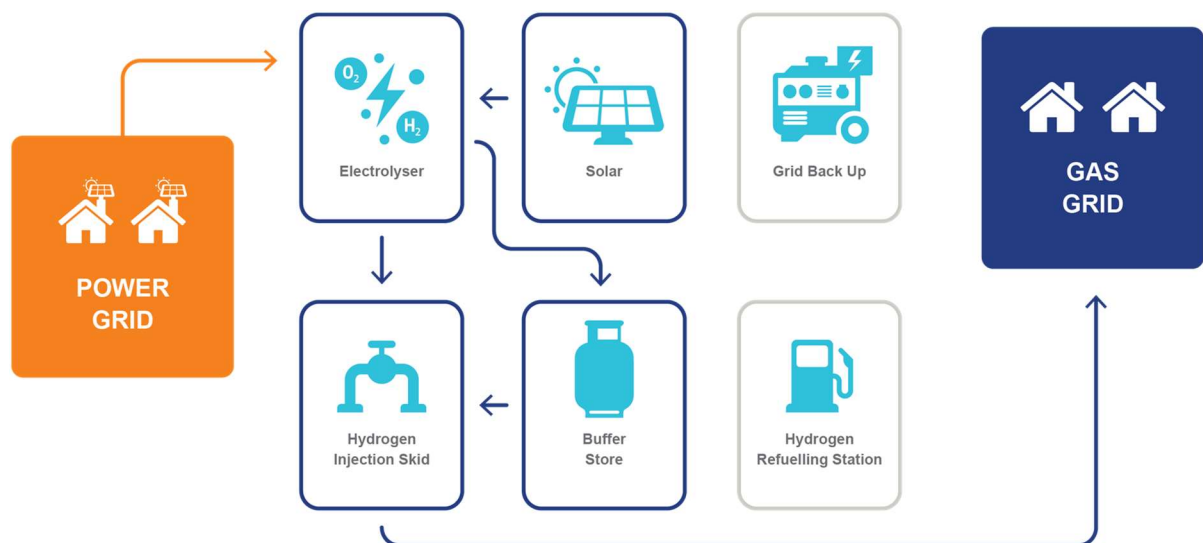


Figure 1 Western Sydney Green Gas Project (Power to Gas demonstration)

The project will be one of the first P2G trials to inject hydrogen into the gas distribution network in Australia and will focus on addressing the technical, regulatory, environmental and economic barriers to the production and use of hydrogen in gas distribution and transmission networks.

The project is considered an important stepping stone to support the decarbonisation of Australia's energy market by demonstrating a long term storage solution for intermittent and variable renewable energy (both within the gas distribution networks as well as conversion to a clean fuel for hydrogen vehicles).

Project components:

- 500kW Polymer Electrolyte Membrane (PEM) electrolyser;
- H₂ grid injection metering skid
- H₂ test and demonstration facilities
- Onsite Power Generator (65kW micro-generator – with potential to increase capacity)
- H₂ Buffer Storage in below ground pipeline
- Rainwater collection and potable water for electrolyser feed

- Additional scope/optimisation under assessment:
 - Additional electrolyser capacity (scalable to 1MW)
 - H₂ Refuelling for transport (current scope includes the design and build to facilitate future refuelling but not currently with refuelling infrastructure)
 - Onsite Behind the Meter (BTM) Solar



Figure 2 Artist Impression of Western Sydney Green Gas Project (Horsley Park)

PROJECT OBJECTIVES

Jemena's Project Objectives include, but are not limited to, the following:

- Demonstrate injection and storage of hydrogen, generated from renewable energy, into the gas distribution network;
- Establish a “green” or “renewable gas” market and demonstrate associated green gas certification
- Demonstrate gas and electricity network coupling, through the interconnection of both networks and markets;
- Demonstrate sector coupling through the implementation of hydrogen refuelling for transport;
- Evaluate all potential revenue streams to inform future hydrogen business cases including, but not limited to:
 - Demand response;
 - Network or ancillary services;
 - Green gas (in the distribution network);
 - Electricity generation; and
 - Hydrogen for transport.

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Australian Government
Australian Renewable Energy Agency

ARENA

Media Release

22 OCTOBER 2018

Hydrogen to be trialled in NSW gas networks

The Australian Renewable Energy Agency (ARENA) today announced it would fund a trial to produce hydrogen using renewable energy and inject it into the Sydney gas network.

On behalf of the Australian Government, ARENA has committed \$7.5 million in funding for Jemena to build a demonstration scale 500 kW electrolyser at its facility in western Sydney.

The \$15 million project - known as *Project H₂GO* - will connect to Jemena's existing gas network which delivers gas to 1.3 million customers in New South Wales.

Hydrogen can be safely added to the natural gas mains at concentrations of up to 10 per cent without affecting pipelines, appliances or regulations.

The two-year trial — the largest of its kind in Australia — involves converting solar and wind power into renewable hydrogen via electrolysis; the process by which electricity is used to split water into hydrogen and oxygen.

The electrolyser will produce hydrogen to be stored in the natural gas network to demonstrate and address the technical, regulatory, environmental and economic barriers to the production and use of hydrogen in various Australian conditions.

The majority of the hydrogen produced will be injected in the local gas network for domestic use and demonstrate the potential for renewable hydrogen storage in Australia's gas networks.

A portion of the hydrogen will be utilised via a gas engine generator for electricity generation back into the grid with the remaining stored for use in an onsite Hydrogen Refuelling Station for hydrogen fuel cell vehicles.

ARENA CEO Darren Miller said hydrogen had huge potential to store renewable energy and supplement natural gas use.

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“As Australia transitions to renewable energy, hydrogen could play an important role as energy storage and also has the effect of decarbonising the gas network with ‘green’ gas,” he said.

Energy Networks Australia identified hydrogen injection into the natural gas network as an avenue to decarbonise the gas distribution networks. Jemena’s trial will support future activities around the production and storage of renewable hydrogen at larger scales.

“There is significant potential in the power-to-gas value chain including the ability to stabilise the grid as well as pairing renewable energy with electrolyzers to soak up and store surplus electricity,” Mr Miller said.

In the longer term, hydrogen also has the potential to be a major Australian export opportunity. Earlier this month, ARENA announced \$22 million in R&D funding into exporting hydrogen, supporting 16 research projects across nine Australian universities and research organisations.

ARENA recently published a report, prepared by ACIL Allen, which identified export opportunities for Australia as global demand for renewable hydrogen increases. ARENA is also part of the Hydrogen Strategy Group, chaired by Chief Scientist Dr Alan Finkel AO, that is working with the COAG Energy Council.

Jemena’s Managing Director Frank Tudor said Power to Gas technology could allow us to store renewable energy to make it dispatchable.

“In the future Australians will need to decide what to do with excess renewable energy on very windy or very sunny days. Jemena’s *Project H₂GO* will demonstrate how existing gas pipeline technology can store excess renewable energy for weeks and months, making it more efficient than batteries which can only store excess renewable energy for minutes or hours,” he said.