



# Australian Hydrogen Centre

APGA Convention and Exhibition 2023

17 October 2023

The **Australian Hydrogen Centre** is supported by its founding members:



Supported by  
**Government of  
South Australia**



# Our Connection to Country

By artist Karen Briggs

## Acknowledgement of Country

AGIG acknowledges the Traditional Custodians of the lands upon which we live and operate, and we pay our respects to Elders past, present and emerging.

We recognise Aboriginal and Torres Strait Islander people's historical and ongoing connection to land and waters, and we embrace the spirit of reconciliation.



# Our Business

One of the largest gas infrastructure businesses in Australia



**>2.1m**  
customers

**609 PJ**  
gas delivered

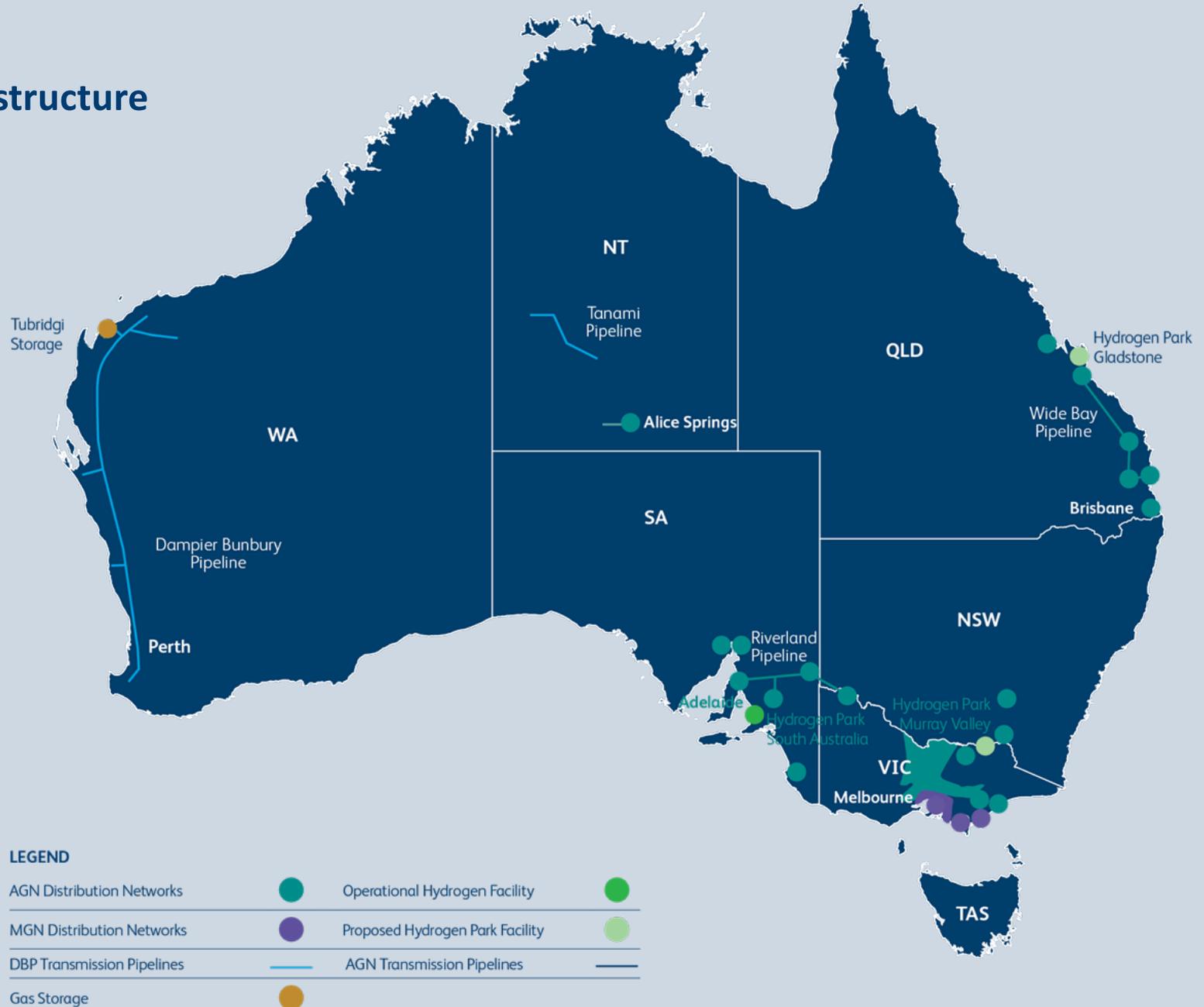
**4,317 km**  
transmission

**35,850 km**  
distribution

**60 PJ**  
gas storage

**1.25 MW**  
electrolysis

As at 31 December 2022



# Background

## Action

Assess the feasibility of blending renewable hydrogen into gas distribution networks (in the near term), and transition to 100% hydrogen networks (over the long term); studies include:

- 1. Regional Town Studies:** 10% hydrogen blending into selected regional towns in SA and Vic
- 2. Statewide Studies:** 10% and 100% hydrogen networks of SA and Vic
- 3. HyP SA Knowledge Sharing:** Key learnings from Hydrogen Park South Australia's operations



*Established at the end of 2019, the \$4.15 million Australian Hydrogen Centre (AHC) is supported by a \$1.28 million Australian Renewable Energy Agency (ARENA) grant*



Environment,  
Land, Water  
and Planning

NEOEN



Government of South Australia  
Department for Energy and Mining



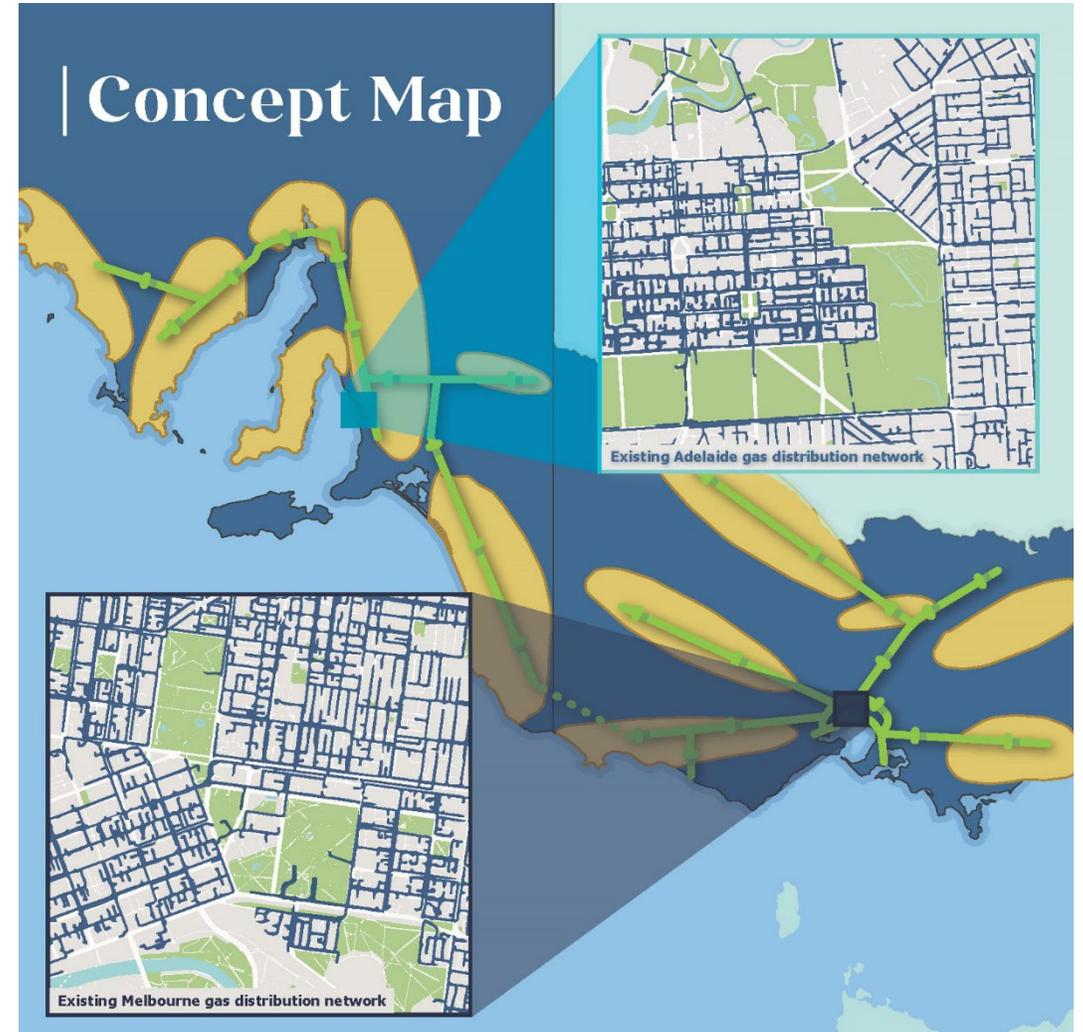
# Key Work Packages

Topic	Lead	Description
<b>Appliance Pathways Assessment</b>	Arup	Gas customer appliance analysis and investigation of possible transition options for appliances to a 100% hydrogen network
<b>Regulatory Standards and Legal Considerations</b>	Farrierswier	Assessing relevant retail law and rules in both SA and Victoria to identify any key issues that need to be addressed to enable state-wide 10% blending
<b>Policy Frameworks Assessment</b>	Oakley Greenwood	A "thought leadership" piece on potential future policy frameworks required to support Australia's emerging domestic hydrogen industry (including consideration of potential incentive mechanisms)
<b>Renewable Hydrogen Market Study</b>	Jacobs	Hydrogen Production Facilities location and layout; sustainable water sourcing; transmission and storage requirements; optimised operating model; capital and operating costings
<b>Gas Distribution Network Analysis</b>	GPA	Suitability (capacity and compatibility) of networks from city gate to customer appliance regulator to achieve 10% blending and 100% conversion, including clear pathway forward
<b>Major Gas Users Assessment (industrial and transport)</b>	Advisian	Review the impact of conversion to hydrogen and identify potential additional users of hydrogen not currently connected to the gas distribution system
<b>Economic Impact Assessment</b>	Ethos Urban	An economic impact assessment outlining the broader economic impacts including the number of direct and indirect jobs; apprentices; wage bill; and economic activity during construction and operation of 10% and 100%
<b>Financial Modelling</b>	Frontier Economics	Customer price impacts of SA and Victorian 10% blending, and 100% conversion
<b>10% and 100% Implementation Plan</b>	Arup	Develop roadmap to implement 10% and 100% hydrogen in networks



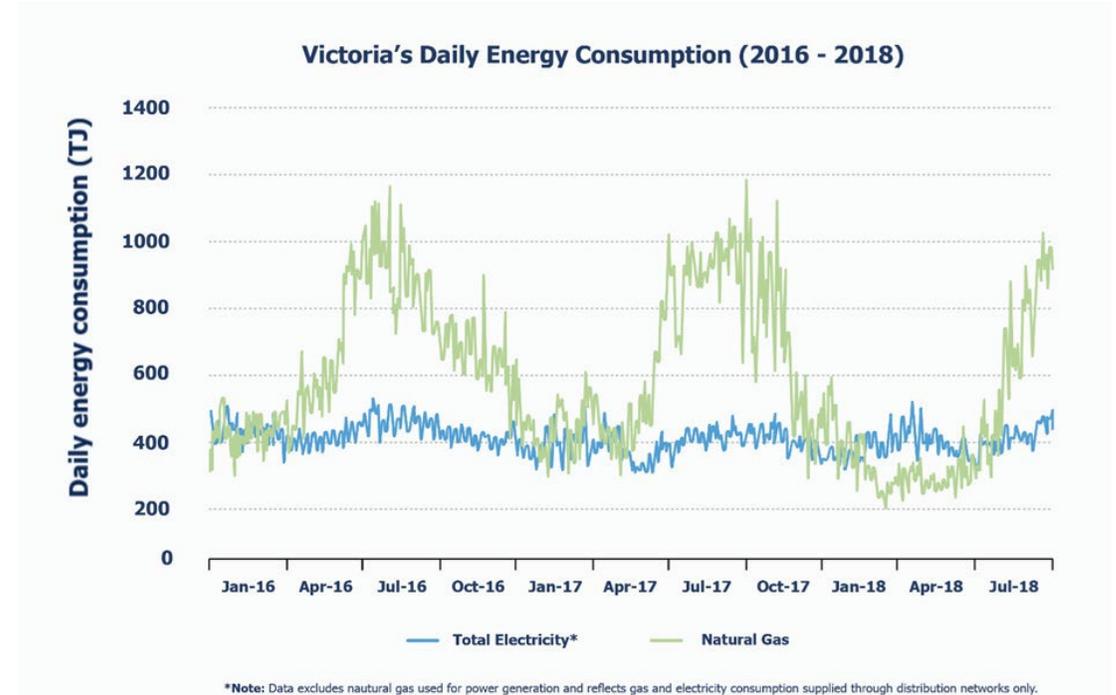
# Overview

- **4 x ~100+ page reports:**
  - Finds 10% and 100% renewable hydrogen in SA and Vic gas networks is technically and economically feasible, and outlines a promising pathway forward to achieve it
- **10% renewable hydrogen networks delivers:**
  - Emissions reduction of >300,000 t CO<sub>2</sub>-e
  - 670 MW of electrolysis supported by existing RE generation, and 30 tonnes of hydrogen storage
  - Establishing scaled domestic demand for hydrogen and creating >700 jobs during construction (>150 ongoing)
- **100% renewable hydrogen networks delivers:**
  - Net zero carbon emissions gas network
  - 15GW of electrolysis supported by more than 30GW of renewable electricity generation, and around 30PJ of hydrogen storage
  - Significant domestic demand for hydrogen, creating 10,305 jobs during construction (5,380 ongoing)



# Gas Network Demand

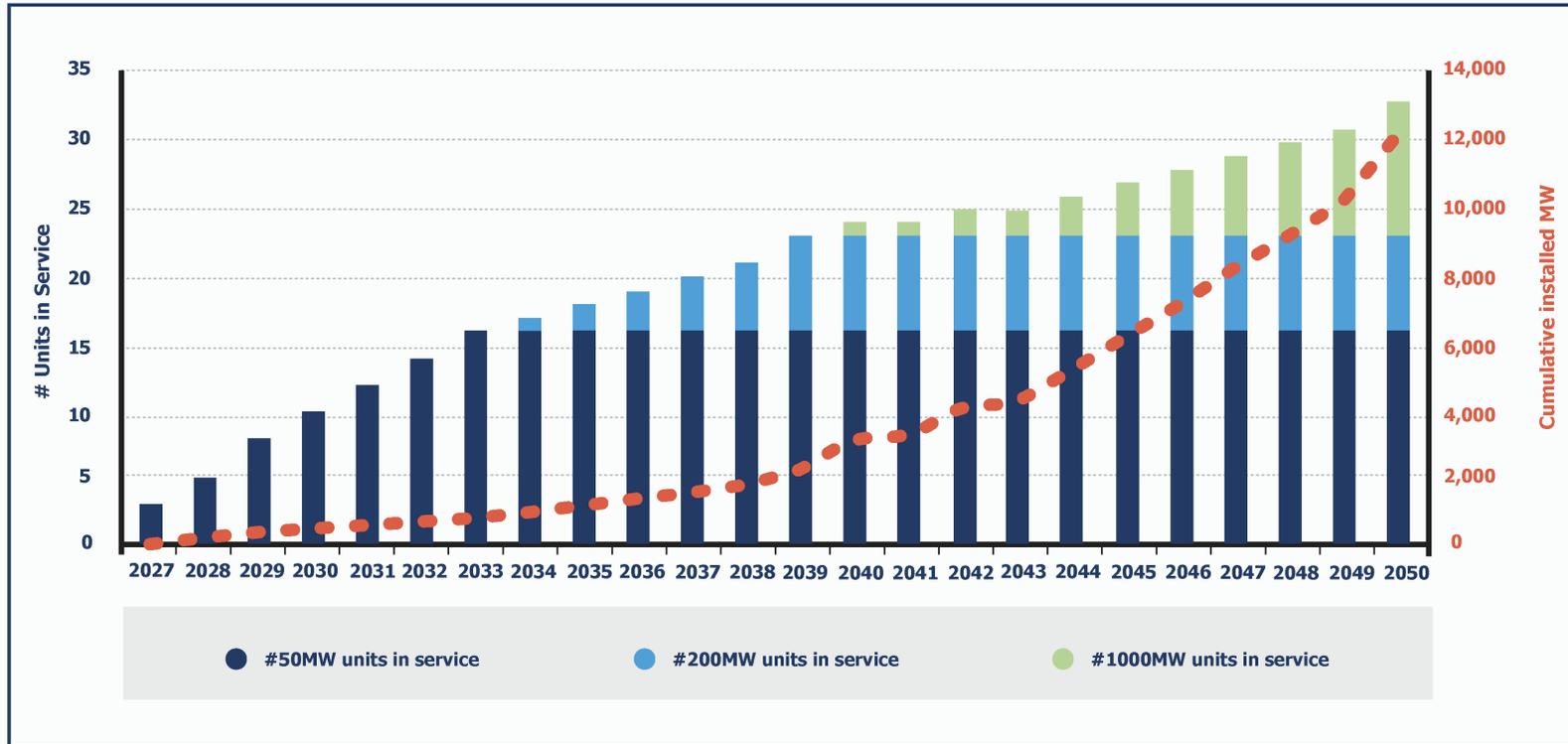
- The Victorian gas distribution network supplies more than 2.1 million connections across a broad range of applications including residential (59% of demand), industrial (31%), and commercial (10%)
- The annual consumption profile of the Victorian gas distribution network reflects large demand peaks in cooler seasons, and most of the gas consumption is for space heating, hot water, and cooking
- Assumed the overall demand for natural gas in distribution networks to 2050 could be supplanted by renewable hydrogen; this is around 1.4 million tonnes of hydrogen annually
- There are a wide range of plausible futures for gas demand, AEMO's Central Scenario as outlined in its 2021 GSOO has been selected as the basis of forecast for renewable hydrogen demand by 2050



Segment	Victorian Customer numbers		Annual Consumption (TJ)	
	Numbers	Percentage	Demand	Percentage
Residential	2,117,755	98%	109,246	59%
Commercial	40,166	2%	17,559	10%
Industrial	884	0.04%	56,991	31%
<b>Total</b>	<b>2,177,434</b>	<b>100%</b>	<b>183,797</b>	<b>100%</b>

# Renewable Hydrogen Production

Projected build-out of electrolyser capacity in Victoria



- Initially, 10 – 200 MW electrolyser units built along existing gas and electricity distribution infrastructure.
- As demand increases, larger scale units 200 MW to 1 GW.
- Water requirements for 100% hydrogen in existing networks is no more than 0.3% of the annual physical water use in both SA and Victoria.
- Options for sustainable water sourcing were considered in detail.

	10%		100%	
	SA	VIC	SA	VIC
<b>Hydrogen required (tonnes)</b>	5,150	28,000	270,000	1,300,000
<b>Aggregate electrolysis (MW)</b>	90	580	2,400	12,000
<b>Total electrical load (GWh)</b>	350	2,000	15,000	70,000
<b>Water consumption (ML)</b>	103	560	5,400	26,000

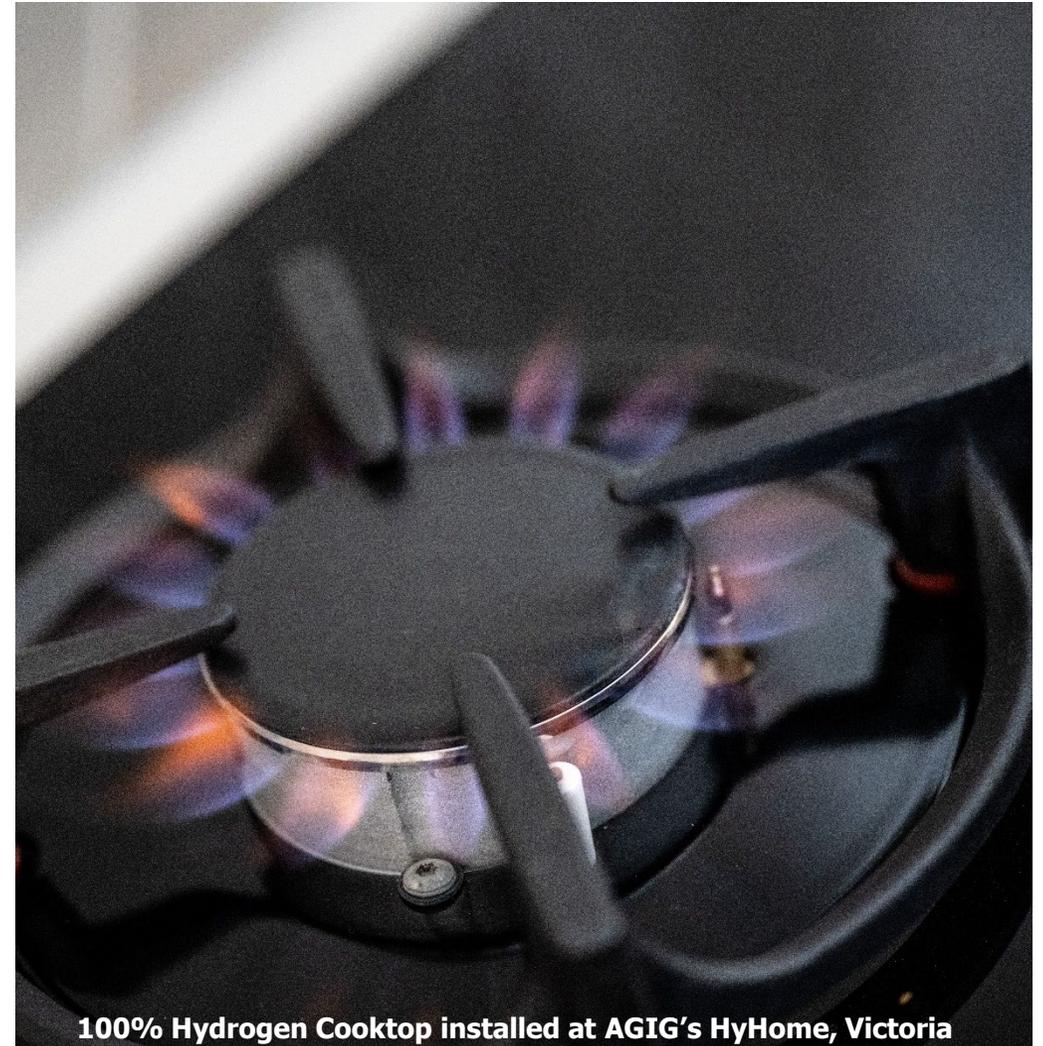
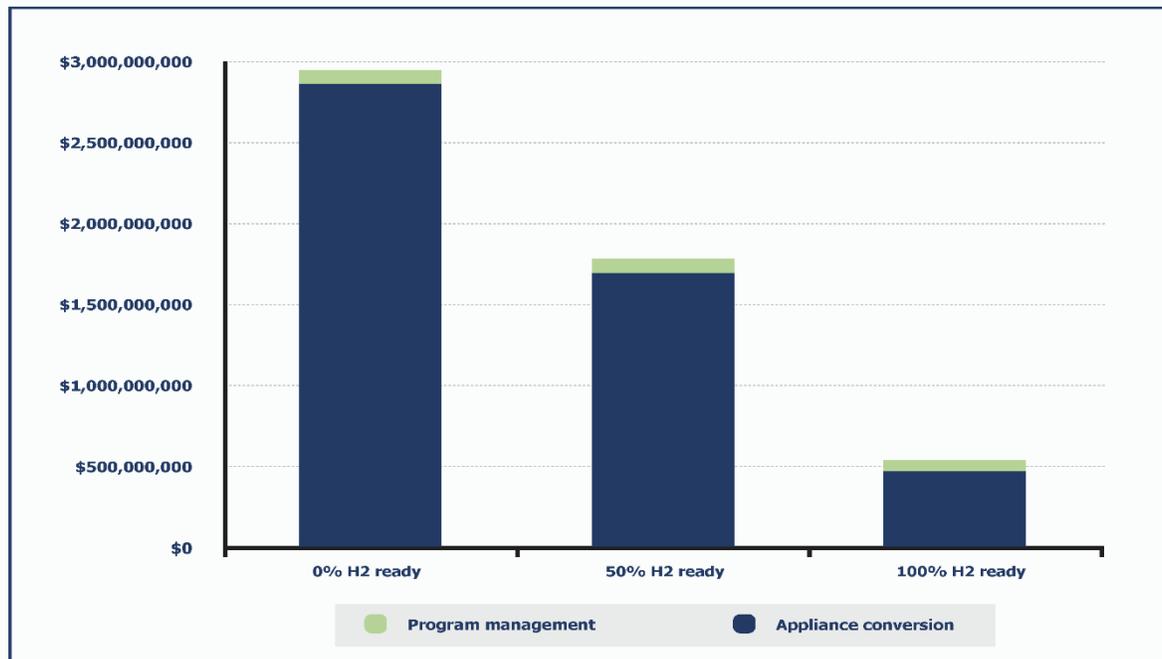
# Network Readiness

- Australia's gas distribution networks stored and transported about 50% hydrogen in 'town gas' around 50 years ago
- Gas distribution networks, their components, and constituent materials are generally compatible to safely and reliably transport 100% renewable gas (hydrogen and biomethane)
- This facilitates new additional renewable energy being brought into the system to meet forecast supply gaps – with no additional expenditure
- 10% hydrogen could slightly reduce the networks overall capacity by around 2-4%, the network could absorb this reduction and maintain supply at historic service levels



# Appliance Pathways

- Customer fitting lines are compatible with 10% and 100%
- Customer appliances are compatible with 10% hydrogen, with research well progressed to support ~20% hydrogen.
- Existing appliances will not work on 100% hydrogen, ensuring 'Hydrogen Ready' appliances are mandated in Australia ensures a lower cost and less customer disruption



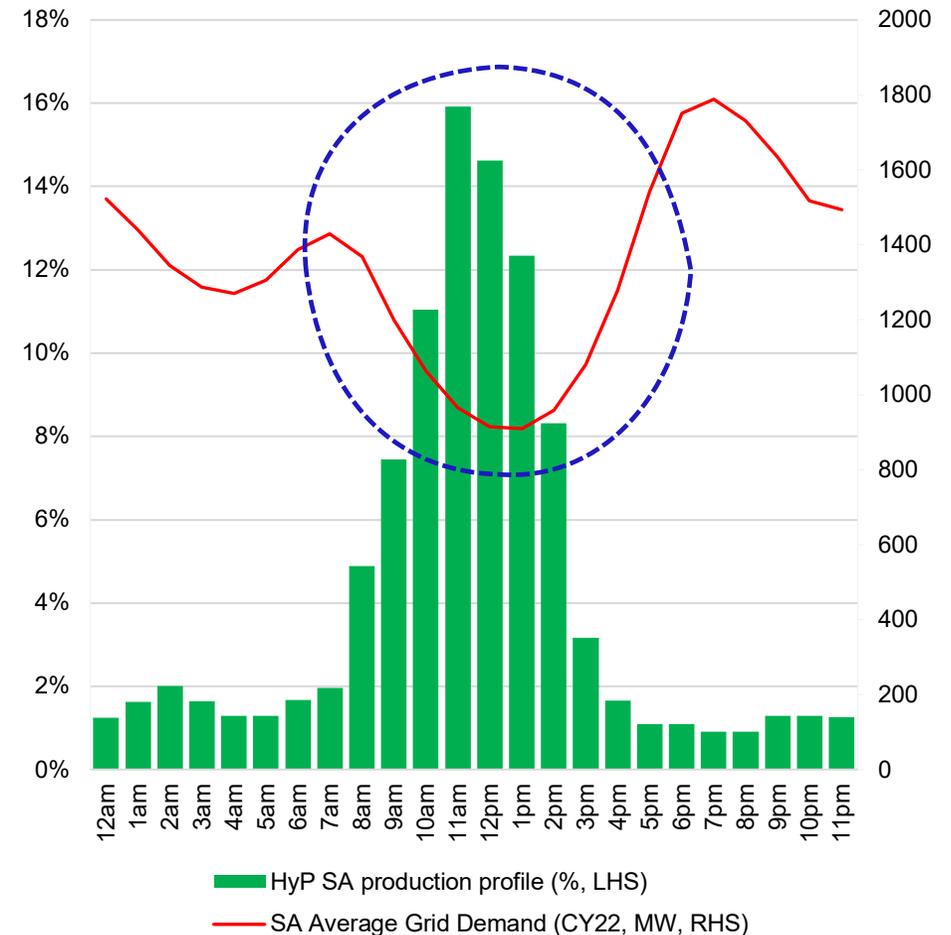
100% Hydrogen Cooktop installed at AGIG's HyHome, Victoria

# Electricity System Integration

- Renewable hydrogen production alongside existing supply at gate stations, achieving 10% on aggregate across Victoria
- Innovative model for renewable electricity and gas integration could draw renewable electricity from by existing or planned developments via PPA, with no additional renewable generation required
- Could increase the electricity load by around 2-3% on current levels, representing an additional market for solar and wind that is optimised for efficient utilisation
- Short-term hydrogen storage enables the electricity load for hydrogen production to be shifted to times of day when electricity demand and prices are low

Item	#
Electrolyser nameplate (MW)	580
Short-term storage (t)	38
Capacity factor	36%
Total electrical load (GWh)	2,000

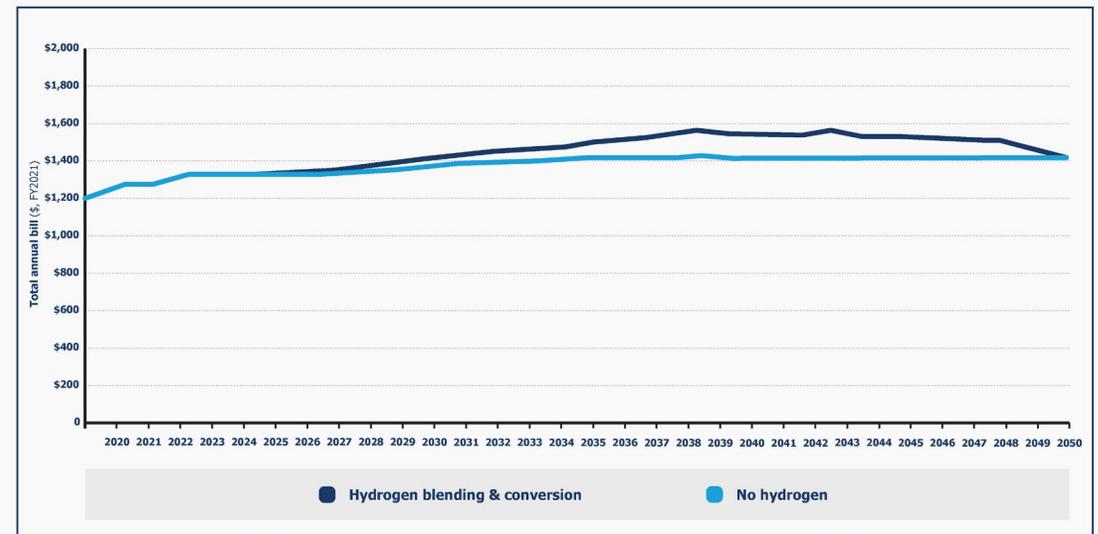
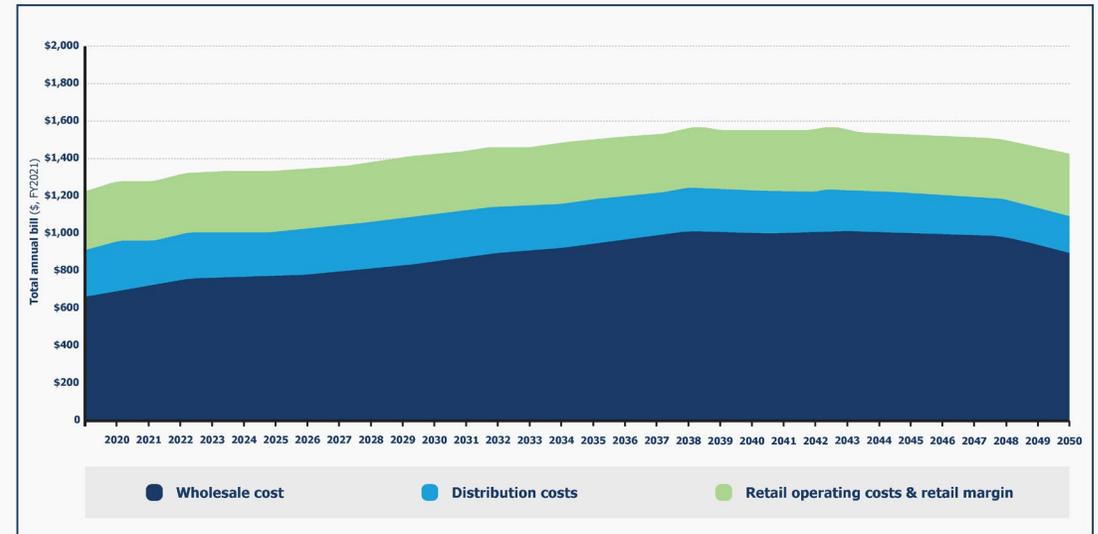
SA NEM Average Grid Demand vs HyP SA Production Profile



# Economic Impacts

- A building block approach used to determine customer bill impacts, considering wholesale cost of energy, distribution and retailing costs
- Comparison to a “no hydrogen” scenario found a moderate increase (4%) to customer bills to achieve 10% hydrogen, coming down to match or beat the projected “no hydrogen” bill prior at 100% hydrogen.
- ‘Hydrogen Hubs’ and other new infrastructure developed for adjacent markets would further improve customer bill projections, as could technology breakthroughs and including other forms of renewable and carbon neutral gas into supply
- An Economic Impact Assessment (EIA) projected the construction and operational phases would generate a range of significant direct and indirect economic benefits.

Total bill for an average Victorian residential hydrogen gas customer



# Summary

- Overall, the reports call for open-mindedness in decision-making to support renewable hydrogen in gas distribution networks to help decarbonise gas customers' energy use
- Supported by a range of communication tools including short animations, to be launched very soon.



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This research shows renewable hydrogen delivers real benefits for all Australians, unlocking greater value from our world-class infrastructure. Our sustainable, circular approach to reducing carbon emissions in both the gas and electricity systems, will minimize disruption for all South Australians as we transition to renewable technologies.

Hon. Tom Koutsantonis MP, South Australia's Minister for Energy and Mining

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Victoria's Gas Substitution Roadmap is charting an ambitious path out of fossil gas, and renewable hydrogen could play a key role in helping decarbonise transport, industrial processes and other hard to abate sectors.

Hon Lily D'Ambrosio MP, Victoria's Minister for Energy and Resources

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“

We're proud to work with industry and government on this innovative project to deliver a potential pathway to decarbonise the Victorian and South Australian gas distribution networks.

Tom Hallam, General Manager Regulation, Transmission and Gas, AusNet Services

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“

By leveraging South Australia's world-class wind resources, Neoen has already shown it is possible to generate highly competitive power for industry and we are exploring opportunities for green hydrogen in a range of domestic and export applications.

Louis de Sambucy, Managing Director, Neoen Australia

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“

AGIG is committed to using renewable gas, including hydrogen, to decarbonise Australia's world-class gas distribution networks in a way that is safe, cost competitive, maintains energy security, and provides the best outcome for our customers.

Craig de Laine, Chief Executive Officer, Australian Gas Infrastructure Group

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The **Australian Hydrogen Centre** would not be possible without the support of ARENA and the founding members South Australia's Department for Energy and Mining, Victoria's Department of Energy, Environment and Climate Action, gas and energy infrastructure businesses, AGN (part of AGIG) and AusNet Services, and leading renewable energy companies, ENGIE and Neoen.



**Australian Government**  
**Australian Renewable Energy Agency**

**ARENA**

