Hydrogen opportunities and the Australian experience so far

Dr Fiona Simon
CEO, Australian Hydrogen Council

September 2021

AHC members

AUSTRALIAN HYDROGEN COUNCIL

As of September 2021

AHC has 80 members

- All are companies
- Range of sizes and locations
- Highest industry representation is from the energy sector, with other main categories of technology, transport and consulting

Why hydrogen?

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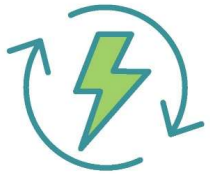
Most common substance in the universe

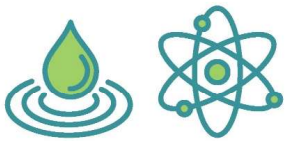
Produced from many energy sources

No greenhouse gas emissions in use

Can be made cleanly using water



Higher energy density than batteries when compressed



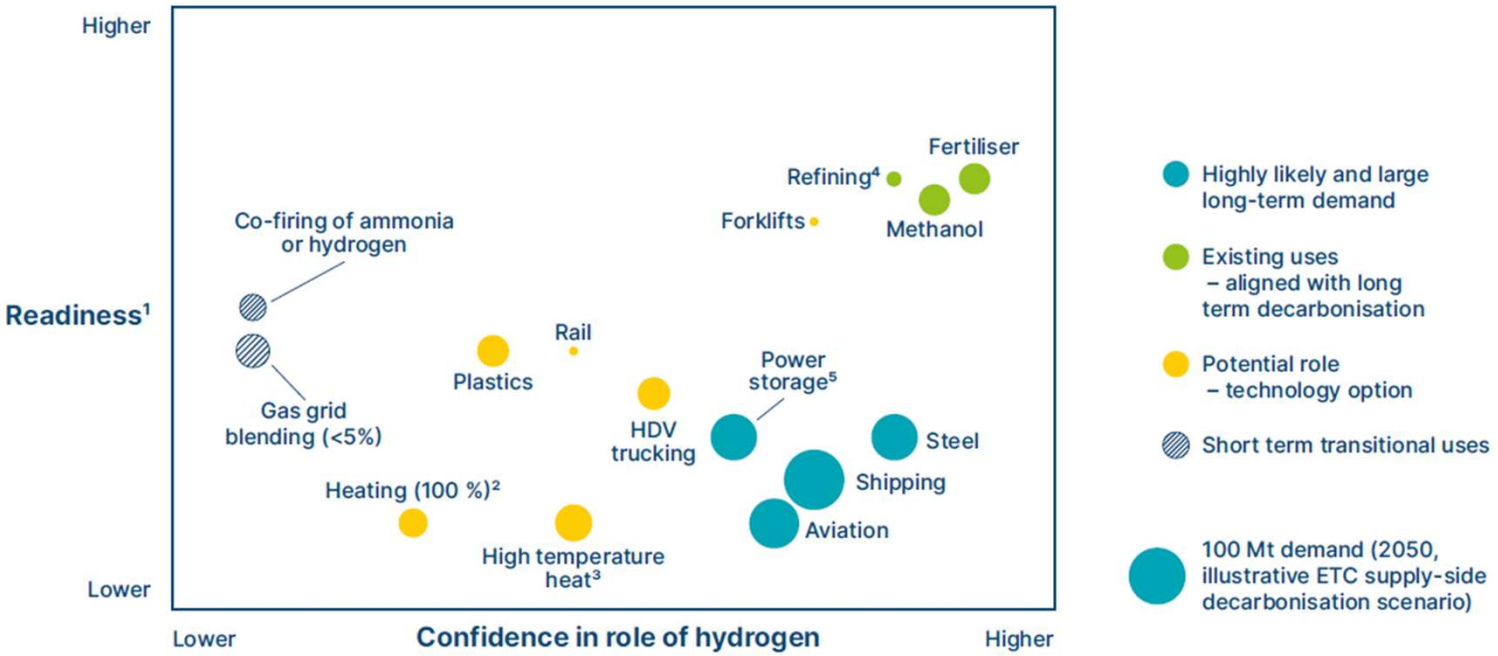
Can be stored as a liquid or gas

Can be stored, transported & exported

No more or less safe than petrol or diesel fuels

Can provide energy to all parts of the economy

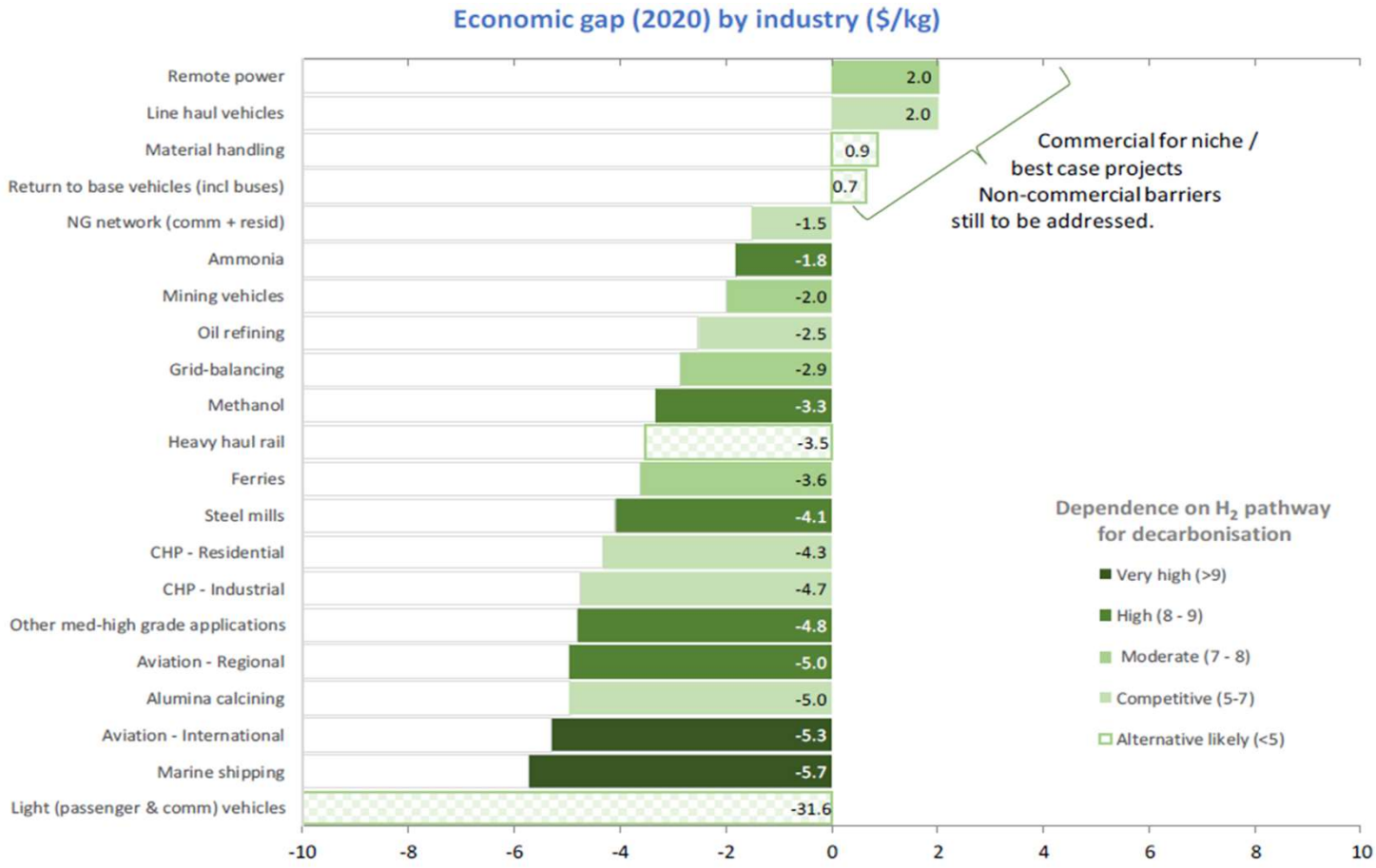
Potential hydrogen uses



NOTES: [1] Readiness refers to a combined metric of technical readiness for clean hydrogen use, economic competitiveness and ease of sector to use clean hydrogen. [2] 'Heating (100%)' refers to building heating with hydrogen boilers via hydrogen distribution grid, [3] 'High temperature heat' refers to industrial heat processes above ca. 800°C [4] Current hydrogen use in refining industry is higher due to greater oil consumption. [5] Long-term energy storage for the power system.

Multiple potential uses of hydrogen in a low carbon economy, some of which can provide early 'off take' for clean hydrogen. SOURCE: Energy Transitions Commission (2021), page 17.

Potential hydrogen uses



Economic gap (2020) by industry ($/kg), SOURCE: Advisian (2021), page 12.

Global momentum continues to grow

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Green, blue and pink: Bipartisan US infrastructure bill allocates $9.5bn to push down the costs of clean hydrogen

Included in the $550bn bill are plans for a national hydrogen strategy and roadmap, at least four regional H2 hubs and billions of dollars for research and development

3 August 2021 15:35 GMT *UPDATED 3 August 2021 15:39 GMT*

By **Leigh Collins**

The new US bipartisan infrastructure bill, if passed by senators as expected this week, will light a fire under the American clean hydrogen sector, legislating for:

- A national H_2 strategy and roadmap;
- $9.5bn of federal cash to be spent on the nascent industry's development, including a push to reduce the cost of green hydrogen to less than $2/kg by 2026 (from more than $5/kg today); and
- The creation of at least four regional hubs for the production and usage of green, blue and pink (nuclear) hydrogen.

JAPAN, THE NEW HYDROGEN NATION

Feb 04, 2020 08:22 | Hanna Makino, Swiss Business Hub Japan

Japan was the first country to adopt a "Basic Hydrogen Strategy" and plans to become a "hydrogen society". The nationwide hydrogen market is expected to grow 56-fold to JPY 408.5 billion (approx. CHF 3,7 billion) by 2030, providing exciting business opportunities.

Press release

UK government launches plan for a world-leading hydrogen economy

First-ever vision to kick start world-leading hydrogen economy set to support over 9,000 UK jobs and unlock £4 billion investment by 2030.

From: Department for Business, Energy & Industrial Strategy, The Rt Hon Kwasi Kwarteng MP, and The Rt Hon Anne-Marie Trevelyan MP

Published 17 August 2021

BUSINESS

Germany and hydrogen — €9 billion to spend as strategy is revealed

As part of its stimulus package, Germany intends to expand the role of green hydrogen to help end the country's reliance on coal. The government agreed on a plan on how to spend the €9 billion earmarked for the project.

News

Chile: Government Presents the National Strategy for Chile to be a World leader in Green Hydrogen

South Korea joins China, Japan in net-zero in $80B squeeze on Australian fossil exports

South Korea, Japan and China's tightened climate goals will crunch Australian thermal coal, make LNG investments harder and possibly kill Santos' Barossa LNG project.

PETER MILNE

Sep 14, 2020 - 03:13 pm

France presents national hydrogen strategy

BARBARA POMPILI | BRUNO LE MAIRE | FCEV | FRANCE | HYDROGEN | SUBSIDIES

The French government presented a national hydrogen strategy. It provides for an investment of 7.2 billion euros by 2030 and a hydrogen production capacity of 6.5 GW by 2030. At the same time, a national H2 committee will be established.

The French Ministry of the Environment and the Ministry of Economy have published a joint strategy paper focussing on the decarbonization of hydrogen production and the design of a hydrogen industry.

Funding so far

Table 1: Main Commonwealth Government Funding Programs/Activities (AUD$ million since 2018; data as at early-May 2021; rounded)

	AUD$ million
ARENA: Research projects	22
ARENA: Feasibility studies, pilot & demonstration projects	35
ARENA: Renewable hydrogen deployment funding round	103
CEFC: Advancing hydrogen fund	300
Establishment of hydrogen hubs	314
HESC pilot project	50
Legal reviews, supply chain studies, certification, etc.	32
Non-ARENA R&D (HyResource sample-based; e.g. ARC grants, Hycel)	33
Hydrogen ready provision	25
Regional recovery partnerships – renewable hydrogen ecosystem development	5
TOTAL	**920**

Source: HyResource (2021) *A Short Report on Hydrogen Industry Policy Initiatives and the Status of Hydrogen Projects in Australia*, May.

Table 2: Main State and Territory Government Funding Programs/Activities (AUD$ million since 2018; data as at early-May 2021)

	AUD$ million
New South Wales	
Hydrogen hubs development	70
Manilla solar and renewable energy storage project	3.5
Port Kembla Investment Fund (hydrogen refuelling station project)	0.5
New South Wales Total (rounded)	***74***
Victoria	
HESC pilot project	50
Victorian hydrogen hub	10
AVHI Program	7.2
Australian Hydrogen Centre	0.5
Victoria Total (rounded)	***68***
Queensland	
Hydrogen industry strategy and fund	29
Hydrogen industry training and skills development	32.6
Queensland Total (rounded)	***62***
Western Australia	
Renewable hydrogen fund (RHF) 1.0	10
Denham project ($5.7 mln total; $1 mln allocated from RHF 1.0)	4.7
Renewable hydrogen fund 2.0	5
Legal framework review	3
Renewable hydrogen unit	2.7
Supply chain models, storage and blending viability projects	2.6
Western Australia Total	***28***
South Australia	
Renewable technology fund – grants	14.4
Renewable technology fund – loans (available only at construction)	27.5
South Australia Total (rounded)	***42***
Tasmania	
Renewable hydrogen industry development program	
- Renewable hydrogen fund	20
- Concessional loans & support services	30
Tasmania Total	***50***
Northern Territory	
Remote hydrogen program	1
Northern Territory Total (rounded)	***1***
Grand Total: State & Territory Governments (rounded)	**325**

Hydrogen projects

AUSTRALIAN HYDROGEN COUNCIL

PROJECT NAME	PROPONENT/S	STATE	CITY/TOWN	STATUS	OPERATIONS DATE	ELECTROLYSER CAPACITY (MW)	H2 PRODUCTION	
Sir Samuel Griffith Centre	Griffith University	QLD	Brisbane	Operational	2013	0.16	2.7	kilograms per hour
Hydrogen Test Facility - ACT Gas Network	Evoenergy, Canberra Institute of Technology	ACT	Canberra	Operational	2018	0.00125		
Clean Energy Innovation Hub (CEIH)	ATCO	WA	Perth	Operational	2019	0.26	23	tonnes per annum
Renewable Hydrogen Refuelling Pilot	ACT Government, ActewAGL, Neon, Hyundai, sgfleet	ACT	Canberra	Operational	2021	0.075	21	kilograms per day
Renewable Hydrogen Production and Refuelling Project	BOC Limited	QLD	Brisbane	Under construction	2021	0.22	2,400	kilograms per month
Hydrogen Energy Supply Chain - Pilot Project	Kawasaki, J-Power, Iwatani, Marubeni, Sumitomo, AGL	Vic	Gippsland	Operational	2021		1-3	1-3 tonnes for one year
Toyota Ecopark Hydrogen Demonstration (Toyota Hydrogen Centre)	Toyota Motor Corporation Australia	VIC	Melbourne	Under construction	2021	0.26	80	kilograms per day
Western Sydney Green Gas Project	Jemena	NSW	Sydney	Under construction	2021	0.50	53	tonnes per annum
Hydrogen Park South Australia	AGN/AGIG	SA	Adelaide	Operational	2021	1.25	20	kilograms per hour
Hazer Commercial Demonstration Plant	Hazer Group	WA	Perth	Under construction	2021		100	tonnes per annum
Hydrogen Refueller Station Project	ATCO, Fortescue Metals Group	WA	Perth	Under construction	2021			See ATCO above
APA Renewable Methane Demonstration Project	APA Group	QLD	Roma	Under construction	2022	0.005	340	kilograms per annum
Denham Hydrogen Demonstration Plant	Horizon Power	WA	Denham	Under construction	2022	0.348	13	tonnes per annum
Hydrogen Fuels Australia Truganina HRS	Hydrogen Fuels Australia	Vic	Truganina	Under construction	2022	0.432	65	kilograms per day
Christmas Creek Renewable Hydrogen Mobiliity Project	Fortescue Metals Group	WA	Pilbara	Under construction	2022	1.4	180	kilograms per day
Port Kembla Hydrogen Refuelling Facility	Coregas	NSW	Port Kembla	Advanced development	2022			
Manilla Solar and Renewable Energy Storage Project	Manilla Community Renewable Energy Inc./Providence Asset Group	NSW	Manilla	Advanced development	2022		400	kilograms per day
Hydrogen Park Gladstone	AGN/AGIG	QLD	Gladstone	Advanced development	2022	0.175	20	kilograms per day
Swinburne University of Technology Victorian Hydrogen Hub - CSIRO Hydrogen Refuelling Station	CSIRO, Swinburne University of Technology	VIC	Melbourne	Advanced development	2022		20	kilograms per day
Arrowsmith Hydrogen Project - Stage 1	Infinite Blue Energy	WA	Dongara	Advanced development	2022	50	25	tonnes per day
SunHQ Hydrogen Hub	Ark Energy Corporation	QLD	Townsville	Advanced development	2023	1	140	tonnes per annum
Hydrogen Park Murray Valley	AGN/AGIG, ENGIE	VIC	Wodonga	Advanced development	2023	10		
Yara-ENGIE Pilbara Renewable Ammonia	Yara Pilbara Fertilizers, ENGIE Renewables Australia	WA	Pilbara	Advanced development	2023	10	625	tonnes per annum
Clean Energy Innovation Park (CEIP)	ATCO, AGIG	WA	Warradarge	Advanced development	2023	10	4.0	tonnes per day
Tallawarra B Dual Fuel Capable Gas/Hydrogen Power Plant	EnergyAustralia	NSW	Yallah	Under construction	2025		200	tonnes per annum
Spicers Retreats Scenic Rim Trial Ecotourism Demonstration	Spicers Retreats	QLD	Cunningham's Gap	Advanced development				

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Toyota Ecopark Hydrogen Demonstration (Toyota Hydrogen Centre)	Toyota Motor Corporation Australia	VIC	Melbourne	Under construction	2021	0.26	80	kilograms per day
Western Sydney Green Gas Project	Jemena	NSW	Sydney	Under construction	2021	0.50	53	tonnes per annum
Hydrogen Park South Australia	AGN/AGIG	SA	Adelaide	Operational	2021	1.25	20	kilograms per hour
Hazer Commercial Demonstration Plant	Hazer Group	WA	Perth	Under construction	2021		100	tonnes per annum
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Arrowsmith Hydrogen Project - Stage 1	Infinite Blue Energy	WA	Dongara	Advanced development	2022	50	25	tonnes per day
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Hydrogen Park Murray Valley	AGN/AGIG, ENGIE	VIC	Wodonga	Advanced development	2023	10		
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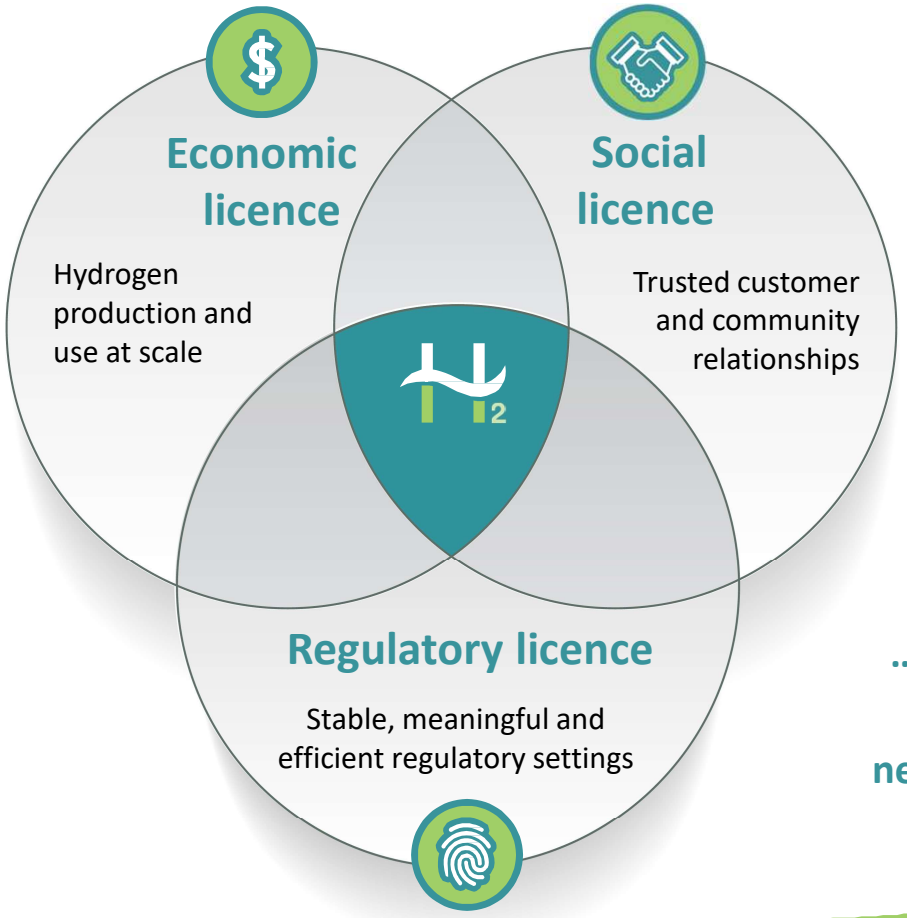
Policy settings to create the industry

AUSTRALIAN HYDROGEN COUNCIL

Framing with the three licences to operate for a sustainable hydrogen industry…



…and prioritising demand side policy to then bring the necessary investment in supply

Getting to scale – AHC White Paper conclusions

AUSTRALIAN HYDROGEN COUNCIL

The hydrogen opportunity is real

- Hydrogen complements renewable electricity and batteries to get to net zero
- It also reflects a new export opportunity

The development of hydrogen at scale will be a considerable task – billions of dollars in investment

- Planning and >$10 bn funding are required to get there
- It is a multi-year (decade?) proposition to get to scale
- But also so large we need to start now

Start with heavy transport and industrial processes

- Are more dependent on clean hydrogen for decarbonisation
- Can drive large sources of new demand

Recommendation 8: Support hydrogen for hard-to-abate industries

We recommend that the Australian Government funds a hydrogen readiness programme of at least A$1 billion for industrial processes that cannot readily be electrified, including (and not exclusively) for the production of steel, ammonia, methanol, and alumina/aluminium.

Funding would be drawn from the Net Zero Fund and should be aligned with funding from state/territory governments.

Funding should be prioritised for projects that protect or create local jobs and have a detailed plan for skilling and re-skilling. Applicants should be required to share information to support industry knowledge development – this could be assisted by engaging with industry associations to support delivery.

AHC priorities

AUSTRALIAN HYDROGEN COUNCIL

International relationships

Working with governments and industry associations in Australia and overseas to grow the hydrogen industry, make connections and share information.

Driving investment

Supporting the industry and its partners to understand and manage risk.

Guarantee of Origin

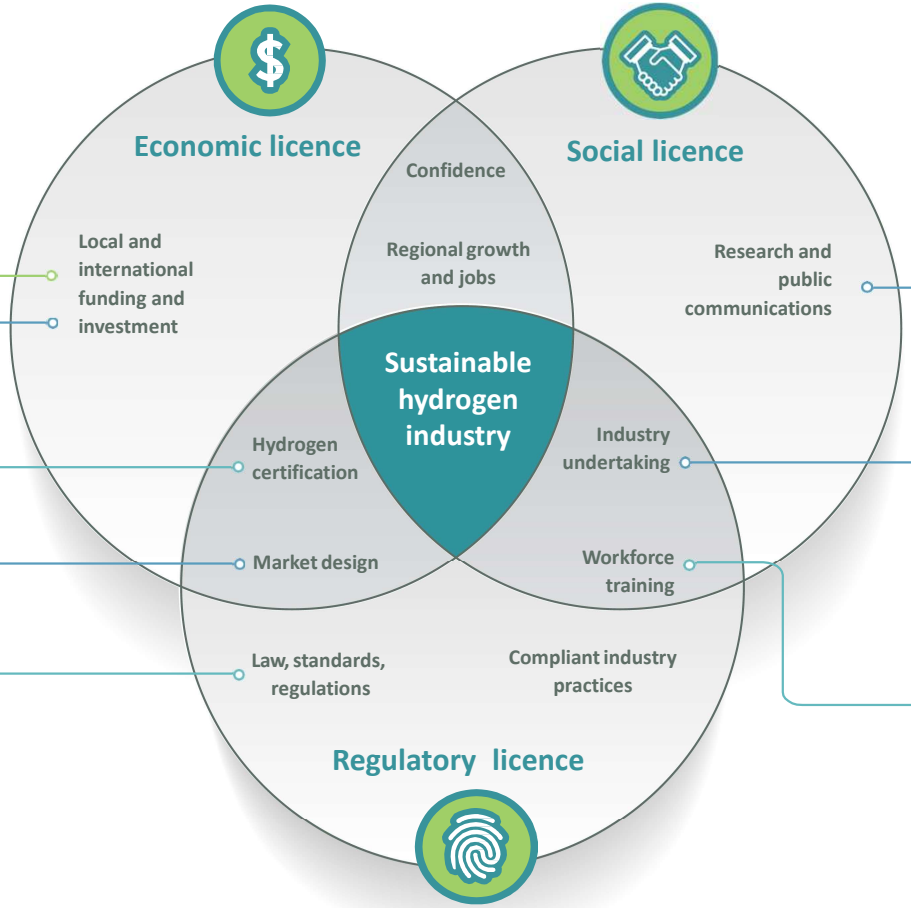
Working with Australian Government to deliver customer confidence about emissions.

Regulation to value the benefits

Developing market activation policies to drive demand and connect energy markets and transport markets.

Developing a trusted and safe industry

Working with Standards Australia and jurisdictional regulators on technical regulations.



Social licence package

Working with stakeholders on:

- An industry undertaking
- Public communications
- Toolkit for Councils

Convening Parliamentary Friends of Hydrogen group.

Legend

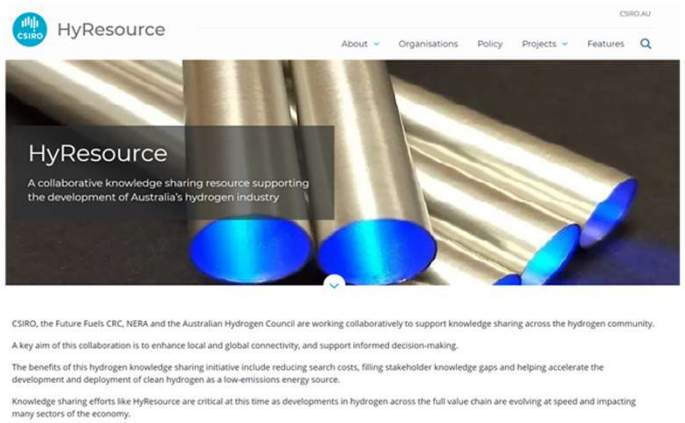
- Shared coordination role
- AHC engagement with other processes
- AHC lead role

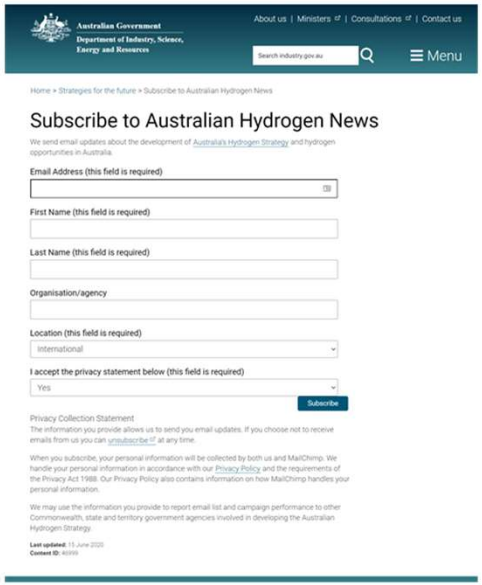
Workforce planning

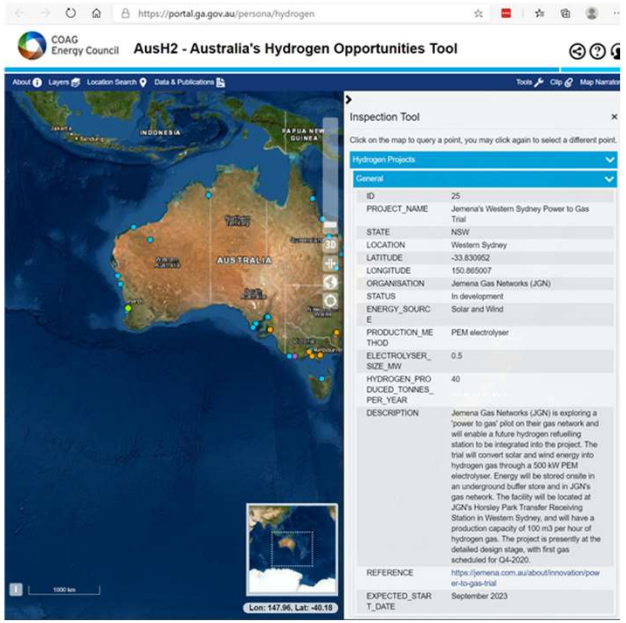
Working with SA Government on understanding and planning for the future hydrogen workforce.

Some references

- https://research.csiro.au/hyresource/
- https://www.industry.gov.au/data-and-publications/australias-national-hydrogen-strategy
- www.ga.gov.au/scientific-topics/energy/resources/hydrogen
- https://arena.gov.au/renewable-energy/hydrogen/
- www.H2council.com.au







AUSTRALIAN HYDROGEN COUNCIL

Thank you

For more information:
h2council.com.au