

THE ANZ HYDROGEN HANDBOOK VOL II

AUSTRALIA AND HYDROGEN

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Global focus on net-zero emissions has put a spotlight on the production of low emission hydrogen and its use in new sectors such as electricity generation and transportation. With its versatility in energy production, direct combustion and as a transport fuel, countries around the world are turning their attention to hydrogen.

Australia is well positioned to produce, use, and export hydrogen – with a clear focus on green hydrogen. Continued investment and development will help to ensure Australia’s competitive place in the global hydrogen industry as a thought leader and as an exporter.

A switch to hydrogen for Australia would not only be expected to avoid greenhouse gas emissions equivalent to one third of Australia’s fossil fuel emissions by 2050, but also generate an additional A\$50 billion of GDP while creating more than 26,000 jobs.⁴¹

With an estimated 262,000 square kilometres of space available to be used for hydrogen (circa 3% of Australia’s land and larger than the average EU member state), stable political system and favourable geography, Australia is in a prime position to utilise hydrogen for energy, transportation, and export.⁴²

The hydrogen export industry could reach 382 petajoules (PJ) in 2040 contributing over A\$2.5 billion to the economy while employing over 4,000 people.⁴³ Overall, the hydrogen export industry could create over 16,000 jobs and add over A\$10 billion to the economy, through increased spending and employment along the entire supply chain needed for export in mostly regional areas.⁴⁴

1. ENERGY OPPORTUNITY

Hydrogen can play a vital role as the grid transitions towards variable renewable energy, helping to smooth out the system. Excess renewable energy from solar or wind which is not needed by the electricity system can be used to power electrolyzers to form green hydrogen. This could see further integration of renewables into the National Electricity Market (NEM) and improve grid responses.

By 2050 it is expected that 15% of the world’s global energy use will be from hydrogen, as countries turn toward low emission or green energy.⁴⁵

2. AUSTRALIA’S HYDROGEN EXPORT POTENTIAL

Australia is expected to service 9.1% of global export demand for hydrogen in 2025.⁴⁶ With its available land, renewable energy and stable political system, Australia is a prime candidate in the global hydrogen export industry. Many of Australia’s major trading partners are both interested in hydrogen usage but do not have the same characteristics as Australia to produce it, yielding a sizable export opportunity for Australia.

To be able to export hydrogen, investment in infrastructure is necessary. Proposed regional hydrogen hubs all have

direct access to deepwater port infrastructure that is currently used for bulk commodity throughput. With minor investments and upgrades, these ports can support the storage and transportation of hydrogen.

As of the 2022 hydrogen strategy report by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), there are 45 projects in Australia which plan to use hydrogen chemical feedstock for both export and domestic markets, and 23 renewable based ammonia production plants in Australia- with several of the larger plants aiming to export.



Hydrogen Hubs (csiro.au)

Australia has seven regional hydrogen hubs which are based in:

1. The Pilbara and Kwinana in Western Australia
2. The Hunter in New South Wales
3. Bell Bay in Tasmania
4. Gladstone in Queensland
5. Port Bonython in South Australia.

AUSTRALIA HAS A COMPETITIVE ADVANTAGE OVER OTHER POTENTIAL HYDROGEN EXPORTING COUNTRIES.

3. WHY AUSTRALIA?

Australia has a competitive advantage over other potential hydrogen exporting countries such as Norway, Qatar and the USA.⁴⁷

Australia’s main advantages come from:

- Lower costs of hydrogen production, storage and transportation;
- Pre-existing relationships with trade partners that are likely to have strong demand for hydrogen.

Cost of production

In the 2018 hydrogen roadmap the Commonwealth Scientific and Industrial Research Organisation (CSIRO) forecast the levelized cost of hydrogen (LCOH) for various production technologies. The LCOH represents the net present value of the unit cost of hydrogen over a hydrogen production asset's lifetime (taken as a proxy for breakeven hydrogen price).

From these estimates, proton exchange membrane (PEM) electrolysis is the most suitable production method for export. The capital expenditure necessary for a PEM electrolyser is high, but PEM electrolysers are flexible allowing them to operate with variable renewable energy power supply, helping to minimise the cost of inputs during peak pricing periods. Operators could store excess renewables supply during low demand or price periods by turning it into hydrogen, which could balance out the investment.

Renewables pricing

Fifty-70% of the production cost of hydrogen is the cost of electricity.⁴⁸ Australia's relative abundance of renewable energy forms a viable means of hydrogen production power. The continued roll out of renewable energy is key to Australia's green hydrogen future.

Green hydrogen is a key focus for many countries. Under this process, renewable electricity generated from solar, wind or other forms splits water into hydrogen and oxygen in an electrolyser. Renewable energy access is therefore central to green hydrogen production. Renewable energy zones (REZs) will play an important role in green hydrogen production and the broader Australian renewables strategy. REZs are clusters of large-scale renewable energy projects which can be developed using economies of scale.

REZs will be serviced by new transmission network infrastructure, including high-capacity transmission lines, poles, wires, and energy hubs which will transfer power generated by solar and wind farms to electricity users. This infrastructure will be critical for the successful operation of REZs, helping to transport generated and stored power to end users or into hydrogen production.

Storage and transportation

Australia has an abundance of unused liquid natural gas, coal, and oil assets which could be used as hydrogen storage facilities. Hydrogen is usually stored via compression in storage tanks, in salt caverns or by turning hydrogen into ammonia or into a liquid state. Pre-existing storage facilities which were previously used in the oil and gas industry can be leveraged to become hydrogen compatible quickly and without too much investment. Pre-existing infrastructure able to be readily converted to support hydrogen enhances Australia's ability to use and export it.

Hydrogen for domestic use will likely be transported via road or purpose-built pipelines. These are unfeasible for export given Australia's geographic position. For longer distances, shipping remains the most viable, with an estimated cost of between A\$0.03 and A\$0.61/tkm.⁴⁹ All seven regional hydrogen hubs have access to deepwater ports, reducing unnecessary costs nonrelated to shipping. Access to Asia remains feasible with Japan, Korea and China all expected to have increasing demand with little ability or space to produce their own hydrogen.

Other hydrogen vectors (form of transporting hydrogen) such as methanol (CH₃OH, liquid) or ammonia (NH₃, gas) are likely to be used due to their relative stability and cost effectiveness compared to transporting hydrogen in its pure gaseous form.

In April 2022, a world first pilot project to export liquid hydrogen, the Susio Project, successfully exported liquid hydrogen from Victoria to Japan. It was the first of its kind shipping liquefied hydrogen from one continent to another, and required strong collaboration from the consortium including AGL, Marubeni, and Sumitomo. This highlights Australia's prowess at the forefront of hydrogen technology and export.

Trade relationships

Australia has free trade agreements with many countries including Japan, the Republic of Korea, China, and Singapore. The established trade relationships in commodities and energy could be leveraged for hydrogen export, proving a competitive advantage for Australia.

AUSTRALIA'S CURRENT HYDROGEN-RELATED INFRASTRUCTURE

The necessary infrastructure is critical for the production, storage, and transportation of hydrogen. With hydrogen playing an ever-important role in Australia's renewables strategy, there are forecasts for up to A\$80 billion of necessary spend by 2030.⁵⁰ Although an intensive capital outlay will be required, Australia's current infrastructure could be the backbone to support the industry.

Australia has over 15 hydrogen projects that have passed financial investment decision, with several other commercial stage projects in early phases, showcasing the

extensive commitments from both the public and private sector into hydrogen related infrastructure.

Current production of hydrogen is c.650 ktpa in Australia and is produced through Natural Gas Steam Methane Reforming (SMR)⁵¹.

Sixty-five percent of the hydrogen produced in Australia is used in the synthesis of ammonia through reacting it with nitrogen gas,⁵² with the rest used in crude oil refining by using hydrogen to remove sulphur from fuels.⁵³

1. PRODUCTION

Central to the production of green hydrogen is a stable and secure electricity source and water - both key inputs to the process.

2. AUSTRALIA'S ENERGY

The Australian energy market operator (AEMO) operates two markets and power systems in Australia, the National Energy Market (NEM) and Wholesale Electricity Market (WEM). AEMO has a mandate to ensure security of electricity and systems, the maintenance of electricity and gas markets, and to lead the future of Australia's energy system.

Having a secure, reliable, and affordable supply of electricity is central for renewable hydrogen development. To supplement traditional energy sources, hydrogen production could be fuelled by renewable energy.

The energy transition and renewable energy is central to the strategy of many public and private sector firms. With that, production and distribution of renewable energy is a focus for Australia's private and public sector. In collaboration, Renewable Energy Zones (REZs) have arisen. REZs are clusters of large-scale renewable energy projects which can be developed using economies of scale to feed energy into the grid. It is expected REZs will play an important role in providing clean energy to produce green hydrogen.

Increased production and transmission projects will help to ensure Australia has viable renewable energy and ensure the security, reliability, and affordability of supply to produce green hydrogen.

3. WATER

Hydrogen can be formed through the electrolysis of water. Electrolysis is a complex process which uses an electric current to convert water molecules (H₂O) into hydrogen (H) and oxygen (O₂). The hydrogen is stored in pipelines and can be used for energy while the oxygen can be released into the air.

Australia has robust water supplies, however desalination and purification plants, dams and pipelines may require investment to ensure pure water is available for electrolysis. Given water's relatively cheap price, the infrastructure in securing and processing it remain a barrier to production.

4. GAS NETWORK

More than 100 natural gas transmission pipelines exist across Australia, connecting gas production centres to distribution networks in major demand centres. Significant research and development projects are being undertaken to assess if current gas transmission channels could be adopted for hydrogen transmission and transportation.

Feasibility studies show that gas blends of 5-20% hydrogen are feasible without the need for significant investment on top of current gas infrastructure.⁵⁴ A national Gas infrastructure plan, announced by the Australian Government in the 2020 Budget, provides an outlook for the next 20 years of investment, highlights the potential to leverage current infrastructure for hydrogen transportation.

5. LAND TRANSPORTATION

With vast expanses, road, and rail transportation play an important role in connecting Australia internally. Before 2025, it is expected that road and rail transport will be the dominant method of hydrogen transport until pipelines are further developed.⁵⁵ Australia has developed a network for domestic transport of hazardous chemicals and liquid natural gas through existing supply chains. These systems and practices can be leveraged for hydrogen, with changes to existing facilities as needed to cater for specific projects and safety and regulatory requirements.

Hydrogen can be compressed to pressures between 200-700 bar and transported via truck which is already used for small scale projects. For longer distances, trucking liquid hydrogen is a more economical means, providing greater trucking capacity reducing the number of trips needed and the associated expense. Either way there is a reliance on Australia's road system for transportation.

6. HYDROGEN STORAGE FACILITIES

After transportation, hydrogen is normally kept in tanks dependent on if it is liquified, compressed, ammonia or Methylcyclohexane (MCL). Technical expertise is readily available from the existing chemical, oil and gas industry to make storage solutions hydrogen compatible.

Longer term solutions are being explored, with possibilities of storing hydrogen in salt caverns, or pre-existing depleted gas fields. Australia currently has seven locations for natural gas storage on the east coast, with two other spots in Western Australia highlighting potential hydrogen storage infrastructure.

7. PORT INFRASTRUCTURE

Australia plans to be a key player in the export of hydrogen into the Asian region and became the first country in the world to export hydrogen when it shipped a liquified form to Japan in 2022.⁵⁶ With aspirations to be the dominant East Asian hydrogen exporter, it is estimated the investment spend to reach that level could be up to A\$80 billion.⁵⁷

For international transport, shipping remains the only viable means of transportation given price and distance. Multiple Australian ports currently ship ammonia highlighting that Australia already has infrastructure in place to export hydrogen. The National Hydrogen Strategy identified 30 potential ports which could be developed into hydrogen export hubs due to existing and potential infrastructure capacity: providing capacity and capability for electricity, water, gas pipelines and storage.

If hydrogen were to be liquified prior to shipping, liquefaction plants and loading facilities should be placed in a close vicinity to minimise any losses in transportation and boil off. Importantly any conversion of hydrogen into other carrier forms other than its natural gaseous state will require additional power infrastructure to be installed to ensure a stable and consistent energy source.

All in all, Australia's current infrastructure could support hydrogen production, however, will require research, development and investment for future scale.

AUSTRALIA'S NATIONAL HYDROGEN STRATEGY

The Federal Government and the Council Of Australian Governments (COAG) Energy Council commissioned the Chief Scientist to develop the blueprint for a national hydrogen strategy. The final National Hydrogen Strategy was released at the November 2019 COAG Energy Council meeting in Perth. In February 2023, the Energy and Climate Change Ministerial Council (ECMC) agreed to review the strategy.⁵⁸

The National Hydrogen Strategy aims to position Australia's hydrogen industry as a major global player by 2030. Notably, individual states also have hydrogen strategies or programs in place. Australia is endeavouring to find ways to approach hydrogen in a 'clean' way with many of the funding mechanisms supporting green technologies and production.

While Australia prioritises hydrogen and was an early adopter in providing a published government document, other countries are in development of or have published strategies for hydrogen. There was a significant uptick from 2020 particularly in European countries around the time when the European Commission published a strategy paper. Countries in the table below have published documentation, strategies and / or roadmaps in relation to Hydrogen (either with involvement or commissioned by respective government, at October 2023).⁵⁹ This table is not an exhaustive list.

Countries Adopting a Hydrogen Strategy

2019	2020	2021	2022	2023
Australia	Canada	Belgium	China	Algeria
Austria	Chile	Colombia	Croatia	India
Japan	EU Commission	Czech Republic	Greece	Ireland
New Zealand	Finland	Hungary	Namibia	Malaysia
Norway	France	Luxembourg	Oman	Türkiye
South Korea	Germany	Morocco	Singapore	United States
	Italy	Paraguay	South Africa	
	Netherlands	Poland	Switzerland	
	Portugal	Russia	Uruguay	
	Spain	Slovakia		
		Sweden		
		Ukraine		
		United Arab Emirates		
		United Kingdom		
		United States		

Source: CSIRO- HyResource

WHAT IS AUSTRALIA DOING NOW?

Australia's National Hydrogen Strategy⁶⁰, as published in 2019, has several key pillars to guide its focus. The strategy outlines the aim to reduce entry to market barriers, create supply and demand within the market and be globally market competitive from a cost perspective. The policy outlines that to achieve these goals, the Australian Government will work with states to support and develop the Australian (particularly clean) hydrogen industry and aim for unity in the regulatory and approval processes across the nation. The Australian Government also outlined their intentions to support partnerships while prioritising the safety and environmental benefits for Australia.

Australia has demonstrated the importance of the hydrogen industry, in Australia, as the DCCEEW released 'State of Hydrogen 2021' and 'State of Hydrogen 2022' in 2022 and 2023 respectively. Regarding Australia's National Hydrogen Strategy, the Energy and Climate Change Ministerial Council (ECMC)'s review of the 2019 document remains in line with the initial pledge to be a hydrogen world leader by 2030 as other countries gain momentum in releasing their own strategies and domestic agendas. The ECMC highlight up to A\$300⁶¹ billion of potential hydrogen investments as well as Australia being home to the largest project pipeline in the world as key opportunities the strategy will be developed around. The Australian Government is the lead in the review, with support from the States and Territories.

THE HYDROGEN HEADSTART PROGRAM AND GUARANTEE OF ORIGIN SCHEME ARE TWO KEY PILLARS OF THE STRATEGY.

Australia has several key programs to support industry development. The **Hydrogen Headstart Program** and **Guarantee of Origin Scheme** are two key pillars of the strategy. Additionally, hydrogen is a component of the Rewiring the Nation program which the Australian Government is investing A\$20 billion in upgrading and transforming the electricity grid.⁶² The Australian Government is also implementing the Safeguard Mechanism which aims to reduce emissions of top industrial emitters. It aims to do this by implementing a baseline which continues to reduce over time.

HYDROGEN HEADSTART PROGRAM

In the 2023- 2024 Federal budget, the Australian Government pledged A\$2 billion for a Hydrogen Headstart Program. This is being administered and designed by the Australian Renewable Energy Agency (ARENA) and DCCEEW.⁶³ They have worked to design the program in conjunction with other stakeholders including the CEFC (Clean Energy Finance Corporation). The purpose of this program is to help accelerate the development of Australia's hydrogen industry with emphasis on large scale green hydrogen projects.

In addition to the A\$2 billion, there will be funding of A\$2 million over two years to support First Nations communities in engaging with developers of relevant projects.⁶⁴

Successful candidates will receive funding as a production credit, the purpose of this is to bridge the gap between the cost of hydrogen produced from renewables and its market price.

The program will be implemented by ARENA who will select large Australian-based projects that produce hydrogen from renewables (or from derivative products made from hydrogen, including ammonia).

Expressions of interest were opened in October 2023, with project selection due to be completed by the end of 2024.

Shortlisted candidates were announced in December 2023 and are listed in the table.⁶⁵

Applicant	Project	Electrolyser Size (MW)	State	End Use
bp Low Carbon Australia Pty Ltd	H2Kwinana	105	Western Australia	Ammonia, Sustainable Aviation Fuel, Minerals processing
HIF Asia Pacific Pty Limited	HIF Tasmania eFuel Facility	144	Tasmania	e-Fuels
KEPCO Australia Pty Ltd (Korea Electric Power Corporation)	Port of Newcastle Green Hydrogen Project	750	New South Wales	Ammonia
Origin Energy Future Fuels Pty Ltd	Hunter Valley Hydrogen Hub	Phase 1 – 50 / Phase 2 – 200	New South Wales	Ammonia, Mobility
Stanwell Corporation Limited	Central Queensland Hydrogen Project	720	Queensland	Ammonia
Murchison Hydrogen Renewables Pty Ltd as trustee for Murchison Hydrogen Renewables Project Trust	Murchison Hydrogen Renewables Project	1,625	Western Australia	Ammonia

Source: Australian Government - ARENA

GUARANTEE OF ORIGIN SCHEME

The Australian Government pledged A\$38.2 million⁶⁶ for the Guarantee of Origin (GO) scheme which, while not exclusive to hydrogen production, is a program which will apply to all clean energy products and assess and certify their emissions level. This is a relatively unique approach and will likely stabilise some of the uncertainty around the qualitative aspects of green hydrogen and its full carbon cost.

Participation in the 'GO' scheme is optional and a further A\$2.2 million in funding has been provided to assist in the designing and drafting process. The proposed design opened for consultation in September 2023.⁶⁷

NATIONAL AGENCIES AND BODIES

Australia has several key agencies which contribute to facilitating funding and shaping policy:

ARENA (Australian Renewable Energy Agency)	<ul style="list-style-type: none"> Established by the Australian Government. Aims to improve cost competitiveness of renewable technologies and help Australia meet its emission reduction targets. Provides knowledge sharing and funding to achieve these targets. Administers the Hydrogen Headstart Program.
CEFC (Clean Energy Finance Corporation)	<ul style="list-style-type: none"> Considered Australia's 'green bank', and aims to invest in the transition to Net Zero by 2050. Has a A\$300 million Advancing Hydrogen Fund which aims to advance green hydrogen cost competitiveness in Australia.⁶⁸ Administers the Clean Energy Innovation Fund which invested A\$28.5 million⁶⁹ across four hydrogen related transactions during the 2022-2023 year.
AHC (Australian Hydrogen Council)	<ul style="list-style-type: none"> The peak industry body for advancing Australia as a hydrogen leader. They often represent the industry to governments and other stakeholders. Focused on building a sustainable hydrogen industry through three lenses; economic, social and regulatory. AHC also runs several working groups and conferences and provides policy papers, submissions and other resources.



OTHER KEY MARKETS

UNITED STATES

While the United States initially lagged behind Australia and much of Europe in their pursuit of hydrogen opportunities, they have since made significant financial and strategic pledges which has solidified their position as an important player in the hydrogen industry. In a strategy paper, released in June 2023, the United States outlines extensive opportunities for clean hydrogen with up to 10 million metric tonnes of output by 2030 and up to 50 million metric tonnes by 2050.⁷⁰ Further key points of this strategy are reducing the cost of clean hydrogen and a focus on regional areas as opportunities to spread infrastructure. The introduction of the Inflation Reduction Act (IRA) signals a shift for the United States towards the energy transition and capitalising on the opportunity for manufacturing in the United States⁷¹. Most of the funding is drawn from significant tax credits. For hydrogen, the Act does not specify a use of certain technique or technology to qualify for funding and credits. Rather, the emphasis is on emissions reduction⁷², allowing wider uptake across industries. The total of all policies in relation to clean energy and climate change programs is targeted to be US\$369 billion (A\$520 billion).⁷³ In October 2023, the Biden-Harris administration announced they had selected seven regional hydrogen hubs to receive US\$7 billion⁷⁴ in funding from a different bill, the 2021 Bipartisan Infrastructure Law.

GERMANY

Germany has been a leader in embracing hydrogen, being an early adopter of the strategy dialogue in line with the European Union and subsequently wider Europe. Germany released an initial strategy paper in June 2020, and updated in July 2023. The ambition behind Germany's hydrogen strategy is climate protection as they aim for net zero greenhouse gas emissions by 2045.⁷⁵ While not diverging from renewable energy as costs remain high for hydrogen, opportunities have been identified in growing and developing new industry with emphasis on emerging technologies in Germany. Germany is committed to the energy transition and has committed funding through their Recovery and Resilience plan. This funding included EUR€3.3billion for decarbonising the economy, with a particular focus on green hydrogen and EUR€1.5 billion⁷⁶ towards all stages of green hydrogen development, including transportation and infrastructure. Following volatility in the oil and gas market, Germany also partnered with Canada in 2022⁷⁷ on bilateral green hydrogen co-operation including establishing a supply corridor and Canada exporting hydrogen to Germany by 2025.⁷⁸

JAPAN

Japan has been an early adopter of engaging in the discussion around hydrogen, notably green and blue hydrogen. A 'Basic Strategy for Hydrogen' released in 2017, highlighted Japan's strong prioritisation of reducing the cost of hydrogen to make it a competitive option and

increase uptake. The 2017 roadmap outlined a target price of US\$3 per kilogram in 2030 reducing to US\$2 in 2050.⁷⁹ While Japan has continuously engaged in revising and publishing their goals and policies for hydrogen through several papers and announcements, a revised edition of the 'Basic Strategy for Hydrogen' was released in June 2023 after being approved by Cabinet. The revised strategy sets some ambitious targets including increasing annual supply of hydrogen to 12 million tonnes by 2040.⁸⁰ Currently, the majority of hydrogen Japan utilises is from fossil fuels, however, into the future they are looking into both green (renewable) and blue (carbon capture) hydrogen options. Japan is also prioritising international partnerships, where necessary, with focus on the green and blue hydrogen being used in a number of forms including transport, industrial uses and for the generation of power to assist in the decarbonisation process. In the revised update, Japan is also looking at the installation target of 15GW⁸¹ of electrolyzers, with a focus on Japanese manufacturers, where possible. To achieve these goals and their strategy, the Japanese Government intends to invest ¥15 trillion (US\$107.5 billion)⁸² in hydrogen strategies and policies to aid the decarbonisation process.

SOUTH KOREA

South Korea released their initial hydrogen roadmap document at the beginning of 2019 with ambitions to shift away from traditional grey hydrogen into a lower carbon intensive approach. A key emphasis, which stands apart from many other nations, is their pledge towards hydrogen fuel cell vehicles, where, by 2040, South Korea plans to manufacture 6.2 million in addition to 1200 refilling stations.⁸³ This includes a mix of passenger cars, taxis, buses and trucks. South Korea is likely to be one of the largest export destinations for large suppliers, one of which is likely to be Australia as trade increases between the two nations. In November 2022, the South Korean Government announced plans to create a firmer supply chain to further develop their hydrogen policies. In January 2023, the South Korean government announced US\$193 million⁸⁴ in funding for six cities to have significant hydrogen investment in fuels cells and various blue hydrogen projects. In 2021, during a visit to Australia by the South Korean President, a strategic partnership⁸⁵ was announced by the Morrison government between the two countries for investigation into clean energy, including green hydrogen. The South Korean government has also created a Hydrogen Generation Bidding Market where producers produce power with hydrogen or hydrogen compounds (including ammonia) can sell their power to operators, both regional and the Korea Electric Power Operator. Korea Power Exchange have selected some winning bidders and this could drive demand in Australia.

WHAT ELSE IS HAPPENING AROUND AUSTRALIA?

Victoria	<p>Victoria is engaged in the hydrogen dialogue with the 'Victorian Renewable Hydrogen Development Plan', which is aligned with the National Hydrogen Strategy. Victoria's blueprint outlines the opportunity for hydrogen, including the potential for 7,600 jobs and A\$11 billion added to the economy annually.⁸⁶ Moving forward, the establishment of hubs and sector coupling is a key priority for the plan in Victoria.</p> <p>In Victoria, the Hydrogen Park Murray Valley located in Wodonga is a key project which has received A\$12.3 million in funding from the Victorian Government in addition to the A\$36 million⁸⁷ from the Australian Renewable Energy Agency (ARENA).</p>
New South Wales	<p>New South Wales places significant value on green hydrogen in their October 2021 'NSW Hydrogen Strategy' report. They also have a 'Net Zero Industry and Innovation Program' report which ties in with NSW's shift to reducing carbon emissions.</p> <p>Key priorities include reducing the cost of green hydrogen significantly, to under A\$2.80 by 2030 with up to A\$3 billion in funding to provide incentives for development in this area. NSW is aiming to produce 110 tonnes of annual green hydrogen and having 700MW of electrolyser capacity by 2030.⁸⁸</p> <p>Key initiatives NSW has supported are the Hume Hydrogen Highway Initiative which is a refuelling network project. NSW also undertook a Hydrogen powered bus trial in 2023 to determine how hydrogen can be used as a fuel source in the future.⁸⁹</p> <p>It has also pledged A\$25 million⁹⁰ to support a Hydrogen Centre of Excellence to help train plumbers in hydrogen specific skills.</p>
Western Australia	<p>Western Australia (WA) released their Renewable Hydrogen Strategy in 2019. This strategy emphasised the importance of hydrogen development to the state as a dedicated Renewable Hydrogen Unit was put into place. A\$10 million was also pledged over four financial years in the Renewable Hydrogen Fund. This commenced 2019-2020.</p> <p>The strategy outlined some key focuses for WA. These are export, remote applications, hydrogen blending in natural gas networks and transport.</p> <p>In August 2020, the WA Government announced A\$22 million for nine initiatives for the future of renewable hydrogen, in line with their Covid- 19 Recovery Plan. The WA Government have continued to invest in renewable hydrogen with a further A\$50 million announced as a part of the 2021-22 budget and A\$117.5 million for the Pilbara and Mid-West based renewable hydrogen hubs. This aims to establish WA as a clean energy hub and attract federal government funding.</p> <p>The 2022-2023 Budget, released in October 2022, confirmed that several WA projects would be receiving funding through the Commonwealth Government's Regional Hydrogen Hubs program. Key WA recipients of Hub Implementation Grants in WA are bp Australia's H2Kwinana Clean Hydrogen Industrial Hub and Western Australian Government's Pilbara Hydrogen Hub. Each of these projects have been granted up to A\$70 million.</p> <p>The WA Government is currently looking at refreshing its strategy, as announced in September 2023.⁹¹</p>

South Australia	<p>South Australia embraced hydrogen early when releasing their hydrogen strategy paper in 2019, the South Australian 'Hydrogen Action Plan'.</p> <p>They outlined five key pillars within the plan. South Australia believes they are set up to be a green hydrogen leader as they already have the land, sun, wind and much of the infrastructure required.</p> <p>SA are prioritising hydrogen infrastructure investment while integrating the energy system to support hydrogen. SA is also emphasising the importance of trade and supply relationships while putting value investing in the workforce and innovation with a sound and robust regulatory framework in place.</p> <p>To date, SA have made approximately A\$15 million in grants and A\$25 million in loans to megawatt scale hydrogen projects⁹² including AGIG's Hydrogen Park and H2U's Eyre Peninsula Gateway Project.</p>
Queensland	<p>Queensland's hydrogen strategy report the 'Queensland Hydrogen Industry Strategy 2019-2024' was released in 2019 with targets for 2030. The strategy seeks to outline goals to support innovation and public and private sector investment. Queensland is also looking to build community awareness around hydrogen while enhancing a policy framework and developing the skill set for the workforce in Queensland. The Queensland Government has committed funding through the 'Queensland Hydrogen Industry Development Fund' which has now committed A\$35 million to several hydrogen related projects.</p> <p>The 'Queensland Renewable Energy and Hydrogen Jobs Fund' now has funding of A\$4.5 billion. Hydrogen projects which have been granted funding include A\$28.9 million for the Kogan Creek Renewable Hydrogen Demonstration Plant and A\$15 million to a Gladstone based large-scale hydrogen export project.</p>
Tasmania	<p>The Tasmanian Government have expressed their intention for investment in green hydrogen through their 'Tasmanian Renewable Hydrogen Action Plan'. Released in 2020, Tasmania had ambitions to produce and use hydrogen locally by 2024 and export hydrogen by 2027⁹³.</p> <p>Tasmania is funding this plan through the 'Tasmanian Renewable Hydrogen Industry Development Funding Program'. Through this program, the Tasmanian government is providing A\$50 million⁹⁴ for hydrogen related projects and programs.</p>
Northern Territory	<p>The Northern Territory (NT) 'Northern Territory Renewable Hydrogen Master Plan' was released in October 2021. The plan is broken up into stages where they will research, plan and trial before active hydrogen projects with the last stage being export.</p> <p>The NT has identified renewable hydrogen as a key industry to assist in the transition as they aim to be net-zero by 2050.⁹⁵</p> <p>The NT Government has committed A\$5 million⁹⁶ in funding over a four-year period, in June 2022. This funding aims to grow the hydrogen industry in the Northern Territory. Also in 2022, the NT Government signed a Memorandum of Understanding regarding development of the Darwin H2 Hub project with Total Eon.⁹⁷</p>
Australian Capital Territory	<p>The Australian Capital Territory (ACT) aims to be net zero emissions by 2045 and in 2020 announced that green hydrogen will be a key factor in achieving this goal.⁹⁸</p> <p>The ACT are well underway in their journey towards the expansion of the green hydrogen industry with projects including a test facility which looks at the gas network and how it can decarbonise, a hydrogen refuelling station and a renewable hydrogen cluster.</p>

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