Australia Hydrogen Market Tracker: Second half 2022
Market update April–October 2022
November 2022
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Executive summary

Hydrogen industry development: Second half 2022 (April–October)

• Nearly 50 new hydrogen-related projects and feasibility studies were announced in April–October 2022, 60% of which involve green hydrogen production.
• A decline in export-related project announcements gives way to a wave of domestic demand developments with a focus on mobility and industrial uses.
• The Australian Energy Market Commission (AEMC) proposed reforms to extend the regulatory framework to hydrogen and renewable gases, paving the way for the development of a domestic hydrogen market.

Australia’s hydrogen ambitions

• The support for a globally competitive hydrogen industry is backed by the government’s ambitions to diversify Australia’s energy system, improve energy supply security, advance decarbonization, and create jobs and economic growth. Government policy and support mechanisms will help prioritize hydrogen in Australia’s energy-related investments, with hydrogen eligibility included in over A$17 billion in announced funding (since 2018).
• Australia’s hydrogen ambitions are underpinned by the National Hydrogen Strategy that sets a goal for the nation to become a global supplier of clean hydrogen by 2030 and estimates the industry could generate over A$11 billion a year in GDP by 2050. The government has since announced progress on several of the initiatives that emerged from the National Hydrogen Strategy, including:
  • Certifying hydrogen production: A proposed approach to the design of an Australian hydrogen Guarantee of Origin (GO) certification scheme was released in June 2021—trials commenced in December 2021 with 19 participants as of July 2022.
  • Regional hydrogen export hubs: More than A$530 million in federal funding is earmarked for the creation of eight regional hydrogen hubs to drive domestic demand and support scalability for the hydrogen industry. Funding recipients include Bell Bay, Tasmania; Hunter Valley and Port of Newcastle, New South Wales; Pilbara and H2Kwinana, Western Australia; Gladstone and Townsville, Queensland; and Port Bonython, South Australia.
  • International collaborations: The federal government has partnered with other countries to attract investments, build supply chains, and advance research and development to establish the foundations for a major hydrogen export industry. Collaborations have been announced with the United Kingdom, Germany, Japan, South Korea, Singapore, and the United States.
• Each state and territory has released its own plans to develop a hydrogen industry, focused on the development of the domestic market and the establishment of foundations that will enable Australian exports to be competitive in the global market.
Federal elections—new energy policy, emissions target, and budget

Newly elected Labor party to accelerate Australia’s energy transition through renewable energy and green hydrogen

Elections

- On 23 May 2022, Anthony Albanese was sworn in as the 31st prime minister of Australia following a decisive victory of the Australian Labor Party over the Liberal-National Coalition, ending nine years of consecutive rule. Climate policy was at the forefront of the transition of power with the newly elected government committing to reducing emissions and promoting renewable energy.
  - The newly elected government’s energy policy is centered around its Powering Australia plan that aims to increase renewable generation share to 82% by 2030, upgrade the electricity grid, invest in green metals manufacturing, support industry with fuel switching to cleaner fuels such as hydrogen, invest in hydrogen electrolyzers, and promote the development of green hydrogen production and export. The new government is expected to prioritize electrolysis-based hydrogen production over fossil fuel–based production with carbon capture and storage (CCS), which was pursued by the previous government.

Emissions target

- On 9 September 2022, the newly elected Labor party successfully passed the Climate Change Bill 2022 that solidifies Australia’s commitment to a 43% emissions reduction (below 2005 levels) and net zero by 2050. The bill itself does not impose obligations directly on companies but will instead guide new policy on follow-through legislative changes and on future project approvals.
  - The Labor government has put forward reforms to the safeguard mechanism, which places a legislated obligation on Australia’s largest emitting facilities to avoid increases in emissions beyond baseline limits. Under the proposed reforms, the baseline limits would be lowered based on a declining annual aggregate emissions target, reaching net zero by 2050. The safeguard mechanism reforms could lead to an acceleration in decarbonizing manufacturing and mineral processing through fuel switching.

Budget

- On 25 October 2022, the Labor government delivered a new federal budget for the 2022–23 financial year (July–June). The new budget provides funding to promote the uptake of fuel-cell vehicles including an exemption of fringe benefits tax and import tariffs for hydrogen fuel-cell vehicles, with hydrogen mobility further supported by a hydrogen highway initiative that allocates nearly A$90 million to fund hydrogen refueling stations on key freight routes.
  - The new budget retained several initiatives introduced by the previous government’s March 2022 budget including funding for the GO certification scheme, Hydrogen Energy Supply Chain (HESC) project, hydrogen strategy and implementation, regional hydrogen hubs program, and the Clean Energy Finance Corporations (CEFC) advancing hydrogen fund.
  - At least one CCS project that was awarded funding under the Liberal-National Coalition has had the government funds canceled; however, a revised round of grants will be made available to the industry in 2023 under a new government Carbon Capture Technologies program.
## Key policy developments

### Key policy developments in second half 2022

#### Proposed regulatory framework for hydrogen and renewable gases
- On 23 September 2022, the AEMC released a final draft of proposed rule changes to the National Gas Rules and National Energy Retail Rules to include hydrogen and renewable gases. The new regulatory framework will lay the foundations for the development of a decarbonized gas sector and integrate hydrogen into the domestic market. The new rules are expected to be finalized and submitted to energy ministers for approval in November 2022.
- The proposed reforms would extend the regulatory framework to hydrogen for pipeline access, adapt spot gas markets, define settlement and reporting obligations, set gas quality specifications, govern heating values in the retail gas markets, provide consumers with transparency about the type of gas supplied, and extend market transparency and reporting mechanisms.

#### Queensland Hydrogen Industry Workforce Development Roadmap 2022–23
- On 19 July 2022, the Queensland government announced the Hydrogen Industry Workforce Development Roadmap that sets out key workforce development, skills, and training actions to support the development of a hydrogen industry—building on the Queensland Hydrogen Industry Strategy 2019–24 (May 2019) and the A$2 billion Renewable Energy and Hydrogen Jobs Fund (June 2021). The roadmap focuses on building a pipeline of skilled workers in planning and design, construction and installation, operations and maintenance, water treatment, manufacturing, transport, and export.

#### Queensland Energy and Jobs plan
- On 28 September 2022, the Queensland government announced the Energy and Jobs plan that includes initiatives to grow a renewable hydrogen industry through the development of renewable energy zones and hydrogen hubs. The plan lays out initiatives to further support the industry through the preparation of legislations to regulate hydrogen development and land use (2023 delivery) and an update of the Hydrogen Industry Strategy to cover 2024–28 (2023 delivery). In addition, the plan sets a renewable energy target of 80% by 2035.

#### GO trial project participants
- In May 2022, the first phase of the GO trials commenced with the announcement of 19 trial participants to advance the design of the draft GO scheme released in June 2021. The participants include 1 coal gasification project, 3 steam methane reforming (SMR) projects, 14 electrolysis projects, and 1 electrolysis and SMR hybrid project.
### New partnerships announced

#### Partnerships announced in second half 2022

<table>
<thead>
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<th>Partnership</th>
<th>Description</th>
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<tr>
<td><strong>Australia-United States Net Zero Technology Acceleration Partnership</strong></td>
<td>On 17 July 2022, the Australian and US governments signed the Net Zero Technology Acceleration Partnership to accelerate the development of zero emissions technology and cooperate on critical minerals supply chains to reduce greenhouse gas emissions. The partnership will sit alongside a memorandum of understanding (MOU)—signed on the same day—between the Commonwealth Scientific, Research, and Industry Organization (CSIRO) and the US National Renewable Energy Laboratory (NREL) to facilitate a research collaboration in renewable energy and hydrogen.</td>
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<td><strong>Queensland government signs a hydrogen agreement with the Port of Rotterdam</strong></td>
<td>On 11 May 2022, the Queensland minister for Energy, Renewables and Hydrogen signed an MOU with the Port of Rotterdam in the Netherlands to collaborate on opportunities to develop a hydrogen export supply chain.</td>
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<tr>
<td><strong>Singapore-Australia Green Economy Agreement</strong></td>
<td>On 18 October 2022, the Australian and Singaporean governments signed a bilateral agreement to facilitate the trade and investment in green goods and services, promote collaboration to build capabilities in new green sectors, and collaborate on standards and conformance to improve the interoperability of markets. The agreement builds on the low-emissions solution MOU (October 2020) to leverage Singapore’s role as a major global transport hub and Australia’s leading role in growing the use of clean hydrogen and clean ammonia.</td>
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<tr>
<td><strong>Queensland technical and further education (TAFE) signs MOU with Ark Energy to reskill workforce</strong></td>
<td>On 13 July 2022, TAFE Queensland signed an MOU with Ark Energy to upskill and reskill Ark Energy’s workforce at the Hydrogen and Renewable Energy Training facility in north Queensland. The MOU follows the announcement of the development of Ark Energy’s SunHQ hydrogen hub (2020)—backed by the Queensland government—at Sun Metals zinc refinery in Townsville and precedes the launch of the Han-Ho Hydrogen Consortium (September 2022) consisting of Ark Energy and its parent company Korea Zinc, Hanwha Impact, and SK Gas to develop a supply chain to export more than 1 million metric tons (MMt) of green ammonia per annum from Australia to South Korea by 2032.</td>
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</table>
Key developments

Industry funding

- **Clean Hydrogen Industrial Hubs Grants**—announced recipients
  - During April and May 2022, a range of funding announcements were made under the 2022 federal election caretaker arrangements for a total of A$530 million. Hydrogen hub implementation grants were awarded to eight locations, including two each in Western Australia, Queensland, and New South Wales; and one each in South Australia and Tasmania. Hub development design grants were awarded to nine projects, three in Queensland, two in Western Australia, and one each in South Australia, Tasmania, Victoria, and Northern Territory.

- **Queensland hydrogen industry development fund**—round two recipients announced
  - In April and May 2022, the Queensland government announced A$8.7 million in support for three hydrogen projects including a renewable hydrogen–powered passenger ferry, hydrogen fuel cell electric buses, and integration of hydrogen production with wastewater treatment.

- **Project specific funding**
  - Central Queensland Hydrogen CQH2 (Stanwell)—A$15 million for development support from the Queensland Renewable Energy and Hydrogen Jobs Fund
  - Gibson Island Green Ammonia (Fortescue-Incitec Pivot)—A$13.66 million for a FEED study from the Australian Renewable Energy Agency (ARENA)
  - YURI Green Hydrogen Project (Yara-ENGIE)—A$47.5 million for development and construction from ARENA

Reports

- The Australian Energy Market Operator (AEMO) released the **Integrated System Plan (ISP) 2022** on 30 June 2022, which projects up to 58 TWh of power demand from hydrogen production for domestic use by 2050 in the step change scenario—which is the most likely development path put forward for the National Electricity Market (NEM). Furthermore, AEMO projects up to 900 TWh of power demand from hydrogen production for exports and domestic demand under the hydrogen superpower scenario.

- Geoscience Australia is exploring the potential for suitable **underground salt accumulations for large-scale hydrogen storage**. Potential developments were identified in the Canning Basin in northern Western Australia, Adavale Basin in central Queensland, and the offshore Polda Basin in South Australia. However, the identified salt accumulations are generally not located in proximity to proposed hydrogen production regions, which will negatively impact the economics of the large-scale storage solution.

- The Geological Survey of Victoria released a report that investigates the **potential to store hydrogen in depleted gas fields** in the onshore Otway Basin in southwestern Victoria. The findings indicate that some depleted fields are suitable, and have the capacity, for hydrogen storage.
### Key project updates in second half 2022

#### Operational

- **Hazer commercial demonstration plant** is a production technology that can convert methane feedstocks into hydrogen and synthetic graphite. In June 2022, Hazer announced the completion of construction and commissioning with first gas produced, but in July 2022 the transition to hot operating mode had been delayed by fabrication difficulties with the heat-exchange vessel, which is expected to delay the production of hydrogen and graphite to 2023.

#### Under construction

- **Yuri Renewable Hydrogen to Ammonia Project** will construct a 10 MW electrolyzer to replace a portion of the hydrogen production produced through the SMR process at Yara Fertilizers' existing liquid ammonia plant in northwest Western Australia. In September 2022, ENGIE reached the final investment decision coinciding with the release of project details by ARENA that included a confirmation of a A$47.5 million conditional grant. Construction is expected to commence in November 2022 and scheduled to be completed in 2024.

#### Announced

- **Hume hydrogen highway** was announced in July 2022 by the New South Wales and Victorian governments to invest a combined A$20 million in grant funding to support the design and delivery of a hydrogen refueling network between Sydney and Melbourne—Australia’s busiest freight corridor. The project includes at least four refueling stations and 25 hydrogen-powered long-haul heavy freight vehicles.

- **Darwin H2 hub** (Total Eren) was announced as a partnership with the Northern Territory government in October 2022, comprising more than 2 GW of solar photovoltaic (PV) generation capacity for 1 GW electrolyzer capacity capable of producing more than 80,000 metric tons of hydrogen per annum.

- **AGL Energy** announced in June 2022 a partnership for a feasibility study to transform **Torrens Island, South Australia** into a green hydrogen hub and the production of hydrogen-derived products. The feasibility study, expected to be completed by the end of 2022, will map key operational and commercial plans for the project, and outline a development timeline.

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- **In October 2022, ITM Power, Linde Engineering, and the Western Australia government announced funding for a feasibility study into the manufacturing of electrolyzers and renewable hydrogen components within the state.**
Multiple clean hydrogen production pathways and the development of a domestic demand market to set the groundwork for an export industry

Developments across the hydrogen value chain

### Production pathways
- The new federal government is prioritizing the production of green hydrogen.
  - **Electrolysis**—Electrolysis dominates the hydrogen production project pipeline because of the nation’s low population density and high-quality wind and solar resources. More than 153 GW of renewable generation capacity has been proposed to supply electrolysers with nearly 84 GW of combined capacity.
- **Coal gasification**—The government-backed HESC project has successfully completed the world’s first shipment of liquefied hydrogen in early 2022. CCS development is planned in the commercial phase targeted for the 2030s.
- **SMR of natural gas with CCS**—Onshore and offshore gas reserves could be utilized to increase SMR production. Australia’s oil and gas fields and deep saline aquifers provide capacity for carbon storage with one of the largest CCS facilities in operation at Gorgon LNG in Western Australia. Approximately five blue hydrogen projects have been announced in Western Australia and South Australia.

### Domestic demand
- Federal and state governments are supporting the development of a domestic demand market to expedite the rapid expansion of the hydrogen supply chain through regional hydrogen hubs and industry-led technology clusters.
  - **Natural gas network**—Three projects are in operation with six more proposed to integrate hydrogen into the natural gas networks. The AEMC released draft rules in September 2022 to reform market regulations to cover hydrogen blends in the gas network.
  - **Hydrogen-ready power plants**—Federal and state governments have announced funding for the development of four power stations that will be capable of using hydrogen blended with natural gas. Construction commenced on the Tallawarra B power plant in February 2022, which is expected to be operational by the end of 2023, and utilizing a 5% blend of hydrogen in 2025.
  - **Mobility**—Australia’s first public hydrogen refuelling stations opened in the Australian Capital Territory and Victoria in March 2021 with five additional facilities under construction, and 27 additional transportation-related projects in various stages of development.

### Exports
- Federal, state, and local governments are backing efforts to position Australia as a major global supplier.
  - **Trial exports**—In March 2019, as part of a collaboration between Queensland University of Technology and the University of Tokyo, Australia successfully exported green hydrogen to Japan using methylcyclohexane (MCH).
  - **Liquid hydrogen exports**—The HESC Port of Hastings liquefaction and export facilities began operating in March 2021, with the first export cargo to Kobe, Japan, departing in January 2022.
  - **Federal funding**—More than A$530 million has been allocated for the creation of eight regional hydrogen export hubs.
  - **International collaboration**—MOUs have been signed by global and local partners to work toward the development of export terminals and international supply chains.
  - **Project announcements**—More than 46 green hydrogen projects include proposals for hydrogen or ammonia exports. Projects have been proposed in all states and the Northern Territory, a majority of which are in Queensland and Western Australia.

Source: S&P Global Commodity Insights, formerly IHS Markit
Australian hydrogen certification standards are critical to the market valuation and international trade of clean hydrogen

- Internationally agreed upon definitions and standards are a major barrier to hydrogen development. Among them is a system that creates a differentiation between different sources of hydrogen based on their carbon footprint. The carbon accounting methodology highlights the challenges facing the development of an international hydrogen trade.

- Australia is leading two work groups within the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) Hydrogen Production Analysis Taskforce (H2PA) on developing calculations for greenhouse gas emissions for hydrogen production from electrolysis and coal gasification with CCS.
  - The IPHE was formed in 2003 with 21 member countries to facilitate and accelerate the transition to using hydrogen and fuel-cell technologies. The H2PA was established in March 2020 to develop a methodology for determining the greenhouse gases associated with the production of hydrogen. Members include the United States, China, the European Commission, India, Australia, the United Kingdom, Germany, Japan, Russia, South Korea, Canada, Chile, France, and Italy.

- The National Hydrogen Strategy aims to create a well-aligned GO scheme as a key component of the technology-neutral approach to becoming a global supplier of clean hydrogen. Key aspects of the future design of a GO scheme include
  - Product coverage: hydrogen, hydrogen derivatives (e.g., ammonia), related products (e.g., biomethane), downstream products (e.g., “green steel”)
  - Production pathways coverage: electrolysis, SMR of natural gas with CCS, and coal gasification with CCS
  - System boundary: cradle to grave, cradle to receiving port, cradle/well to gate, gate to gate
  - Carbon accounting frameworks and treatment of offsets
  - Administration, legal framework, and reporting requirements

- Hydrogen certification trails began in December 2021 to track emissions from hydrogen production, as well as the type of technology and energy source used to manufacture it. The 18-month trials are being led by the Clean Energy Regulator and Department of Industry, Science, Energy and Resources. As of July 2022, 19 projects are involved in GO trails including coal gasification, electrolysis, and SMR.

- In February 2022, under the Smart Energy Council’s Zero Carbon Certification Scheme, ActewAGL’s hydrogen refueling station in Canberra was certified as Australia’s first renewable green hydrogen produced from 100% renewable energy and with zero carbon emissions. In September 2022, the Smart Energy Council provided precertification for Yara International's green ammonia plant, with construction scheduled to commence in October 2022.
# State and territory policy aligns with the National Hydrogen Strategy

<table>
<thead>
<tr>
<th>Australia hydrogen strategies and policies</th>
<th>Jurisdiction</th>
<th>Policy</th>
<th>Status</th>
<th>Date issued</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Federal</td>
<td>National Hydrogen Strategy</td>
<td>Released</td>
<td>November 2019</td>
<td>Sets a vision for Australia to become a major global player in the clean hydrogen industry by 2030; outlines initial steps that need to be taken to develop national and international hydrogen economies through large-scale production and export; augments the Hydrogen Roadmap published in August 2018.</td>
</tr>
<tr>
<td></td>
<td>New South Wales (NSW)</td>
<td>Hydrogen Strategy</td>
<td>Released</td>
<td>October 2021</td>
<td>Sets a path for developing a hydrogen industry with the aim to reduce the cost of green hydrogen; provides up to A$3 billion of incentives; delivers 110,000 metric tons of annual green hydrogen production by 2030; and drive decarbonization in transport, industrial, and energy sectors to help reach net-zero emissions by 2050.</td>
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<tr>
<td></td>
<td>Victoria (VIC)</td>
<td>Renewable Hydrogen Industry Development Plan</td>
<td>Released</td>
<td>February 2021</td>
<td>Provides a blueprint to fast-track the renewable hydrogen sector with the aim to accelerate decarbonization and promote economic recovery.</td>
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<td></td>
<td>Western Australia (WA)</td>
<td>Renewable Hydrogen Roadmap</td>
<td>Released</td>
<td>November 2020</td>
<td>Sets goals to position Western Australia as a significant producer, exporter, and user of renewable hydrogen; follows the Western Australia Hydrogen Strategy released in July 2019 that identified areas of focus for the development of the industry including export, remote applications, hydrogen blending in natural gas networks, and transport. Western Australia’s goal is to achieve a market share in global hydrogen exports by 2030, like the 12% market share it has in LNG today.</td>
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<tr>
<td></td>
<td>South Australia (SA)</td>
<td>Hydrogen Action Plan</td>
<td>Released</td>
<td>September 2019</td>
<td>Identifies five key areas to help scale up renewable hydrogen production for export and domestic use, including facilitating investment, establishing a regulatory framework, deepening trade relationships, fostering innovation and workforce development, and integrating hydrogen into the energy system.</td>
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<tr>
<td></td>
<td>Tasmania (TAS)</td>
<td>Renewable Hydrogen Action Plan</td>
<td>Released</td>
<td>March 2020</td>
<td>Creates a vision to become a leader in large-scale renewable hydrogen production and a significant global supplier of renewable hydrogen from 2030.</td>
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<tr>
<td></td>
<td>Northern Territory (NT)</td>
<td>Renewable Hydrogen Strategy</td>
<td>Released</td>
<td>July 2020</td>
<td>Presents a five-point action plan addressing local industry development, resource management, growing and harnessing demand, supporting innovation, and responsive regulation.</td>
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Source: S&P Global Commodity Insights, formerly IHS Markit © 2022 S&P Global
Momentum in Australia’s hydrogen industry is accelerating

### Australia hydrogen market development timeline

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<tr>
<th>Year</th>
<th>Event</th>
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<tr>
<td>2008</td>
<td>National Hydrogen Technology Roadmap</td>
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<tr>
<td>2017–18</td>
<td>A Hydrogen Roadmap for South Australia National Hydrogen Roadmap</td>
</tr>
<tr>
<td>H2 2020</td>
<td>Victorian Renewable Hydrogen Industry Development Plan GO scheme International collaborations Germany, Singapore, and Japan Queensland Renewable Energy and Hydrogen Jobs Fund</td>
</tr>
<tr>
<td>H1 2021</td>
<td>New South Wales Hydrogen Strategy Australia’s Long-Term Emissions Reduction Plan A$1 billion Low Emissions Technology Commercialisation Fund GO scheme trials begin</td>
</tr>
<tr>
<td>H2 2021</td>
<td>Queensland hydrogen industry workforce development roadmap 2022–32</td>
</tr>
<tr>
<td>H2 2022</td>
<td>First liquid hydrogen export Australia’s first green hydrogen project certified ActewAGL’s hydrogen refueling station HyGATE initiative funding opens</td>
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**Source:** S&P Global Commodity Insights, formerly IHS Markit

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Hydrogen production included in 86% of the project pipeline

Demonstration projects are under way to explore the use of hydrogen in gas networks, mobility, and power sectors

- Australia’s 11 operating gray hydrogen projects primarily support the agriculture and mining sectors. Production facilities are in Queensland, New South Wales, and Victoria, with one of the world’s largest ammonia production sites located in Western Australia supplying domestic and export markets.

- Gas network, mobility, and power-related projects dominate the more advanced stages of the pipeline, which will help establish the domestic hydrogen market and pave the way for export projects that are primarily in the early phase of development.

- Nearly 55% of the project pipeline is in Queensland and Western Australia thanks to high-quality renewable resources, land availability, established export industries, and strong government support.
Australia accounts for 22% of the global power-to-X project pipeline
Rapid decline expected in green hydrogen production cost

Dedicated solar PV and onshore wind below SMR with CCS by 2040 owing in part to rising gas prices
Funding packages of nearly A$17.4 billion to support the hydrogen industry

More than A$714 million earmarked for three hydrogen-ready power stations and A$610 million allocated to economic development zones

- The Australian federal government, state governments, and other government agencies have earmarked nearly A$4.5 billion in grants for hydrogen-related projects, research, and feasibility studies across the supply chain, with an additional A$300 million in financing through the CEFC Advancing Hydrogen Fund.

- Of the earmarked funding, A$2.1 billion has been allocated to specific projects, with 38% of that funding toward the production of hydrogen, including A$103 million from the ARENA Renewable Hydrogen Deployment Fund to fast-track the development of three 10 MW electrolyzers.

- In addition, hydrogen-related projects are eligible, along with other low-carbon technologies, for a portion of the A$5.2 billion in grants and financing, including the A$1 billion CEFC Low Emissions Technology Commercialisation Fund.

Australian hydrogen industry funding

Allocation of project-specific funding

Source: S&P Global Commodity Insights, formerly IHS Markit; CSIRO; ARENA © 2022 S&P Global
Hydrogen production to increase from 0.4 MMt to 19.4 MMt (2020–50)

- Blue hydrogen production from natural gas is poised to commence by 2027, increasing to 20% of total supply by 2050, with continued E&P of onshore and offshore resources in Northern Territory and Western Australia. In addition, Australia’s oil and gas fields and deep saline aquifers provide capacity for carbon storage, with 92% of hydrogen production from natural gas to include CCS by 2050.

- Low population density (3.3 people per square kilometer) combined with solar and wind resources hosting capacity factors as high as 32% and 54%, respectively, will facilitate the growth in green hydrogen production that will account for 78% of total supply by 2050.

- Domestic demand sectors are expected to create the foundations for a globally competitive hydrogen industry. Federal and state governments are supporting the development of regional hydrogen hubs and industry-led technology clusters to aid in the build-out of the hydrogen supply chain; reduce overlaps; and identify gaps in the development, deployment, and commercialization of new hydrogen-focused technologies.

- Commercial-scale hydrogen exports are expected to begin as early as 2026, increasing by 36% per year in the 2030s, accounting for 89% of production by 2050.

Note:
Green hydrogen is electrolysis-generated hydrogen using electricity derived from zero-emission power sources.
Blue hydrogen is hydrogen that is transformed from hydrocarbon fuels with carbon capture.
Gray hydrogen is hydrogen that is transformed from hydrocarbon fuels with unabated carbon dioxide emissions.
Hydrogen projects concentrated in capital cities, industrial development zones, and along the coast
Australia’s power-to-X megaprojects

Asia Renewable Energy Hub
• **Location:** Port Hedland, Western Australia
• **Proponents:** NW Interconnected Power Pty Ltd (CWP Global, InterContinental Energy, Vestas, and Pathway Investments)
• **Overview:** Up to 26 GW of wind and solar PV capacity capable of producing approximately 1.6 MMt of green hydrogen and 9 MMt of green ammonia per year for domestic and export markets.
• **Cost:** A$52 billion
• **Land area:** 6,500 sq km
• **Key dates:** Final investment decision 2025, construction 2026, first production 2036
• **Project timeline:**
  • 2014: Project development commenced
  • October 2020: First stage granted environmental approval by Western Australian government. Major Project Status granted by the federal government. Proposed second stage to include an additional 11 GW of renewable generating capacity
  • December 2020: First stage granted environmental approval by the federal government
  • June 2021: Minister for the Environment rejected the revised 26 GW proposal under the Environment Protection and Biodiversity Conservation Act 1999.
  • Proponents are working with the government in addressing points made in the notification
  • **July 2022:** BP acquired a 40.5% stake and operatorship in a JV with InterContinental Energy (26.4%), CWP Global (17.8%), Macquarie Capital and Macquarie’s Green Investment Group (15.3%).

Western Green Energy Hub
• **Location:** Goldfields-Esperance region of southeast Western Australia
• **Proponents:** InterContinental Energy, CWP Global, and Mirning Green Energy Limited
• **Overview:** Up to 50 GW of wind and solar PV capacity to produce approximately 3.5 MMt of green hydrogen and 20 MMt of green ammonia per year for domestic and export markets
• **Cost:** A$70 billion
• **Land area:** 15,000 sq km
• **Key dates:** Final investment decision 2028, first production 2030
• **Project timeline:**
  • July 2021: Project announced
  • December 2021: Western Australian government announced the project would receive Lead Agency Services from the Department of Jobs, Tourism, Science and Innovation