

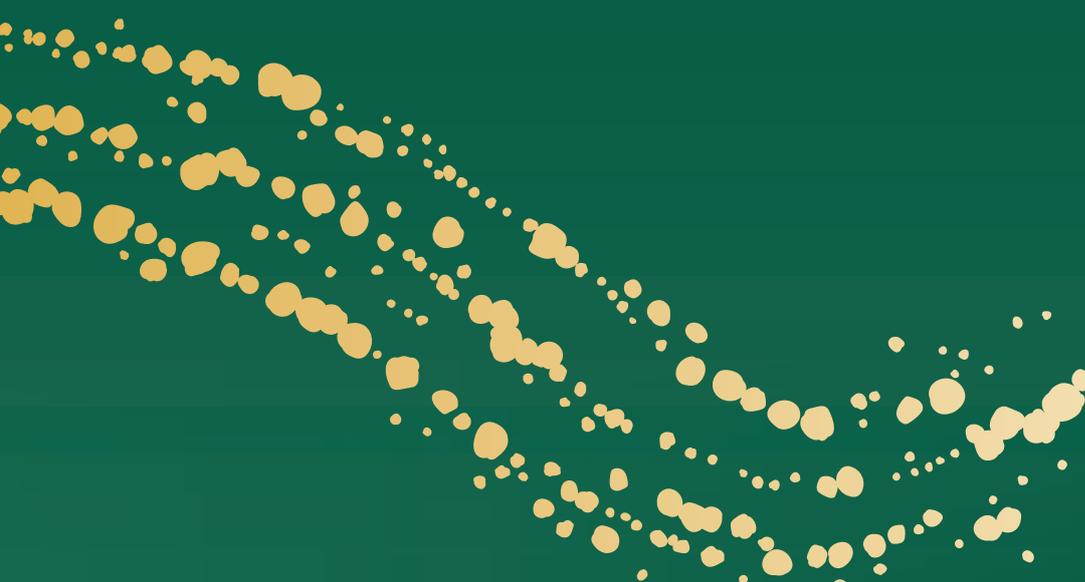


Australian Government

Australian Trade and Investment Commission

Australian Hydrogen Equipment, Technology and Services

Go green with Australia



AUSTRALIA

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We are experts in connecting Australian businesses to the world and the world to Australian businesses.

We help companies around the world to source Australian goods and services for their global supply chains as well as identify and take up investment opportunities in Australia.

To discover how we can help you and your business, visit: austrade.gov.au

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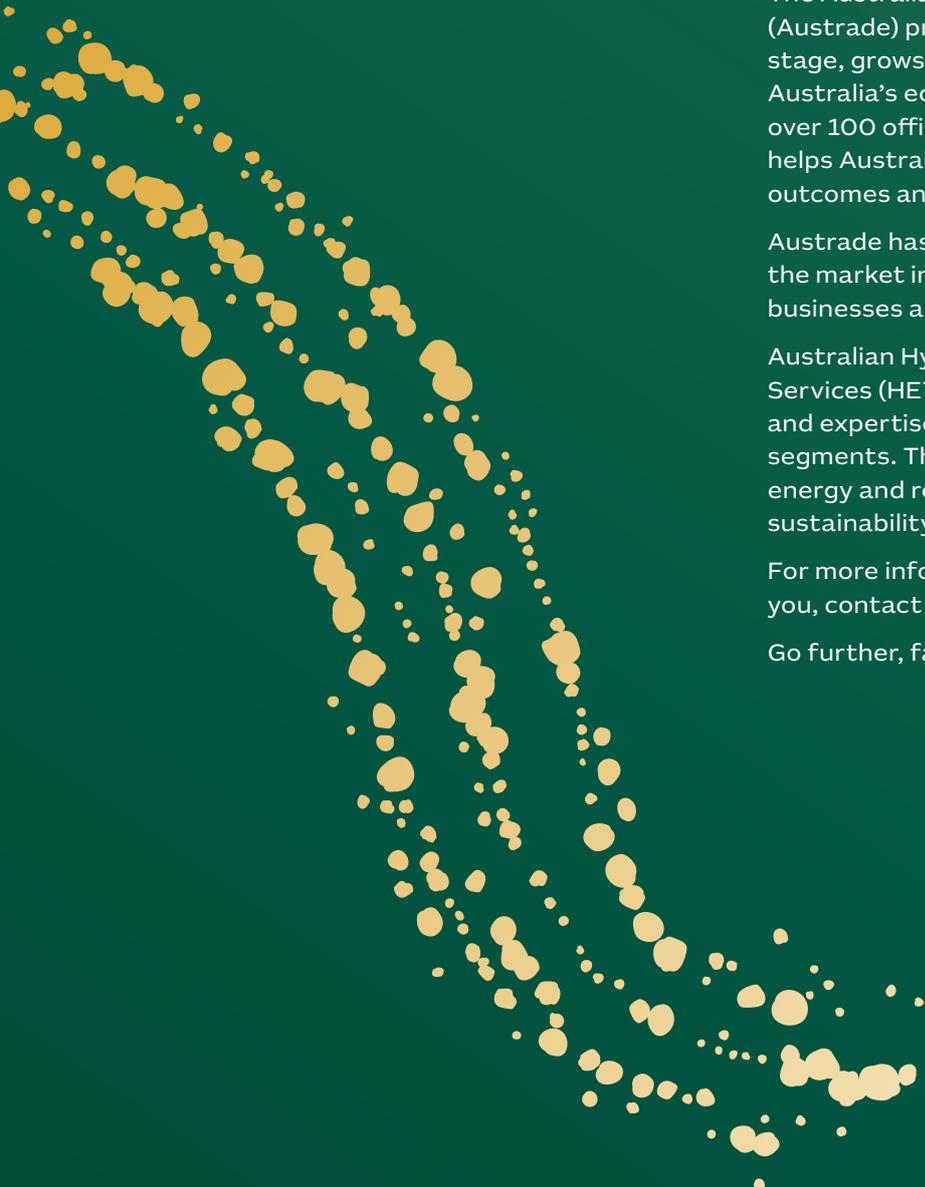
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The Australian Trade and Investment Commission (Austrade) promotes Australia on the global stage, grows and diversifies trade and helps build Australia's economic security and prosperity. With over 100 offices at home and worldwide, Austrade helps Australian businesses achieve diverse export outcomes and win investment needed to grow.

Austrade has the expertise, the contacts and the market intelligence to help grow Australian businesses and build Australia's economic prosperity.

Australian Hydrogen Equipment, Technology and Services (HETS) businesses offer leading technology and expertise across hydrogen supply chain segments. They are working with world leading energy and resource companies in supporting their sustainability and decarbonisation objectives.

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Australia and the hydrogen supply chain

Australia is playing a leading role in the emerging global hydrogen energy market

Australia's ambition is to become a renewable energy superpower, decarbonise our economy and increase clean energy exports to contribute to regional and global decarbonisation.

Australian-made hydrogen will be essential to making our ambition a reality. Hydrogen can be combusted for industrial heat, used as a chemical input for green manufacturing or a fuel for heavy transport. In addition, it can be liquified and compressed for export to our key trading partners.

Hydrogen can also be used to produce value added products such as green metals, green fertiliser and green chemicals. These products are increasingly in demand from the Australian economy and international markets.

Australia is well placed to play a significant role in the global hydrogen industry. Australia has an abundance of natural resources to make clean hydrogen for our own use and to supply the world.

Australia also has a skilled resource and energy workforce and a long history as a trusted energy and resources exporter. Developing Australia's hydrogen industry will help ensure Australia remains a reliable energy partner to our key regional trading partners through the energy transformation.

As outlined in the State of Hydrogen report, according to Bloomberg New Energy Finance, Australia's hydrogen and derivatives industry investment pipeline is AUD\$230 to \$300 billion ^[1]. This represents approximately 40 per cent of all global renewable hydrogen projects announced to date ^[2]. Australia stands to gain significant economic benefits by ensuring this pipeline of potential investments progresses to completion.

The International Energy Agency's 2022 World Energy Outlook predicts Australia will become the second largest net-exporter of low-emissions hydrogen by 2030 and the largest by 2050 ^[3].

The Australian Government is supporting the development of Australia's hydrogen industry. It has committed AUD\$2 billion to the Hydrogen Headstart Program ^[4].

This program aims to accelerate the development of Australia's hydrogen industry, catalyse clean energy industries and help Australia connect to new global hydrogen supply chains.

Hydrogen Headstart is a competitive hydrogen production program that will provide revenue support to around two large-scale renewable hydrogen projects. Support for the program will be provided as a production credit. This is designed to bridge the commercial gap between the production cost and sales price of renewable hydrogen of derivative products (e.g. ammonia).

In addition, the Australian Government is fast-tracking the development of the hydrogen industry through activities including:

- investing more than AUD\$500 million into developing regional hydrogen hubs ^[5];
- funding a Guarantee of Origin (GO) scheme, which will certify renewable energy and track and verify emissions from clean energy products – in particular hydrogen ^[6]. This is critical to ensuring Australia is an attractive investment destination, to accelerate investment in an Australian hydrogen industry. The GO scheme will support access to future markets for verified renewable and clean products;



- reviewing existing legislation, regulations and standards to ensure our legal frameworks facilitate industry development and meet safety needs ^[7];
- delivering a National Hydrogen Infrastructure Assessment (NHIA). The NHIA looks at the hydrogen supply chain needs, including electricity and gas networks, water supply networks, refuelling stations, roads, rail and ports ^[8];
- investing in critical opportunities through funding pools. These include Powering the Regions Fund ^[9], the National Reconstruction Fund ^[10], the Australian Renewable Energy Agency (ARENA) ^[11] and the Clean Energy Finance Corporation (CEFC) ^[12].
- progressing crucial research and development and industry development activities with our international energy partnerships with other countries including:
 - > delivery of the German–Australian Hydrogen Innovation and Technology Incubator (HyGATE) initiative. This will support projects along the hydrogen supply chain and facilitate collaboration between Australian and German partners ^[13].
 - > a memorandum of understanding with the Netherlands to support the development of a renewable hydrogen supply chain from Australia to Europe ^[14].

To position us for future success, the Australian Government is leading a review of Australia’s National Hydrogen Strategy. This review will ensure Australia remains on the path to be a global hydrogen leader by 2030 on both an export basis and for the decarbonisation of Australian industries ^[15].

Our hydrogen industry is advancing important innovations to accelerate the global commercialisation of hydrogen technologies.

- Our experienced ecosystem of technology companies, engineering firms and corporate organisations are developing and trialling new and novel technologies.

- Our Cooperative Research Centres (CRCs) are completing industrial-scale research and innovations to decarbonise energy exports and support the emergence of hydrogen export and value chains.
- Our world-leading research institutions are working on transformative hydrogen research and development projects and advancing the commercialisation of hydrogen production and storage.

Australia’s culture of innovation has spawned commercialisation of technology into new business opportunities. Australia’s national science agency and innovation catalyst, the Commonwealth Science and Industrial Research Organisation (CSIRO), Australian universities and other research centres have successfully established spin-off companies.

These spin-off companies are further developing and commercialising their hydrogen production, storage, distribution and mobility technologies. Hydrogen technologies are being adapted by commercialisation partners and incorporated into their hydrogen technology solutions for global export markets.

Our world-class education and training institutes are also supporting the emergence of a new hydrogen-ready workforce.

Australian universities and vocational training institutions are designing new micro-credential courses. These will upskill our workforce and create transition pathways for workforces across the hydrogen supply chain.

Australia is committed to supporting the next generation of workers. We are preparing them with the skills needed for jobs now and in the future. A great example of this is the establishment of a Hydrogen Centre of Excellence. This vocational training centre specialises in renewable and hydrogen training to equip apprentices and trainees with the skills required to support the emerging green hydrogen industry ^[16].

International partnerships

Australia is driving collaboration and advancing our HETS offerings through international partnerships

We are working closely with international partners to advance practical action on climate change and build new clean energy industries.

Australia has eight international clean energy partnerships in place. These are with Germany, India, Japan, the Republic of Korea, Singapore, the United Kingdom, the United States and the Netherlands.

These partnerships aim to deepen cooperation on technology development and support regional and global energy transformation. In addition, the partnerships increase and diversify clean energy supply chains, build new clean energy trade opportunities for Australia and drive emissions reduction.

The partnerships are backed with significant funding for joint projects, spanning areas including hydrogen technology and supply chains, solar PV manufacturing and green metals.

Bilateral partnerships – collaboration examples

United States

Australia and the United States are enhancing bilateral cooperation under a Climate, Critical Minerals and Clean Energy Transformation Compact (the Compact). The Compact establishes climate and clean energy as a central pillar of the Australia-United States Alliance^[17].

Under the Compact, Australia and the United States are working together to foster dynamic hydrogen industries that utilise research and development, incentives and public-private partnerships. Both countries will coordinate approaches on hydrogen research, innovation, deployment, markets and supply chains, including through multilateral platforms in which the United States and Australia play leadership roles. In addition, the Compact will promote robust emissions accounting methodologies.

Germany

The Australia-Germany Hydrogen Accord (the Accord) underpins collaboration designed to establish a supply chain in green hydrogen between Australia and Germany. The Accord aims to reduce renewable hydrogen production costs and facilitate technology innovation in the industry. The Accord includes the Hydrogen Innovation and Technology Incubator (HyGATE) Initiative. HyGate supports real-world pilot, trial and demonstration projects along the hydrogen supply chain and facilitates collaboration between Australian and German partners^[18].

India

India and Australia reiterated shared ambitions on green hydrogen with the exchange of the agreed Terms of Reference for the India-Australia Green Hydrogen Taskforce. The Taskforce will be comprised of Australian and Indian experts in green hydrogen. It will report to the India-Australia Ministerial Energy Dialogue on trade, commercial and research opportunities between the two countries through the manufacture and deployment of green hydrogen^[19].

Collaboration with India under the Australia-India Letter of Intent on New and Renewable Energy Technology will accelerate the production and deployment of renewable energy technologies. This collaboration will create new economic opportunities, diversify global clean energy supply chains and help reduce global emissions^[20].

Japan

Japan and Australia are collaborating on a Japan-Australia Partnership on Decarbonisation through Technology. The technology-led partnership is advancing cooperation with a drive towards net zero emissions. This includes clean fuel ammonia, hydrogen and derivatives produced from renewable energy or fossil fuels with substantial carbon capture utilisation and storage^[21].

Australia and Japan have also partnered on the Hydrogen Energy Supply Chain project, which delivered the world's first shipment of liquified hydrogen from the La Trobe Valley in Victoria to Kobe, Japan in January 2022^[22].

Republic of Korea

The Australia-Republic of Korea Low and Zero Emissions Technology Partnership is driving collaboration and increasing the adoption of low and zero emissions technologies. Early priorities for cooperation include hydrogen supply (including clean hydrogen and clean ammonia), low emissions steel and iron ore and carbon capture and storage ^[23].

Singapore

Singapore and Australia are working together under the Green Economy Agreement (GEA). The GEA includes long-term emissions reduction strategies and low-emissions pathways, including hydrogen and facilitating business-to-business collaboration and participation in projects for hydrogen ^[24].

The Netherlands

Australia and the Netherlands signed a Memorandum of Understanding (MoU) to support the development of a renewable hydrogen supply chain from Australia to Europe. The MoU covers a range of activities, including hydrogen standards and certification, port infrastructure and supply chain development. In addition, it covers innovative hydrogen technologies such as shipping and equipment, as well as government policies on safety, social licence and regulations ^[25] for hydrogen.

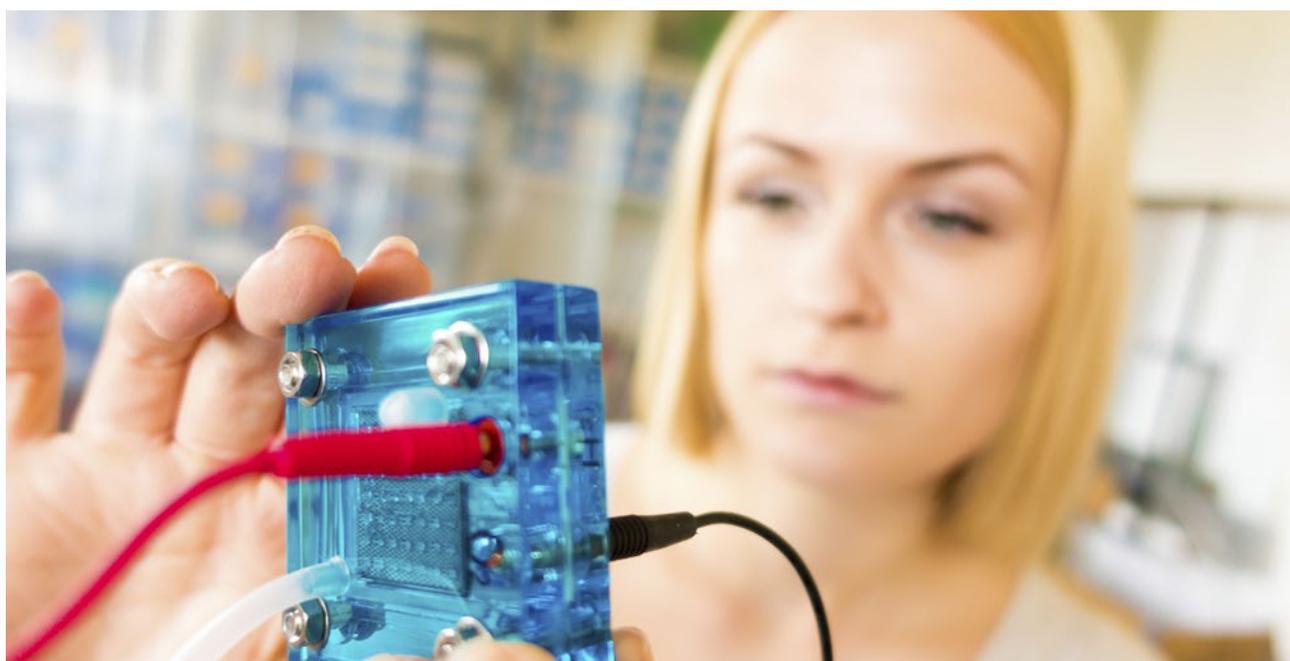
United Kingdom

Australia and the United Kingdom (UK) are working together under an Australia-UK Clean Technology Partnership. This partnership aims to make low emissions technologies globally scalable and commercially viable ^[26].

Research and development partnerships

Australia actively participates in international clean energy innovation forums including Mission Innovation, the Clean Energy Ministerial and Breakthrough Agenda. These are important international forums to accelerate the pace and scale of innovation through collaboration and shared strategies for the deployment of clean energy technologies.

Participating in these international collaborative efforts is a way for Australia to demonstrate leadership and commitment towards decarbonisation. In addition, they attract the investment needed to deploy clean energy technologies and strengthen research and international partnerships.



Australia's hydrogen solutions

Australia's expertise extends far beyond producing and exporting hydrogen molecules

Australia's Hydrogen Equipment, Technology and Services (HETS) sector can play an important role in the success of the emerging global hydrogen industry. The Australian HETS sector will play a crucial role in assisting our regional partners to decarbonise their economies.

Australian HETS businesses offer cutting-edge technology and expertise across hydrogen supply chain segments, including

- a new era of innovative electrolysers providing increased efficiency;
- simplified low-cost balance of plant; and
- innovative and safe hydrogen storage options using non-flammable, non-toxic materials.

Hydrogen Equipment, Technology and Services Supply Chain Segments ^[27]

Equipment

Includes manufactured items (plant, machinery, equipment) that contribute to the production, storage, transportation or utilisation of hydrogen; parts for machinery and equipment; industry-specific supplies such as chemicals; and construction and civil engineering.

Technology

Includes engineering design; information and communications technology (such as data analytics, real-time monitoring and sensors); and scientific research into production, storage, transportation and utilisation.

Services

Includes equipment maintenance and repairs, specialised consulting, e.g., risk, policy implementation, applied sciences such as laboratory work, environmental sciences, data processing, supporting hydrogen utilisation, training and education.

Australia's highly skilled and innovative suppliers into the energy and resources sectors are now expanding their offerings to include HETS solutions and services. These HETS solutions and services are applicable across the emerging hydrogen value chain and the Australian companies are expanding their offerings into global markets.

For example, Australian businesses with unique capabilities in electrolysis, hydrogen storage, transport and water treatment solutions are servicing global hydrogen supply chains. In addition, our experienced professional services, construction, manufacturing, electricity, gas, water and waste management services are also supporting the emerging hydrogen economy.

The Australian Hydrogen Council (AHC) is the peak body for the clean and green hydrogen industry in Australia. The AHC is working with Australian companies and stakeholders to fast track the growth of the HETS sector. It's achieving this by facilitating greater connection across the domestic hydrogen ecosystem to increase visibility and awareness of Australian technologies.

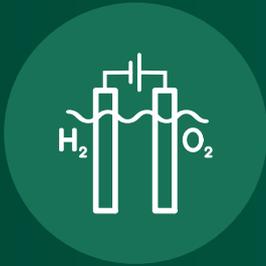
Australia's capabilities across the hydrogen value chain

Australian HETS companies have established international partnerships to test, demonstrate and deploy their products and services across the emerging global hydrogen value chain.

The following pages showcase Australian HETS companies and their technologies. They include examples of international partnerships showcasing Australia's cutting-edge technology and expertise across hydrogen supply chain segments, including:

- Production process
- Storage
- Distribution
- Utilisation
- Enabling and supporting products and services





Hydrogen production process capability

Australia is a country of bright ideas and innovation and has the expertise and experience to manufacture and deliver hydrogen production equipment, technology and services.

Australia's hydrogen production process capability includes:

- Electrolysis: separating hydrogen from water through the application of direct current.
- Thermochemical processes: using heat and chemical reactions to release hydrogen from natural gas and organic materials including steam methane reforming and biomass gasification.
- Project infrastructure, development and maintenance: planning and design, approvals and permits, engineering, procurement and construction, installation and commissioning, operations and maintenance.

Delafield Pty Limited



Capability

Delafield is a research and development company with decades of experience specialising in state-of-the-art processes and carbon-neutral production technology for 'green' hydrogen.

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Address

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Queensland, 4130, Australia

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whitehydrogen@delafield.com.au

Website

www.whitehydrogen.com.au

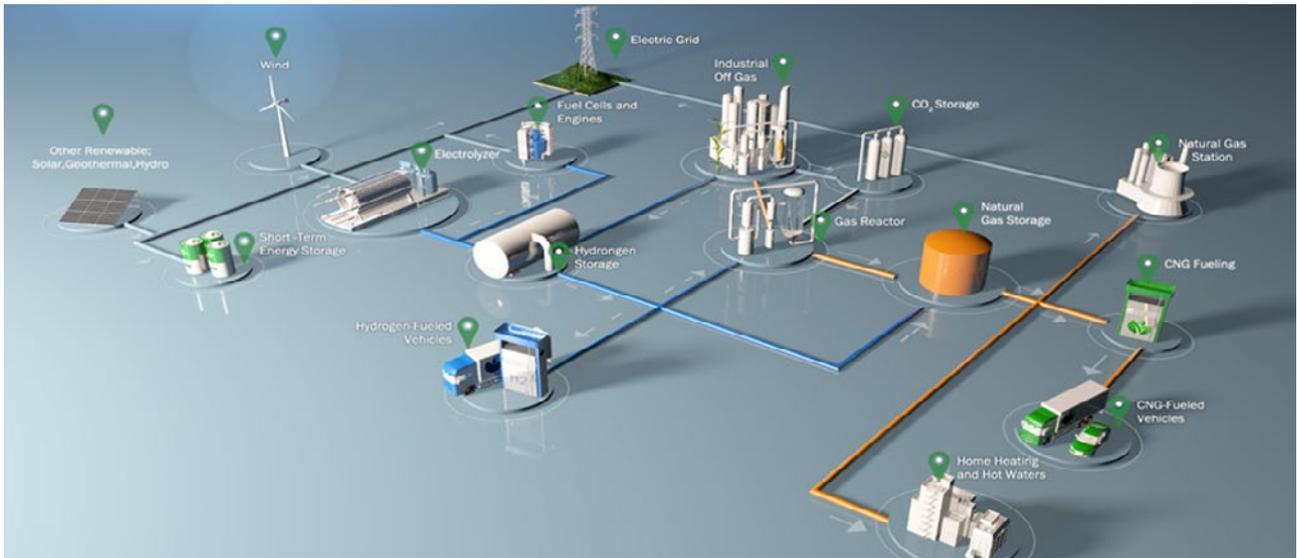
Solution

Delafield stands at the forefront of the renewable green hydrogen sector, offering innovative solutions. Delafield's flagship, White Hydrogen, revolutionises hydrogen production, ensuring continuous, cost-effective on-site and on-demand production of environmentally friendly green hydrogen. This carbon-neutral process and optimised waste resource efficiency highlight the team's innovative approach and dedication to environmental stewardship. This propels us towards a sustainable, carbon-neutral world—the ultimate solution for a brighter future.

Applications

The revolutionary White Hydrogen technology presents a twenty-four hours a day, seven days per week on-site, on-demand hydrogen production facility. Limitless domestic and industrial applications result from this. We are transforming low value biomass, crude glycerol, a biodiesel production byproduct, to high-value green hydrogen through a low-cost, carbon-neutral process.

Dimer Technologies Pty Ltd



DIMER

Capability

Dimer focuses on developing novel technologies and engineering solutions for hydrogen generation and processing, power-to-hydrogen, carbon capture, utilisation and storage and co-generation renewable microgrids.

Phone

+61 3 9653 6499

Address

Level 27, 101 Collins Street,
Melbourne, 3000, Australia

Email

info@dimer.com.au

Website

www.dimer.com.au

Solution

Dimer is one of the industry leaders of gas processing technologies and engineering solutions for heavy industries' low-carbon transitions.

Dimer is specialised in low-carbon gas recovery and production, power-to-hydrogen, green ammonia, carbon capture and utilisation, green house gas treatment and smart microgrids.

Dimer works through the full cycle of low-carbon gas and renewable projects. This includes research and development, designs, engineering, procurement and construction, technical consulting, engineering implementation, project development and operation and maintenance.

Applications

Dimer's solutions are for industrial and energy applications, such as oil and gas, petrochemical, mining, steel, building materials, renewable energy and manufacturing sectors.

Endua Pty Ltd



ENDUA

Capability

The Endua power bank provides reliable, cost-effective, decentralised power via a turn-key, modular, long duration energy storage system.

Phone

+61 401 713 137

Address

104 Boniface Street, Archerfield,
Queensland, 4108, Australia

Email

hello@endua.com

Website

www.endua.com

Solution

Endua's team has developed a self contained, rapidly deployable system utilising commercial-ready technologies which cost-effectively stores over 10 hours of renewable energy. In addition, the system makes renewable energy available as electricity on-demand. Endua's power bank uses renewable energy to split water into hydrogen and oxygen. The hydrogen is captured and stored as gas, then converted back into clean electricity. It uses a unique polymer electrolyte membrane (PEM) hydrogen technology, developed in-house, in an innovative standalone hydrogen power bank system. Endua additionally has an exclusive license to intellectual property arising from 15 years and \$8 million of PEM water electrolysis research at CSIRO. Endua also has intellectual property in its complete system design, manufacture, component integration and control systems.

Applications

Applications include telecoms, utilities, industrial loads, digital infrastructure and community-level power. Endua's partner, Ampol, is enabling early customer engagement and speed to market through access to their business-to-business customer database.

Energys Australia Pty Ltd



Capability

Zero emissions hydrogen fuel cell power for stationary and marine applications.

Phone

+61 1300 596 368

Address

2 Anzed Court, Mulgrave,
Victoria, 3170, Australia

Email

greenH2@energys.com.au

Website

www.energys.com.au

Solution

Energys' highly skilled and experienced team of hydrogen engineers, scientists and business and energy experts have developed fuel-cell power products. These products represent a technically proven and commercially viable pathway from fossil-fuelled electrical power towards a net zero future. From small-scale 10-kilowatt gen-sets to multi-megawatt scale utility services, Energys' hydrogen fuel cell range offers a zero-emissions alternative to carbon-emitting power sources. The systems integrate seamlessly with other power sources and control systems, batteries and direct renewables, delivering right mix of reliable power where and when needed.

Applications

Fuel cells for the marine sector and stationary fuel cell generators. These products offer clean, sustainable, twenty-four hours per day, seven days per week power generation for remote, stand-by and continuous power operations.

Hazer Group Limited



Capability

Australian low emissions hydrogen and graphite production method.

Phone

+61 8 9329 3358

Address

Level 9, 99 St Georges Terrace,
Perth, 6000, Australia

Email

contact@hazergroup.com.au

Website

www.hazergroup.com.au

Solution

HAZER® Process, a novel low-emission hydrogen and graphite production process. The process enables the effective conversion of natural gas and similar feedstocks into hydrogen and high-quality graphitic carbon, using iron ore as a process catalyst. The carbon in the gas feedstock is converted to a saleable and versatile graphitic carbon product rather than waste carbon dioxide.

Applications

The HAZER® Process enables the decarbonisation of traditionally hard-to-abate sectors. These include power generation and heavy industry, including steel making, petroleum refining and chemicals manufacturing, by making use of existing energy supply chains and infrastructure.

Hysata Pty Ltd



Capability

Hysata is an Australian electrolyser manufacturing company which has developed the world's most efficient electrolyser. The electrolyser is capable of operating at an ultra-high 95% (41.5 watt-hour per kilogram (kWh/kg) hydrogen produced) overall system efficiency, surpassing incumbents by 20%.

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+61 460 533 022

Address

1 Darcy Road, Port Kembla,
New South Wales, 2505, Australia

Email

prachi.agrawal@hysata.com

Website

www.hysata.com

Solution

Hysata's electrolyser system, with intrinsically low capex and design for mass-manufacturability, offers step-change improvements.

World's highest efficiency due to novel 'Capillary-Fed Electrolysis', saving hydrogen producers an ~~US~~\$3 billion in renewables capex per 1 megatonne per annum (Mt p.a.) of hydrogen production.

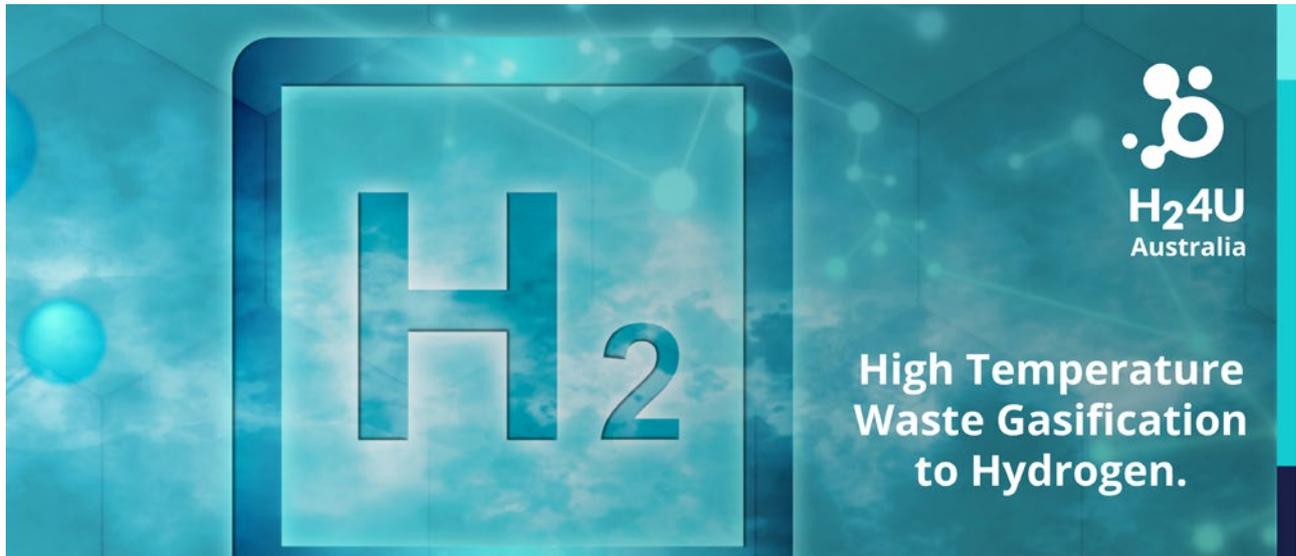
Simplified balance of plant (BOP). Per megawatt (MW), Hysata's system has 20 times less liquid, 10 times less heat rejection and is targeting 5 times less mass.

Ease of manufacturing and scaling with modular technology, relying on polymeric cell architecture and earth-abundant materials such as Nickel.

Applications

Green hydrogen production for decarbonising hard-to-abate sectors such as steel, chemicals manufacturing (e.g. ammonia, methanol), aviation, shipping and refining.

H2 4U Pty Ltd



Capability

High-temperature waste gasification which converts waste materials, such as municipal solid waste, into energy and valuable by-products.

Phone

+61 455 777 471

Address

Upper Coomera,
Queensland, 4208, Australia

Email

henk@h24u.com

Website

www.h24u.com

Solution

H2 4U specialises in high-temperature waste gasification plants. These plants convert over 90% of waste materials into green hydrogen, energy and valuable by-products, including chemicals, transportation fuels and fertilisers.

Operating at temperatures over 1600°C, the gasification technology harvests large quantities of energy from various waste feedstocks with minimal processing or sorting.

Applications

Hydrogen and syngas can generate electricity or manufacture synthetic fuels, chemicals and other valuable products. End users can use the syngas to make green steel or to operate a smelter. H2 4U is exploring projects for green hydrogen production, electricity production and sustainable aviation fuels.

Optimal Group Australia Pty Ltd



Capability

Optimal is a supplier of hydrogen fuel cells, microturbines, energy storage systems and electrolysers, in addition to full solution EPC capability.

Phone

+61 3 9545 1077

Address

9 Bastow Place, Mulgrave,
Victoria, 3179, Australia

Email

sales@optimalgroup.com.au

Website

www.optimalgroup.com.au

Solution

Optimal has partnered with leading clean energy technologies including Capstone Green Energy, Panasonic, ITM Power, LS Energy, Ucap/Maxwell and others. The partners bring together integrated solutions tailored to each application from concept to reality. Optimal's services include feasibility and design, project execution and installation, along with service and remote monitoring. The experienced team includes process, chemical, electrical, mechanical and aerospace engineers. In addition, Optimal's dedicated team of service technicians deliver support to all installations across Australia, New Zealand, PNG and Fiji.

Applications

Optimal is a leading supplier of hybrid energy systems for a broad range of industries, including commercial, industrial, mining, oil and gas, food, agriculture and pharmaceutical sectors.

PAC (2012) Pty Ltd (Pipeline Actuation Control)



Capability

PAC provides niche products and services to a variety of industries, specialising in hydrogen systems and all aspects of flow control.

Phone

+61 8 9314 1827

Address

13 Bowen Street, O'Connor,
Western Australia, 6163, Australia

Email

sales@pipact.com.au

Website

www.pipact.com.au

Solution

Part of Australian owned HIFraser Group, PAC has the capability to locally design, manufacture and maintain hydrogen ecosystems and flow control systems across a range of critical industries. These industries include oil and gas, mining, transportation and agriculture.

Through an exclusive partnership with French PEM technology provider Elogen, PAC are introducing hydrogen generation solutions built by Australians for Australians.

Additionally PAC are specialists in flow control systems including pneumatic and hydraulic, hydrogen and oxygen storage, compression and distribution systems.

Applications

Energy, transport, defence, mining, industrial feedstocks, hydrogen production, hydrogen distribution, metering systems, injection systems, pneumatic control systems, wellhead control systems and chemical injection.

Element Alpha Pty Ltd (Kraaktek)



KRAKTEK

Capability

Kraaktek leads in advancing the hydrogen economy with its innovative ammonia cracking technology, essential for hydrogen-on-demand, hydrogen-powered vehicles and industrial processes. Our technology simplifies hydrogen extraction from ammonia with maximum efficiency, bridging interdisciplinary adoption of hydrogen.

Phone

+61 403 865 795

Address

6 Sorrell Street, Paramatta
New South Wales, 2150, Australia

Email

sam@kraaktek.com

Website

www.kraaktek.com

Solution

Kraaktek's innovative ammonia cracking technology in an exclusive partnership with Newcastle Institute for Energy and Resources (NEIR) and unlocks a reliable, eco-friendly hydrogen supply. This technology is fuelling a range of applications from hydrogen-on-demand to powering vehicles and advancing cleaner industrial processes in steel making and manufacturing. Our solution propels a sustainable, hydrogen-powered future, fostering environmental efficiency across diverse sectors.

Applications

- Hydrogen on demand
- Steel making
- Hydrogen powered vehicles
- Marine vessels
- Energy storage and power generation
- Farm machinery
- Industrial heating

Synergen Met Limited



Capability

Synergen Met uses its proprietary plasma technology to efficiently produce clean hydrogen and solid carbon outputs via methane pyrolysis.

Phone

+61 7 3211 3878

Address

Level 6, 126 Margaret Street,
Brisbane, Queensland, 4000, Australia

Email

hello@synergenmet.com

Website

www.synergenmet.com

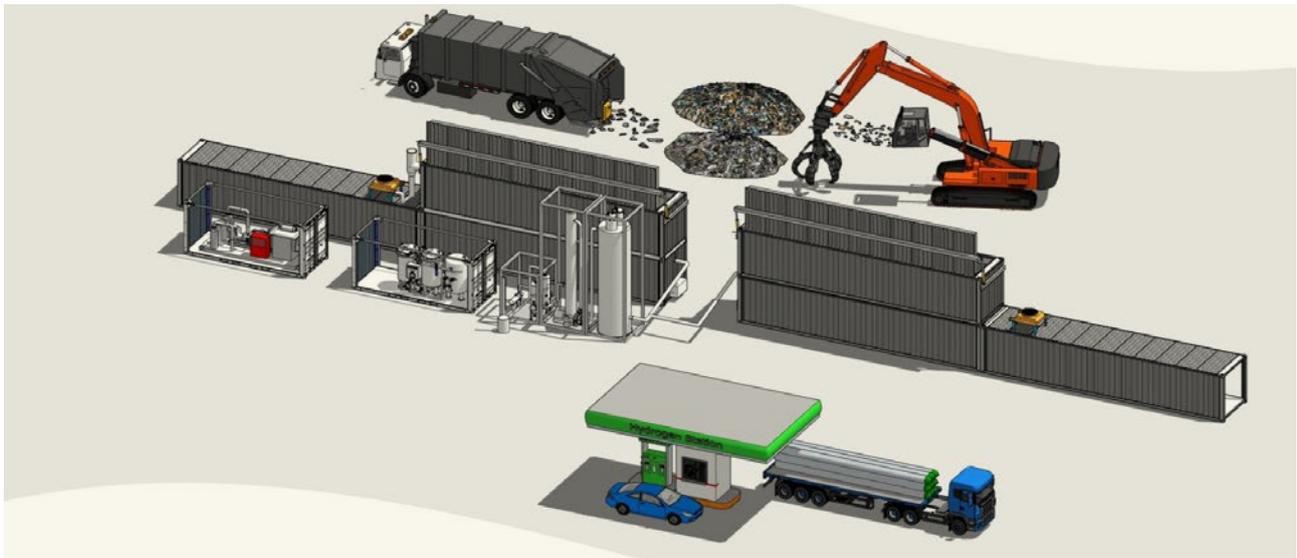
Solution

Synergen Met is an Australian cleantech company which specialises in proprietary thermal plasma technology for a variety of applications, creating hydrogen and carbon. In addition, the technology removes and completely destroys harmful PFAS (per- and polyfluoroalkyl substances) in the environment. Through a pyrolysis process, Synergen Met can efficiently ionise natural gas into valuable pure hydrogen and solid carbon, for use in various renewable industries.

Applications

Synergen Met partners with coal seam gas operators, gas transmission pipeline entities, mining and chemical producers and carbon dioxide hard to abate sectors.

Wildfire Energy Pty Ltd



Capability

Wildfire Energy's MIHG (Moving Injection Horizontal Gasification) technology converts residual wastes destined for landfill and incineration into renewable electricity, hydrogen and biofuels and clean aggregates for recycling.

Phone

+61 488 150 695

Address

Level 14, 167 Eagle Street,
Brisbane, Queensland, Australia

Email

contact@wildfireenergy.com.au

Website

www.wildfireenergy.com.au

Solution

Wildfire Energy is an early-stage technology company, developing the MIHG technology. The MIHG technology is designed to process difficult solid waste residuals into energy products and hydrogen at distributed scale using patented, high temperature gasification.

The technology is carbon negative when processing municipal solid waste (MSW) destined for landfill (due to the avoidance of methane emissions). Also when processing residual biomass (due to carbon sequestration in biochar). Hydrogen can be produced with a levelised cost of less than \$2 per kilogram, today. Wildfire is looking to develop and license projects globally.

Applications

Conversion of domestic and industrial waste and all types of biomass into hydrogen for mobility applications and various industrial uses.



Hydrogen storage capability

Australia offers safe and cost-effective hydrogen storage solutions. Drawing on Australia's expertise in large-scale storage and distribution of liquefied natural gas and other gases, we offer hydrogen storage equipment, technology and services for our regional partners looking to integrate hydrogen into their energy mix.

Australia's safe hydrogen storage capability includes:

- Tanks and vessels: Compressed and liquified hydrogen and hydrogen suspended in nanoporous materials.
- Chemical carrier: Ammonia, methylcyclohexane, methanol, hydrides, adsorbents and synthetic natural gas.
- Salt cavern: Large-scale underground hydrogen storage.

Ardent Underground Pty Ltd



Capability

Safe, large-scale storage of compressed hydrogen gas, which decouples renewable energy production from demand.

Phone

+61 2 8717 7777

Address

5 George Young Street,
Regents Park, NSW, 2143, Australia

Email

mail@ardentunderground.com

Website

www.ardentunderground.com

Solution

Ardent Underground provides a safe, large scale, cost effective compressed hydrogen storage solution using blind boring technology to construct an underground cavity which safely stores 20 – 150 tonnes of hydrogen per shaft. The application of blind bored shafts draws on existing know how from the mining industry and the completed storage safely contains hydrogen at high pressure without the risk of contamination. This unique solution to hydrogen storage delivers significant advantages over aboveground pressure vessels and significantly contributes to lowering the cost of green hydrogen, enabling the transition to zero emissions.

Applications

Industrial feedstock solution to decarbonise existing grey hydrogen uses. Diurnal storage of renewable energy, standby, peaking, mobility, green steel, hydrogen hubs, liquid hydrogen plant, sustainable aviation fuels and hard to abate applications.

Carbon 280 Pty Ltd



Capability

Hydrilyte® is a safe and non-toxic hydrogen storage system. The process for storing and releasing hydrogen works without catalysts.

Phone

+61 402 457 711

Address

42 Chadwick Street,
Hilton, Western Australia, 6163, Australia

Email

mark@carbon280.com

Website

www.carbon280.com

Solution

Carbon280 is the developer of Hydrilyte® and the Hydrilyte® hydrogen storage system. Hydrilyte® is a metal hydride dust suspended in mineral oil. It is a safe and non-toxic material for storing hydrogen which requires no compression or cooling. It can be stored and transported using existing liquid fuels infrastructure. The metal is widely available, which enables scaling to export quantities.

Hydrilyte® is safe for people and non-toxic to the environment. The process for storing and releasing hydrogen works without catalysts. There is no need for additional purification. Hydrilyte® is highly stable and enables storage for decades if required.

Applications

Carbon 280's primary hydrogen market segments include: industrial hydrogen, hydrogen refueller supply chains (hub to station), renewable firming and energy export.

LAVO Hydrogen Storage Technology Pty Ltd



LAVO

Capability

LAVO's technology aims to support the hydrogen supply chain and help propel the nation towards becoming a global leader in hydrogen.

Phone

+61 3 9653 6499

Address

Level 9/ 120 Sussex Street,
Sydney, New South Wales, 2000, Australia

Email

amer.rathore@lavo.com.au

Website

www.lavo.com.au

Solution

LAVO Hydrogen Storage Technology Pty Ltd was established to develop and manufacture intrinsically safe, low pressure, high energy-density, solid-state hydrogen storage technology. This technology is uniquely Australian designed, patented and has more than 30 years of operational life. The technology has also been validated by researchers at the University of New South Wales.

Lavo provides long-term renewable energy storage and delivery solutions utilising an integrated utility-scale hybrid Battery Energy Storage System (BESS) and Hydrogen Energy Storage System (HESS).

Artificial intelligence based asset management digital solutions optimises energy consumption and contributes to efficient energy supply.

Applications

A wide ranging products in renewable energy including community batteries Energy as a Service product line and on-site green hydrogen generating HESS and BESS.

Integrated power systems for telecom Base Transceiver Station (BTS) sites, utility-scale HESS and BESS containerised units for solar and wind farm operators and grid power companies. At LAVO, we are driving the global green energy transition in partnership with energy industries in Australia, Europe, Japan and the Middle East.

Rux Energy Pty Ltd



Capability

Breakthrough hydrogen storage efficiency, targeting bulk storage for the supply and distribution of packaged hydrogen using existing truck, rail and marine freight.

Phone

+61 423 630 524

Address

Suite 145/4 Cornwallis St, Eveleigh,
New South Wales, 2015, Australia

Email

nicolle@ruxenergy.com

Website

www.ruxenergy.com

Solution

Rux Energy's core intellectual property is in breakthrough advanced nanoporous materials (both in the architecture and molecular design of the materials) and scalable green manufacturing. Rux is systems integrating these materials into agile ISO containerised systems. This will enable freight operators to move hydrogen at densities comparable to liquefied hydrogen, but at 10 times the energy efficiency and significantly greater safety. In utilising the existing containerised freight infrastructure, Rux helps coordinate ecosystems to bring forward the lowering of the cost of supply and distribution of hydrogen. This is the key driver of cost to end-users.

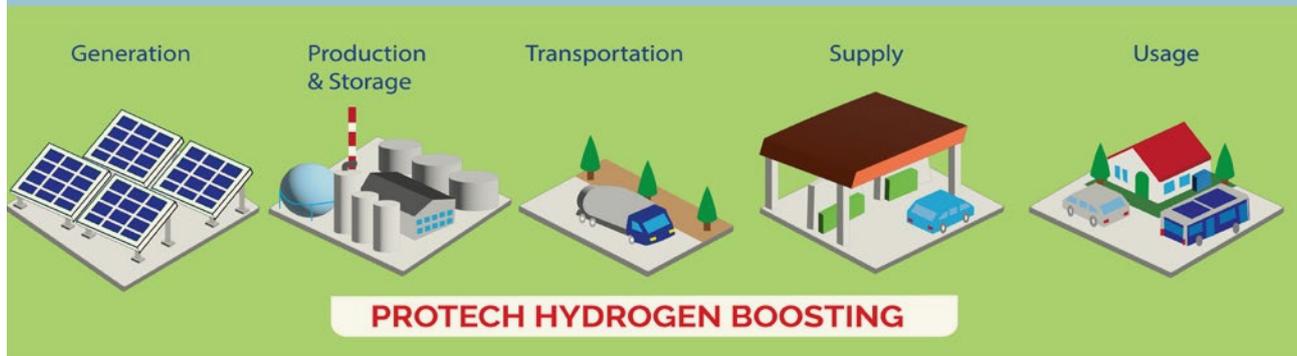
Applications

Hydrogen storage includes:

- long duration large scale supply of packaged hydrogen;
- reduced cost for hydrogen distribution where pipelines are unavailable/unfeasible; and
- on-vessel/vehicle for marine, mobility and aviation.

ProTech Pumps (Solar Injection Australia brand)

Hydrogen Supply Chain



Capability

Protech Pumps has over 50 years of hydraulic and pneumatic engineering, design and manufacturing experience. This includes pressure testing, high pressure gas boosting and chemical injection applications.

Phone

+61 7 3277 8822

Address

592 Tarragindi Road, Salisbury,
Queensland, 4107, Australia

Email

sales@protechpumps.com

Website

www.protechpumps.com

Solution

Boosting (compressing) hydrogen is a key requirement in the storage, transportation and supply of hydrogen.

With both hydraulic and pneumatic drive options, the gas boosters will take the low pressure gas from the electrolyser and boost it as high as 700 bar. At this pressure a 125 litre tank can store 5 kilograms of hydrogen.

With significant investment in research and development, Protech Pumps focuses on increasing the efficiency of hydraulic gas boosters through a combination of variable speed and proportional control. This will deliver on-demand high-pressure hydrogen with lower energy input.

Applications

Hydrogen compressing - filling, storage and decanting.

Pressure Testing - hydrostatic, hydrostretch and pneumatic.

White Graphene Ltd



Capability

White graphene – or boron nitride nano sheets, an advanced nano material – creates an impermeable barrier to hydrogen atoms when integrated into a coating or resin. It prevents steel embrittlement and hydrogen leakage and results in safe and economically viable transport and storage of hydrogen.

Phone

+61 7 3054 4503

Address

Level 13, 120 Edward Street, Brisbane, Queensland, 4000 Australia

Email

info@white-graphene.com

Website

www.white-graphene.com

Solution

White graphene Ltd can contribute to accelerating the energy transition. The company manufactures and functionalises white graphene (boron nitride nano sheets). White graphene can play an essential role in making safe and economically viable transportation and storage of hydrogen possible.

White graphene has unique properties. By incorporating it in a coating or resin, it can form an impermeable barrier to moisture and hydrogen atoms, preventing steel embrittlement and hydrogen leakage. By integrating this innovative nano material in a coating, existing pipeline infrastructures can be repurposed into a hybrid transport system. This enables safe transport of both gas or hydrogen. For advanced carbon and glass fibre storage systems, white graphene can also be a game changer.

For grade IV/V solutions, white graphene can be integrated into the liner or added to the resin used into composites.

Applications

White Graphene coating can be applied to existing or new (hydrogen) gas pipelines and hydrogen storage tanks.



Hydrogen distribution capability

Australia is the first country in the world to export a shipment of liquefied hydrogen to an international market.

The Hydrogen Energy Supply Chain (HESC) project, supported by Australian HETS companies, safely delivered a world-first extraction, liquefaction and transportation of liquefied hydrogen by sea to Japan ^[28].

Australia's hydrogen distribution capability includes:

- Pipeline: Moving hydrogen molecules through pipelines from the point of production to the end user.
- Road: Moving hydrogen molecules stored in tanks and vessels to the end user.
- Sea: Moving hydrogen molecules stored in tanks and vessels on ships to international markets.

Long Pipes Limited



long pipes ltd
the fluid highway!
ABN 18 39 49 331

Capability

The Hydrogen Highway (H2H™) is a lightweight, high pressure composite pipe distribution solution for the transmission and distribution of hydrogen. H2H™ has a hi tech, multi-layer liner to create a fully lined, diffusion resistant, pipeline which is not subject to hydrogen embrittlement. As a non-metallic pipeline solution, it will be able to be installed under power transmission lines.

Phone

+61 427 42 868

Address

26b Cooper Road, Cockburn Central,
Western Australia, 6164, Australia

Email

neil.graham@longpipes.com

Website

www.longpipes.com

Solution

Long Pipe's Fluid Highways® and Hydrogen Highway™ are game-changing pipelines: seamlessly lined, providing unparalleled durability and longevity. Composite manufacture eliminates internal corrosion. Suitable for water, hydrogen, oil & gas and aggressive fluids such as hot brine and carbon dioxide. High-pressure (over 100 bar) capable, yet very light.

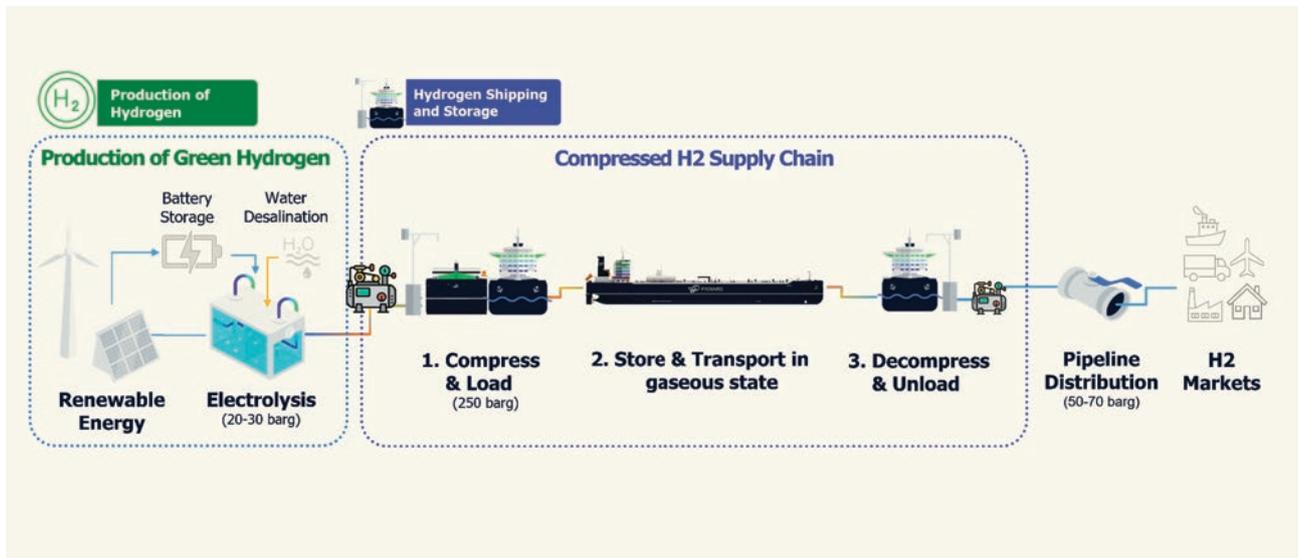
Multi-kilometre lengths between joints enable rapid installation. Fewer people on-site improves construction performance and embedded fibre optics allows continuous monitoring. This is called Embedded Intelligence.

Study by University New South Wales concluded Long Pipe's pipelines have significantly lower carbon dioxide footprint versus steel or High Density Polyethylene (HDPE). Also, H2H™ has very low hydrogen permeability.

Applications

As an adjunct to the Fluid Highway®, H2H™ will connect hydrogen production facilities (e.g. electrolyzers) to end users. Using power transmission corridors will accelerate project approvals.

Provaris Energy Ltd



Capability

Integrated developer of green hydrogen supply chains, including the production and export of hydrogen using a proprietary compressed hydrogen carrier for marine transport and storage.

Phone

+61 8 9322 6955

Address

Unit 19, 40 Street Quentin Avenue, Claremont, Western Australia, 6010, Australia

Email

info@provaris.energy

Website

www.provaris.energy

Solution

The use of compression as a bulk carrier has been demonstrated to show compelling energy efficiency and economic benefits over the alternative carriers (i.e. ammonia and liquification). This results in the lowest cost of delivered green hydrogen at scale over a shipping distance of up to 3,000 nautical miles. Reducing the number of process steps that are capital and energy intensive, in order to convert and reconvert a hydrogen gas to chemical or liquid, offsets the limited volume capacity (energy density) of compression.

Applications

Export of compressed hydrogen to international markets.

Development of export projects in Norway through its subsidiary, Provaris Norway AS, Provaris is collaborating on two projects totalling 750 megawatt (MW) electrolyser capacity targeting first operations in 2027. In addition, Provaris's TiwiH2 project located in Northern Australia has a 90 kilotonne per annum (ktpa) export capacity.

Terra15 Pty Ltd

Continuous, affordable, and accurate monitoring of your energy pipelines using industry leading technology



Capability

Terra15 specialises in pipeline monitoring, providing round the clock leak and digging activity detection.

Phone

+61 484 734 533

Address

Suite 9.04, Level 9/256 Adelaide Terrace,
Perth, Western Australia, 6000, Australia

Email

info@terra15.com.au

Website

www.terra15.com.au

Solution

Terra15's cutting-edge Distributed Acoustic Sensing (DAS) hardware is a technological breakthrough for pipeline monitoring. The system uses a single fibre optic cable which acts as thousands of vibration/acoustic sensors.

Terra15's powerful software solution, AssureSrv uses sophisticated algorithms, developed by in-house specialists, to ensure a precise and intelligent monitoring solution. Operators gain continuous insights into the state of their pipeline, leading to reduced downtime, maintenance and labour costs. In addition, the solution enhances the security and safety of their energy pipeline assets.

Applications

Sectors: Pipeline management (hydrogen, ammonia, water and natural gas).

Application Examples: Pipeline leak and digging activity detection.



Hydrogen utilisation capability

Australia's experienced and highly skilled technology companies are developing a range of hydrogen utilisation solutions. These will decarbonise their industrial processes, logistic vehicle fleets and maritime logistics.

Australia's hydrogen utilisation capability includes:

- Export: Liquefied hydrogen, ammonia and other such as methanol for international markets.
- Industrial use (feedstock and energy): Power and grid, industrial heat, minerals processing, chemical industries.
- Large stationary power: Mining, agricultural, industrial, combines heat and power applications, on-site construction.
- Mobility: Utilisation in refuelling stations, logistics, light and heavy vehicles, bus, trucks, rail, aviation, marine, mining and agricultural vehicles.

H2X Global Limited



Capability

H2X is an Australian owned hydrogen fuel cell vehicle and power company.

Phone

+61 448 834 758

Address

8-10 Dawson Street, Sale,
Victoria, 3850, Australia

Email

brendan@h2xglobal.com

Website

www.h2xglobal.com

Solution

H2X Global is an automotive company developing hydrogen fuel cell electric vehicles and fuel cell electric generators. H2X focuses on “back to base” logistic vehicle fleets. H2X leverages hydrogen fuel cell technology to provide clients with zero-emission vehicles with fast refuelling and longer driving range than battery-powered vehicles.

H2X is active in Europe and South East Asia and it is growing quickly towards markets that show an interest in hydrogen. H2X is a core supplier to help round out the needs for vehicles and develop new solutions for those customers.

Applications

Hydrogen-powered vehicles for heavy-powered equipment, such as buses, trucks (including concrete and refuse) and back-to-base vehicles including delivery vans and taxis.

HYDI Pty Ltd



Capability

HYDI is removing diesel emissions in heavy transport and machinery with a hydrogen on demand solution.

Phone

+61 8 8244 1077

Address

37 West Thebarton Road, Thebarton,
South Australia, 5031, Australia

Email

info@hydi.com.au

Website

www.hydi.com.au

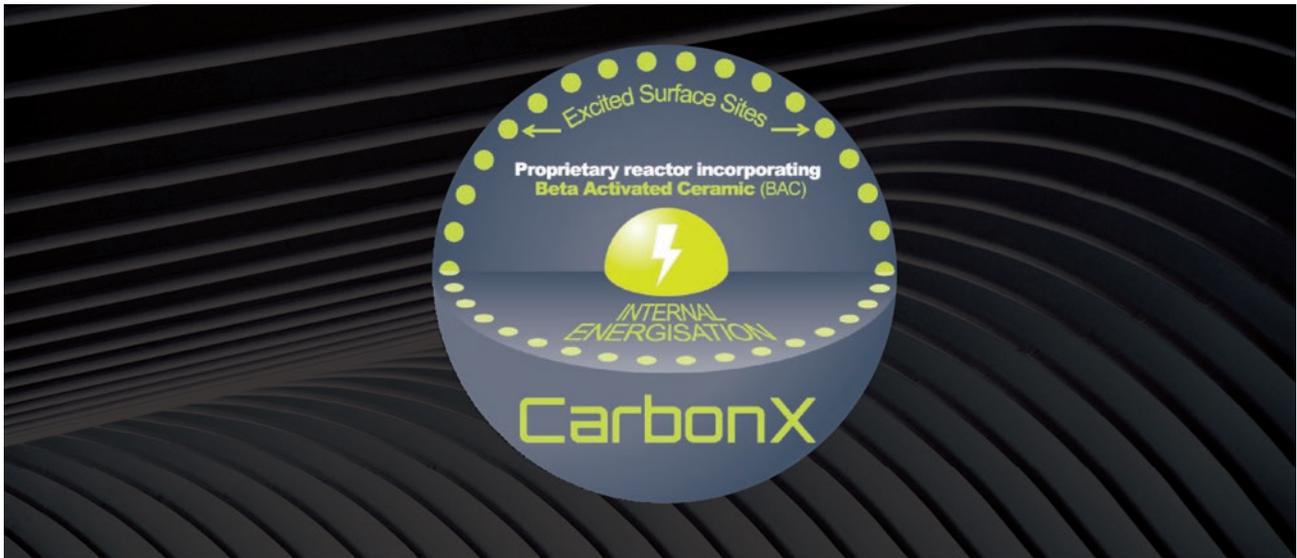
Solution

HYDI's hydrogen on demand system supplies hydrogen gas to a diesel engine's intake to improve combustion efficiency. Unique in its use of distilled water with minimal electrical input, it stores no hydrogen and is responsive to engine load variations. Reduced fuel consumption enables immediate return on investment while reducing carbon and greenhouse gas exhaust emissions and increased performance. It delivers the capability to transition heavy machinery into cleaner, more cost- efficient equipment at a fraction of the cost of replacement.

Applications

The HYDI technology is applicable to the heavy transport, mining and earthmoving, generators and energy, marine and rail transport sectors.

entX Limited



entX

Capability

entX has assembled a world-class team of scientists. Combining an exceptional skill base with leading-edge technology, strong financial backing and highly experienced management, the team identifies, develops and commercialises clean energy solutions.

Phone

+61 8 8470 1700

Address

Level 10, 111 Gawler Place, Adelaide,
South Australia, 5000, Australia

Email

massey@entx.com.au

Website

www.entx.com.au

Solution

The CarbonX Process is a ground-breaking patented technology, which has the potential to profitably convert carbon dioxide to methanol and other commercial products. Until now, conversion of waste carbon dioxide into usable chemicals has been technically possible but commercially challenging. Existing technologies are hampered by the large amount of energy required. entX's CarbonX Process offers the opportunity of low-cost solutions to deliver a range of commercially viable products, including methanol and other C1 and C2 carbon compounds.

Applications

Applications include industrial decarbonisation and carbon capture and utilisation.

Carbon dioxide waste from blue hydrogen production can be addressed via the CarbonX as another option to reinjecting waste carbon dioxide back into gas reservoirs. It also allows land locked projects to have a viable carbon capture, utilisation and storage management option.

Onetide Pty Ltd



ONETIDE®
AIR - LAND - SEA - SPACE

Capability

Hydrogen marine portable microgrid and autonomous re-fuelling at sea system and integration. Energy resilience products providing faster, lower cost, lower emissions and safer site solutions.

Phone

+61 439 733 122

Address

Street Unit 1, 9 Kalmia Road, Bibra Lake
Western Australia 6163, Australia

Email

rebekah.manley@onetide.com.au

Website

www.onetide.com.au

Solution

Onetide provides novel engineering solutions bringing efficiency and safety optimisation to maritime logistics. Onetide has the technology to make renewable energy a global reality, by designing and implementing mobile, renewable and redeployable power systems. The marine portable hydrogen based microgrid aims to provide a safer, lower cost and lower emissions solution. It offers autonomous underwater vehicles (AUV) and autonomous surface vehicles (ASV) integration capability and demonstrated productivity enhancement and return on investment. Onetide has technical and engineering expertise and sovereign advanced additive manufacturing capabilities to design and deliver this innovative, practical and safe solution across diverse industry sectors.

Applications

Remote energy, logistics and maritime infrastructure to defence, resources, marine logistics, humanitarian assistance and disaster relief Humanitarian Assistance and Disaster Relief (HADR) sectors.



Hydrogen enabling and supporting capability

Australia offers credible and well-established professional services, education and training institutes and research and development centres. Australia is renowned for our world-class education and training. Australian universities perform highly in all three major international university rankings due to the quality of their research.

With a passion for innovation and a vibrant research and development sector that is integrated with industry, Australia ranks as the ninth best country in the world for creating intellectual property. Our policy and regulatory, software and IT services and legal firms provide services supporting the emerging hydrogen industry across the value chain. They support our regional partners to decarbonise their economies.

Australia's hydrogen enabling and supporting capability includes:

- Professional services
- Education and training
- Software and IT Services
- Research and development
- Policy and regulation

Arche Energy Pty Ltd



ARCHÉ

Capability

Arche Energy is a clean energy, power and infrastructure advisory company. Arche Energy provides a depth of experience to the investment community in developing and executing clean energy, power generation and infrastructure projects.

Phone

+61 7 3523 3337

Address

Office 36, L2, 1024 Ann Street,
Fortitude Valley, Queensland, 4006, Australia

Email

martin.smith@archeenergy.com.au

Website

www.archeenergy.com.au

Solution

Services Arche supplies to clients include technical support, concept development, scoping, engaging original equipment manufacturers (OEMs) of technologies and components, key infrastructure stakeholder engagement, procurement support and planning and engineering management expertise.

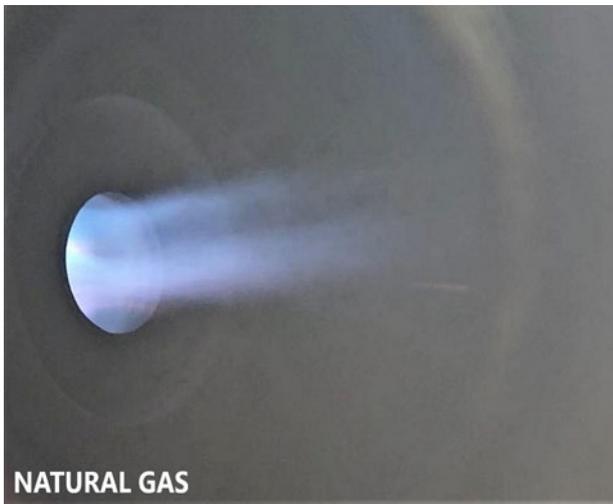
Applications

Arche Energy's team holds substantial hydrogen experience and has developed several studies to produce hydrogen in its range of colours.

Technical Director and Principal Consultant Martin Smith recently completed a secondment as an engineering technical lead for the CQ-H2 project. CQ-H2 is the largest export-focused renewable hydrogen project in Australia, eventually scaling up to around 3,000 megawatt (MW) by the early 2030s.

The multicultural team based in Australia includes professionals from Colombia, Chile and Mexico. The team is experienced in developing clean energy technologies, with expertise in project development and delivery. In addition, the team is experienced in site and concept selection of large-scale wind/solar developments.

Australian Engineering Solutions Pty Ltd (Austeng)



Capability

Enabling existing natural gas/Liquefied Petroleum Gas (LPG) burners to operate on a gas/hydrogen blend and seamlessly switch between 100% gas and gas/hydrogen blend.

Phone

+61 3 5278 2044

Address

78-80 Douro Street, North Geelong,
Victoria, 3215, Australia

Email

info@austeng.net.au

Website

www.austeng.net.au

Solution

Austeng designed, built and commissioned (with regulatory approval) a hydrogen/natural gas blending station to fuel a substantial gas burner system (mixture ranging from 0-40% hydrogen). This successfully proved the technical viability of introducing hydrogen/gas blend into existing gas burners.

Using a hydrogen/natural gas mix paves an economically sustainable pathway towards zero emissions, while reliable hydrogen supply systems are progressively established.

The next step for Austeng's proven technology is 100% hydrogen fuelled systems for gas-fired industrial applications.

Turnkey project capabilities include:
Feasibility; Design; Regulatory Compliance;
Manufacture; Installation; Servicing.

Applications

High-temperature gas fired appliances including: Crematoria; Melting furnaces; Thermal oxidisers; Baking and Enamelling furnaces; Heat treating furnaces; After burners.

H2H Energy Pty Ltd



Capability

H2H Energy is Australia and New Zealand's leading technical and manufacturing expert in hydrogen refuelling infrastructure for the transport sector.

Phone

+61 498 938 944

Address

8/30 Corbould Road, Coolum Beach,
Queensland, 4573, Australia

Email

info@h2henergy.com.au

Website

www.h2henergy.com.au

Solution

To date H2H Energy has refuelled more fuel cell electric buses (FCEB) than any other provider either side of the Tasman. Refuelling systems are operating in multiple locations across Australia and New Zealand.

H2H is a family owned, Queensland based hydrogen specific engineering and manufacturing firm. It specialises in automated and certified hydrogen refuelling systems for the world's emerging hydrogen industry.

H2H's designs are informed by proprietary modelling software. These configure refuelling systems to client requirements and control using H2H's custom control system software to make them safe, reliable and fast.

Applications

H2H's Australian designed, built and commissioned, fully automated, fast hydrogen refuelling systems support a range of applications. These include refuelling operations in heavy haulage, road and maritime public transport systems, commercial and private vehicle fleets.

Incite Energy Pty Ltd



Capability

Incite Energy combines specialist economic, financial analytical skills and knowledge with real-world engineering and project development capability to support clients decarbonise and transition to renewable energy.

Phone

+61 499 804 196

Address

Level 6, 123 Eagle Street, Brisbane, Queensland, 4000, Australia

Email

info@incite.energy

Website

www.incite.energy

Solution

Incite Energy offers directional strategic advice to decision-makers on decarbonisation execution strategy and techno-economic modelling of the lowest energy cost for supply to proposed hydrogen facilities. In addition, Incite Energy conducts feasibility assessments, conceptual engineering, due diligence and approvals, project leadership and owners engineer and design team for renewable energy solutions. Incite Energy also specialises in power system studies, the energy market and regulatory design.

Applications

Incite Energy works with:

- Large mining and oil and gas businesses seeking to reduce their carbon footprint.
- Local Governments transitioning communities to renewable energy.

Powerledger Operations Australia Pty Ltd



Capability

Vision™ platform offers twenty-four hours per day, seven days per week visualisation of the energy provenance used in hydrogen production. It provides real-time granular data for seamless traceability.

Phone

+61 419 923 241

Address

Level 2, 108 St Georges Terrace, Perth,
Western Australia, 6000, Australia

Email

sales@powerledger.io

Website

www.powerledger.io

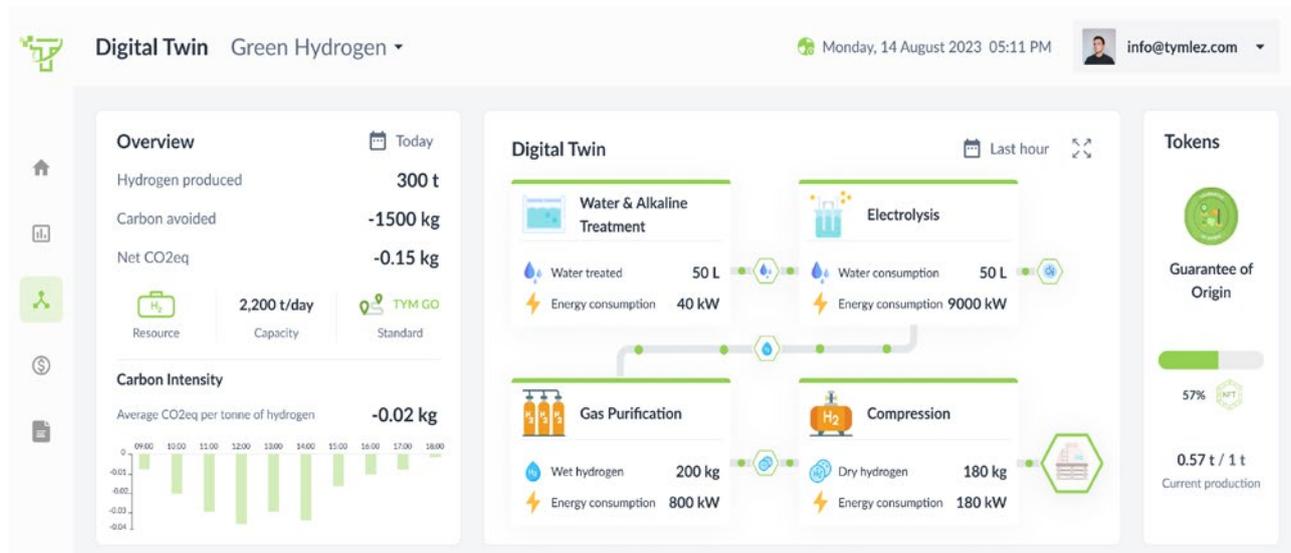
Solution

Powerledger's Vision™ introduces an advanced Portfolio Management Tool for seamless carbon emission monitoring across production sites. With Vision Emissions, you can track global consumption sites' carbon intensity and explore detailed metrics on a dynamic world map. Precise data includes carbon emissions per site and the percentage of carbon-free energy. The solution also integrates granular grid metrics, enhancing emission accountability and energy sourcing evaluation. Vision™ empowers informed decisions for a greener future.

Applications

Applications include tracking of green hydrogen production, granular visualisation of energy portfolios, tracking and tracing across multiple production locations and certification of green hydrogen consumers. These include green ammonia producers.

TYMLEZ Group Ltd



Capability

TYMLEZ enables companies to create immutable guarantee of origin certificates for their hydrogen, along with reporting on its sustainability credentials.

Phone

+61 424 272 789

Address

16 Nexus Way, Southport,
Queensland, 4215, Australia

Email

info@tymlez.com

Website

www.tymlez.com

Solution

CarbonCentral by TYMLEZ enables companies to create immutable guarantee of origin certificates for their hydrogen along with reporting on its sustainability credentials. The solution operates by interfacing directly with hydrogen production facilities to capture and report on real-time production metrics. It can provide data for regulators for the issuance of guarantee of origin certificates against any standard or methodology globally. TYMLEZ has worked with industry leaders on developing its CarbonCentral platform. Industry leaders include Lloyd's Register, Safetytech Accelerator and Aerospace Malaysia Innovation Centre. Working with these companies ensures the platform is built to support the most demanding of hydrogen value chains.

Applications

The CarbonCentral TrustChain enables the tracking and documentation of the entire production process, from renewable energy generation to hydrogen production and distribution. TYMLEZ's solution paves the way for a more sustainable and accountable energy future.

Worley Pty Ltd

Taking low-carbon hydrogen from PowerPoint to Power Plant



Capability

Are you certain about your hydrogen project?

Worley partners with our customers to find solutions to low carbon hydrogen challenges. We have the knowledge, people and differentiated tools to help you make the right project decisions.

Phone

+61 2 8923 6866

Address

Level 17, 141 Walker Street, North Sydney,
New South Wales, 2060, Australia

Email

sydney.reception@worley.com

Website

www.worley.com

Solution

Struggling with risk and uncertainty?

The new low carbon hydrogen space introduces a swathe of old risks in new shapes and sizes – offtake, regulatory, policy, commercial and economic, supply chain, technical, technology and of course, safety and social license to operate. We help you to identify, quantify and mitigate these risks. Optimising your project becomes a formulated journey that we can achieve quickly and competently with our differentiated tools, people and knowledge.

Applications

Is getting to FID costing you too much?

We apply those same differentiated tools and methodologies, market knowledge and hydrogen expertise to develop and deliver a path to low carbon hydrogen Final Investment Decision (FID) that is faster, cheaper and provides you with greater certainty and confidence.

Company index

● Primary capability ● Other capability

Company	Production process	Storage	Distribution	Utilisation	Enabling and supporting	Capability
Arche Energy	●		●	●	●	Technical-commercial advisory services
Ardent Underground		●				Large scale underground storage
Austeng				●	●	Hydrogen/natural gas blending station fuelling a substantial gas burner system
Carbon 280 Pty Ltd		●	●			Hydrogen suspended in a safe nontoxic liquid
Dimer	●			●		Hydrogen production and micro-grid level power-to-hydrogen solutions
Delafield/White Hydrogen	●				●	Research and development company specialising in green hydrogen production processes
Endua	●	●				Off grid hydrogen energy production, power generation
Energys Australia	●					Zero emissions hydrogen fuel cell power for stationary and marine applications
entX Limited					●	Convert carbon dioxide to methanol and other commercially viable products
Hazer Group Limited	●					Low emissions hydrogen and graphite production method
H2 4U	●			●		High-temperature waste gasification technology
H2H				●	●	Hydrogen refuelling infrastructure for the transport sector
H2X Global				●		Hydrogen fuel cell electric vehicles for heavy powered equipment
HYDI				●		Hydrogen Direct Injection supplies hydrogen gas to diesel engines

Company index

● Primary capability ● Other capability

Company	Production process	Storage	Distribution	Utilisation	Enabling and supporting	Capability
Hysata	●					Low cost, ultra-high 95% efficient electrolyser systems
Incite Energy					●	Offering specialist economic, financial analytical skills combined with real-world engineering and project development capability
Kraktek	●					Innovative ammonia cracking technology simplifying hydrogen extraction from ammonia with maximum efficiency
LAVO		●				Safe, low pressure and high energy-density solid-state hydrogen storage technology
Long Pipes			●			Pipeline with a thermoplastic liner for high-pressure long-distance hydrogen distribution
Optimal Group Australia	●			●		Suppliers of hydrogen fuel cells, microturbines, energy storage systems, and electrolyzers in addition to full solution EPC capability
Onetide				●		Hydrogen marine portable microgrid
Pipeline Actuation Control	●	●	●		●	Assemble the balance-of-plant of PEM electrolyzers and end-to-end solutions for hydrogen production
Powerledger					●	Software solutions for the tracking, tracing and trading of renewable energy
ProTech Pumps		●	●		●	Pressure testing, high pressure gas boosting and chemical injection applications

Company index

● Primary capability ● Other capability

Company	Production process	Storage	Distribution	Utilisation	Enabling and supporting	Capability
Provaris Energy	●	●	●			Compressed hydrogen gas carriers for export of large-scale hydrogen
Rux Energy		●	●			MOFs will increase the volumetric and cost efficiency of system-wide hydrogen storage
Synergen Met	●					Plasma technology to efficiently produce clean hydrogen and solid carbon outputs via methane pyrolysis
Terra15			●		●	Pipeline monitoring, providing round the clock leak and digging activity detection
Tymlez					●	Sustainability focused solutions across ESG Compliance, Guarantee of Origin, and Smart Energy, powered by blockchain technology
White Graphene		●	●			White graphene – or boron nitride nano sheets, an advanced nano material – creates an impermeable barrier to hydrogen atoms in pipelines and storage tanks
Wildfire Energy	●					Converting residual wastes into renewable electricity, hydrogen and biofuels and clean aggregates for recycling
Worley Limited	●	●	●	●	●	Professional services company providing engineering, procurement, and construction expertise across the hydrogen value chain

Connect with Australia

Australia is on the path to becoming a Renewable Energy Superpower, as the world transforms to achieve net zero emissions.

Our abundance of renewable energy, metals and minerals are natural advantages we can convert to broad growth opportunities.

Coupled with strong standards, sustainability capabilities, our skilled workforce and track record, Australia is strongly placed to be a partner of choice in a global green economy.

We encourage international buyers to act now and discover how Australia's hydrogen equipment, technology and services providers will accelerate your green ambitions.

Austrade promotes Australia's role as a global climate leader and trusted partner in our region. We enable trade and investment to deliver the great global transformation of our time: achieving net zero and a green economy.



Austrade has over
100 offices
at home and worldwide.

Contact one of our advisors to help you explore the Australian connections and information you need.

www.austrade.gov.au/en/contact-us/

Further information

Hydrogen in Australia

HyResource is a collaborative knowledge-sharing resource supporting the development of Australia's hydrogen industry ^[29]. HyResource offers comprehensive, up-to-date information on Australia's active hydrogen projects and hub development including:

- Policy in Australia provides a comprehensive dataset of Commonwealth, State and Territory public support programs and initiatives of relevance to hydrogen-related activities in Australia.
- Hydrogen projects map provides a snapshot of Australia's active hydrogen projects.
- Hydrogen projects spreadsheet is a downloadable spreadsheet dataset of Australian hydrogen-related projects.
- Active hydrogen projects are a searchable list of active industry hydrogen projects across the full asset life-cycle spectrum.

Government initiatives

National Hydrogen Strategy (2019)

The **National Hydrogen Strategy** sets a vision for a clean, innovative, safe and competitive hydrogen industry that benefits all Australians ^[30]. A review of the strategy is underway to reflect the adaptive approach to hydrogen industry development.

State of Hydrogen (2022)

The **State of Hydrogen Report** is an annual report of Australia's clean hydrogen industry development performance, including a review of Australia's pathway for a clean hydrogen future. It includes the development of Australia's hydrogen industry, how it compares to the rest of the world, what governments around Australia are doing to advance the industry and the path ahead for the hydrogen industry in Australia ^[31].

Guarantee of origin scheme

Australia is working with industry and in close collaboration with our international energy partners to develop an internationally consistent Guarantee of Origin scheme for Australia - a product-based emissions accounting framework that measures and tracks emissions and associated information across the hydrogen value chain ^[32].

Government agencies

The Australian Renewable Energy Agency

The **Australian Renewable Energy Agency** (ARENA) supports the global transition to net zero emissions by accelerating the pace of pre-commercial innovation, to the benefit of Australian consumers, businesses and workers. In addition, ARENA's Knowledge Bank offers an open-source library of reports, studies, multimedia and tools that provide guidance and learnings to benefit future renewable energy projects ^[33].

CSIRO – Hydrogen Industry Mission

Australia's National Science Agency, **Commonwealth Scientific and Industrial Research Organisation** (CSIRO) supports global decarbonisation through a commercially viable Australian hydrogen industry comprising domestic and export value chains by 2030. The Hydrogen Industry Mission supports global decarbonisation through a commercially viable Australian hydrogen industry comprising domestic and export value chains ^[34].

Geoscience Australia

Geoscience Australia (GA) is Australia's pre-eminent public sector geoscience organisation. GA mapping tools assist in the identification of hydrogen operations and production in Australia ^[35].

Industry associations

Australian Hydrogen Council

The **Australian Hydrogen Council** (AHC) is the peak body for the hydrogen industry, with members from across the hydrogen value chain. AHC represents the emerging hydrogen industry, connecting it with its stakeholders to collectively create a clean and resilient energy future with hydrogen a key part of the energy mix ^[36].

Clean Energy Council

The **Clean Energy Council** (CEC) is the peak body for the clean energy industry in Australia. The CEC is a not-for-profit, membership-based organisation representing and working with Australia's leading renewable energy and energy storage businesses. It aims to further development of clean energy in Australia in this way ^[37].

Cooperative Research Centres (CRC)

Future Energy Exports CRC

The Future Energy Exports CRC (FEnEx CRC) hydrogen export and value chains research program addresses research challenges in processing and delivering cost-effective large-scale hydrogen export methods and includes export-class systems and technologies ^[38]. In addition, the FEnEx flagship project, the Kwinana Energy Transformation Hub (KETH), will be a unique industrial-scale facility to research, test, and demonstrate decarbonisation technology solutions, including hydrogen and research and development facilities ^[39].

Future Fuels CRC

The Future Fuels CRC is enabling the decarbonisation of Australia's energy networks by working with its partners in a collaborative and connected research community embracing industry, academia and governments. It is focused on Australia realising the full potential of low-carbon fuels in the energy supply mix ^[40].

Heavy Industry Low Carbon Transition CRC

The Heavy Industry Low Carbon Transition CRC (HILT CRC) is a collaborative venture that brings together industries, researchers and government organisations. It aims to de-risk decarbonisation and help the steel, iron, alumina and cement industries to decarbonise heavy industry ^[41].

Regional hydrogen clusters

Regional hydrogen clusters across Australia are accelerating the development of the hydrogen equipment, technology and services (HETS) sector. The clusters are driving market activation, establishing a global identity and recognised brand for Australian hydrogen technology and expertise ^[42].

New South Wales

- Hunter Hydrogen Technology Cluster (NewH2)

Queensland

- Central Queensland Hydrogen Technology Cluster (CQH2)
- Queensland Hydrogen Industry Cluster (H2Q)
- North Queensland Hydrogen Consortium (NQH2)
- Southern Queensland Hydrogen Industry Institute (SQHII)

South Australia

- South Australian Hydrogen Technology Cluster (SA-H2H)

Tasmania

- Bell Bay Hydrogen Cluster (BBH2)

Victoria

- Clayton Hydrogen Technology Cluster (Clayton H2)
- Gippsland Hydrogen Cluster
- Greater Geelong Hydrogen Technology Cluster
- Mallee Hydrogen Technology Cluster

Western Australia

- Mid West Hydrogen Technology Cluster
- Perth and Peel Hydrogen Cluster

Research initiatives

HyResearch Australian hydrogen research and development portal is collaborative initiative between CSIRO and the Australian Hydrogen Research Network (AHRN). The portal is a knowledge-sharing platform enhancing connections and collaborations across the research and broader hydrogen communities, domestically and internationally ^[43].

New South Wales

- Macquarie University – Sustainable Energy Research Centre
- The University of Newcastle – Hydrogen capability
- The University of Sydney – Net Zero Initiative
- University of Technology Sydney – Hydrogen Energy Program
- University of New South Wales – Hydrogen Energy Research Centre
- University of Wollongong – Australian Institute for Innovative Materials
- Western Sydney University – School of Engineering, Design and Built Environment

Northern Territory

- Charles Darwin University – Energy and Resources Institute

Queensland

- Central Queensland University – Centre for Hydrogen and Renewable Energies
- Queensland University of Technology – Centre for Clean Energy Technologies and Practices
- Queensland Centre for Advanced Technologies - Hydrogen Energy Systems Future Science Platform
- The University of Queensland – Hydrogen Research

South Australia

- The University of Adelaide – Institute of sustainability, Energy and Resources

Tasmania

- University of Tasmania – Hydrogen integration into power systems

Victoria

- Deakin University – Hycel
- Federation University – Centre for New Energy Transition Research
- Monash University – Energy Institute (Clean Fuels and Hydrogen)
- RMIT University – Sustainable Hydrogen Energy Laboratory Research Group
- The University of Melbourne – Hydrogen and Clean Fuels Program
- Victorian Hydrogen Hub – Led by Swinburne University of Technology

Western Australia

- Curtin University – Institute for Energy Transition
- Edith Cowan University – Centre for Sustainable Energy and Resources
- University of Western Australia – Centre for Energy

Emerging hydrogen and clean energy training centres

- Plumbing Industry Climate Action Centre – Hydrogen Centre of Excellence
- University of New South Wales (UNSW) – ARC Training Centre for The Global Hydrogen Economy
- University of Wollongong – Energy Futures Skills Centre
- Wollongong TAFE – Renewable Energy Training Facility

References

- ¹ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (April 2023) *State of Hydrogen 2022*, DCCEEW, accessed 20 November 2023. www.dcceew.gov.au/energy/publications/state-of-hydrogen-2022
- ² DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (April 2023) *State of Hydrogen 2022*, DCCEEW, accessed 20 November 2023. www.dcceew.gov.au/energy/publications/state-of-hydrogen-2022
- ³ IEA (International Energy Agency) (November 2022) *World Energy Outlook 2022*, IEA, accessed 22 September 2023. www.iea.org/reports/world-energy-outlook-2022
- ⁴ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (6 July 2023) *Hydrogen Headstart program*, DCCEEW, accessed 22 September 2023. www.dcceew.gov.au/energy/hydrogen/hydrogen-headstart-program
- ⁵ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (26 October 2023) *Building regional hydrogen hubs*, DCCEEW, accessed 15 November 2023. www.dcceew.gov.au/energy/hydrogen/building-regional-hydrogen-hubs
- ⁶ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (20 September 2023) *Guarantee of Origin scheme*, DCCEEW, accessed 15 November 2023. www.dcceew.gov.au/energy/renewable/guarantee-of-origin-scheme
- ⁷ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (9 November 2023) *Growing Australia's hydrogen industry*, DCCEEW, accessed 15 November 2023. www.dcceew.gov.au/energy/hydrogen
- ⁸ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (13 April 2023) *National Hydrogen Infrastructure Assessment*, DCCEEW, accessed 15 November 2023. www.dcceew.gov.au/energy/publications/national-hydrogen-infrastructure-assessment
- ⁹ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (undated) *Powering the Regions Fund*, DCCEEW, accessed 15 November 2023. www.consult.dcceew.gov.au/powering-the-regions-fund
- ¹⁰ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (27 October 2022) *National Reconstruction Fund: diversifying and transforming Australia's industry and economy*, DCCEEW, accessed 15 November 2023. www.industry.gov.au/news/national-reconstruction-fund-diversifying-and-transforming-australias-industry-and-economy
- ¹¹ ARENA (Australian Renewable Energy Agency) *Australian Renewable Energy Agency*, accessed 15 November 2023. www.arena.gov.au
- ¹² CEFC (Clean Energy Finance Corporation) CEFC, accessed 15 November 2023. www.cefc.com.au
- ¹³ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (27 January 2023) *Australia and Germany strengthen hydrogen partnership*, DCCEEW, accessed 15 November 2023. www.dcceew.gov.au/about/news/australia-and-germany-strengthen-hydrogen-partnership
- ¹⁴ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (31 January 2023) *Australia and the Netherlands sign milestone renewable hydrogen agreement*, DCCEEW, accessed 15 November 2023. www.dcceew.gov.au/about/news/australia-netherlands-sign-milestone-renewable-hydrogen-agreement
- ¹⁵ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (27 September 2023) *Australia's National Hydrogen Strategy*, DCCEEW, accessed 15 November 2023. www.dcceew.gov.au/energy/publications/australias-national-hydrogen-strategy
- ¹⁶ Queensland Government (16 November 2023) *Australia's first Hydrogen Centre of Excellence opens in Brisbane*, Queensland Government, accessed 20 November 2023. www.statements.qld.gov.au/statements/96578
- ¹⁷ Prime Minister of Australia (20 May 2023) *Australia-United States Climate, Critical Minerals and Clean Energy Transformation Compact*, Prime Minister of Australia, accessed 20 November 2023. www.pm.gov.au/media/australia-united-states-climate-critical-minerals-and-clean-energy-transformation-compact
- ¹⁸ DCCEEW (Australian Government, Department of Climate Change, Energy, and the Environment and Water) (25 May 2023) *Australia's international clean energy partnerships*, DCCEEW, accessed 22 September 2023. www.dcceew.gov.au/climate-change/international-commitments/international-partnerships
- ¹⁹ DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (24 May 2023) *India-Australia Green Hydrogen Taskforce*, DCCEEW, accessed 20 November 2023. www.dcceew.gov.au/climate-change/international-commitments/international-partnerships/india-australia-green-hydrogen-taskforce

- ²⁰. DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (25 May 2023) *Australia's international clean energy partnerships*, DCCEEW, accessed 22 September 2023. www.dcceew.gov.au/climate-change/international-commitments/international-partnerships
- ²¹. DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (25 May 2023) *Australia's international clean energy partnerships*, DCCEEW, accessed 22 September 2023. www.dcceew.gov.au/climate-change/international-commitments/international-partnerships
- ²². HESC (Hydrogen Energy Supply Chain) (2023) *The worlds first Hydrogen Energy Supply Chain Pilot Project*, HESC, accessed 20 November 2023. www.hydrogenenergysupplychain.com
- ²³. DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (25 May 2023) *New low emissions technology partnership with the Republic of Korea*, DCCEEW, accessed 20 November 2023. www.dcceew.gov.au/about/news/new-low-emissions-technology-partnership-with-the-republic-of-korea
- ²⁴. DFAT (Department of Foreign Affairs and Trade) (2023) *Singapore-Australia Green Economy Agreement*, DFAT, accessed 20 November 2023. www.dfat.gov.au/geo/singapore/singapore-australia-green-economy-agreement
- ²⁵. DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (25 May 2023) *Australia's international clean energy partnerships*, DCCEEW, accessed 22 September 2023.
- ²⁶. DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (25 May 2023) *Australia's international clean energy partnerships*, DCCEEW, accessed 22 September 2023. <https://www.dcceew.gov.au/climate-change/international-climate-action/international-partnerships>
- ²⁷. NERA (National Energy Resources Australia) (30 March 2023) *Powering Up: Seizing Australia's Hydrogen Opportunity by 2040*, NERA, accessed 22 September 2023.
- ²⁸. HESC (Hydrogen Energy Supply Chain) (2023) *The worlds first Hydrogen Energy Supply Chain Pilot Project*, HESC, accessed 20 November 2023.
- ²⁹. CSIRO (Commonwealth Scientific and Industrial Research Organisation) (2023) *HyResource*, CSIRO, accessed 23 September 2023.
- ³⁰. DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (22 November 2019) *National Hydrogen Strategy*, DCCEEW, accessed 22 September 2023.
- ³¹. DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (April 2023) *State of Hydrogen 2022*, DCCEEW, accessed 22 September 2023.
- ³². DCCEEW (Australian Government, Department of Climate Change, Energy, the Environment and Water) (20 September 2023) *Guarantee of Origin scheme*, DCCEEW, accessed 22 September 2023.
- ³³. ARENA (Australian Renewable Energy Agency) (2023) *Australian Renewable Energy Agency*, ARENA, accessed 22 September 2023.
- ³⁴. CSIRO (Commonwealth Scientific and Industrial Research Organisation) (May 2021) *Hydrogen Industry Mission*, CSIRO, accessed 23 September 2023. www.csiro.au/en/about/challenges-missions/Hydrogen
- ³⁵. Geoscience Australia (Australian Government, Geoscience Australia), (22 June 2023) *Hydrogen*, Geoscience Australia, accessed 22 September 2023. www.ga.gov.au/scientific-topics/energy/resources/hydrogen
- ³⁶. AHC (Australian Hydrogen Council) (2023) *The Official Page of the Australian Hydrogen Council*, AHC, accessed 22 September 2023.
- ³⁷. CEC (Clean Energy Council) (2023) *About*, CEC, accessed 22 September 2023.
- ³⁸. FEnEx CRC (Future Energy Exports Cooperative Research Centre) (2023) *About*, FEnEx CRC, accessed 22 September 2023.
- ³⁹. KETH (Kwinana Energy Transformation Hub) (2023) *Innovation-led energy solutions*, KETH, accessed 22 September 2023.
- ⁴⁰. Future Fuels (Future Fuels Cooperative Research Centre) (2020) *About*, Future Fuels CRC, accessed 22 September 2023.
- ⁴¹. HILT CRC (Heavy Industry Low Carbon Transition Cooperative Research Centre) (2023) *About HILT CRC*, HILT CRC, accessed 22 September 2023.
- ⁴². NERA (National Energy Resources Australia) (2023) *Regional Hydrogen Technology Clusters*, NERA, accessed 22 September 2023.
- ⁴³. CSIRO (Commonwealth Scientific and Industrial Research Organisation) (2023) *HyResearch: Australian Hydrogen R&D Portal*, CSIRO, accessed 23 September 2023.

