

QUEENSLAND
Hydrogen

Queensland, Australia: investing in a hydrogen future

Hydrogen is the most abundant element and is widely used in a range of manufacturing and industrial processes. Around the world, hydrogen is increasingly being used as a clean fuel, and there is growing global interest in hydrogen produced from renewable sources as a versatile energy carrier to support the transition to a low-carbon economy.

Almost anything that uses energy can be powered by hydrogen. Hydrogen is a clean, flexible energy carrier that can help to reduce carbon emissions from transport, power generation and industrial sectors. Hydrogen can also play a key role in integrating renewable energy into the electricity grid and has the potential to become a valuable new export industry for Queensland.

Australia has a diverse mix of existing and planned hydrogen projects, creating a national context conducive to growing the hydrogen economy. Queensland is a hydrogen leader among the Australian states, with the Queensland Government committed to being at the forefront of renewable hydrogen production in Australia by 2030.

Queensland is well positioned to rapidly scale up a hydrogen economy utilising existing infrastructure at key ports such as Gladstone, Brisbane and Townsville. The state's abundant renewable energy sources and technical and research capabilities also make it an ideal location for the development of a 'green' hydrogen sector.

EXISTING
AND PLANNED

hydrogen projects

Queensland and other Australian states and territories



Proposed



In progress



Completed

Queensland offers investors and business owners many advantages, including:

- stable government
- Australia's lowest payroll tax rate
- competitive labour costs
- low cost of living
- sophisticated transport and communication infrastructure
- highly skilled labour
- streamlined development approvals and project facilitation processes
- a strong private investment sector.

Queensland has the potential to produce and export renewable hydrogen using our natural resources, creating a new wave of high-value, innovation-focused jobs in the process.

The state is well positioned to meet the growing international demand for renewable hydrogen and to supply the domestic energy market. Our established infrastructure, proximity to Asia, significant solar resources and available land make Queensland the ideal location to produce renewable hydrogen for domestic and international use.

Moreover, Queensland's established credentials as a global energy exporter mean that we have both the infrastructure and experience to lead the export of renewable energy. The Queensland Government has already made great progress in this area, driven by its target to fuel 50% of its energy needs from renewable sources by 2030. Our solar PV capacity is world-class.



\$5 billion

Queensland has \$5 billion in committed renewable investment with \$1.1 billion already constructed and operating and a further \$20 billion in the pipeline.



Highly skilled workforce

- Over 15% of Queensland's workforce have STEM qualifications such as science or engineering



Established energy exporter

- 20.58 million tonnes of LNG exported in 2018



World-leading solar PV capacity

- Queensland enjoys over 300 days of sunshine per year



Pro-business government

- Queensland boasts a supportive policy and regulatory regime, with a strong focus on innovation



Queensland is the manufacturing state

- Manufacturing is the sixth-largest contributor to the Queensland economy



Proximity to markets

- Brisbane is Australia's closest eastern capital city to Asian markets

Queensland Hydrogen Industry Strategy 2019–2024

Under the Queensland Hydrogen Industry Strategy 2019–2024, the Queensland Government is committed to leading Australia in renewable hydrogen production.

Vision

By 2030, Queensland is at the forefront of renewable hydrogen production in Australia, supplying an established domestic market and export partners with a safe, sustainable and reliable supply of hydrogen.

Queensland Hydrogen Industry Strategy – focus areas



PRODUCTIVE | international partnerships

Queensland is working closely with international partners through collaborative research and development, and is supporting world-class renewable hydrogen projects.

In 2019, the Queensland Government re-signed a memorandum of understanding with the Japan Oil, Gas and Metals National Corporation that includes cooperation on hydrogen, and recently signed a statement of intent with the University of Tokyo's Research Center for Advanced Science and Technology to collaborate on hydrogen.

Also in 2019, JXTG, Japan's largest petroleum conglomerate, in partnership with Chiyoda Corporation and researchers from Japan and Queensland, tested the export supply chain by transporting hydrogen produced in Queensland to Japan. The renewable hydrogen was produced at QUT's solar-cell facility at the Queensland Government's Redlands Research Facility using JXTG's proprietary technology, which aims to reduce the cost of CO2-free hydrogen.



Professor Masakazu Sugiyama
– Queensland's hydrogen envoy in Japan

In June 2019, Professor Masakazu Sugiyama from the University of Tokyo generously accepted an honorary appointment as Queensland's hydrogen envoy in Japan.

Professor Sugiyama is a highly regarded international expert in renewable energy and hydrogen technologies, with an excellent working relationship with Queensland universities and an extensive industry network in Japan.





The Europe-Queensland hydrogen connection

The Queensland Government is keen to work with European partners looking to develop hydrogen projects in Queensland.

European companies already pursuing renewable hydrogen opportunities in Queensland include ENGIE (France), Hydrogen de France (France), NEL (Norway), Siemens (Germany), Linde (Germany/USA).

Queensland is also working on providing an internationally recognised accreditation process for renewable hydrogen, with the goal of ensuring sustainable investment outcomes can be guaranteed.



The ENGIE/Springfield partnership

In December 2019, global energy and services company ENGIE and Queensland's Springfield City Group signed an historic 50-year strategic alliance to make Greater Springfield a 'net zero energy' city.

Under the alliance, investments are planned in renewable energy generation and storage infrastructure, district energy schemes, green mobility solutions, digital technology, energy-efficiency initiatives and a dedicated research and innovation centre.

The Zero Net Energy Vision for Greater Springfield is that, by 2038, the Greater Springfield community – with a forecast population in excess of 500,000 – will be generating more energy than it consumes.

SUPPORTING

hydrogen innovation through R&D

The Queensland Government is directly supporting innovation in hydrogen technology.

The government's \$755 million flagship Advance Queensland initiative is supporting programs that drive innovation and build on the state's natural advantages. The Advance Queensland Strategy includes a commitment to address energy sustainability through innovation, with hydrogen identified as a priority industry.

Two of Queensland's leading tertiary institutions are at the forefront of research and development that will drive innovation to support competitive production, storage, transport and use of hydrogen.

Queensland University of Technology

Green hydrogen pilot plant

Queensland University of Technology (QUT) is leading an \$8.4 million research project to establish a pilot plant producing green hydrogen fuel at the Queensland Government's Redlands Research facility.

QUT and their project partners are embarking on hydrogen research for Australian conditions. The project will develop a scalable process to evaluate the viability of decentralised renewable energy systems to generate hydrogen from renewable sources. Using two solar array technologies and battery packs, hydrogen will be produced using electrolysis technology. The resulting hydrogen will be used within the facility as well as exported. The facility will allow researchers and industry to optimise the production and use of renewable hydrogen, with the aim of scaling up into megawatt-scale development.

QUT has received financial assistance from the Australian Renewable Energy Agency (ARENA) and is working with Swinburne University of Technology, Sumitomo Electric Industries, Griffith University, Energy Developments Limited and the Queensland Government's energy company, CS Energy.

The Queensland Government has committed to providing financial support for the establishment of the facility.

Hydrogen refuelling station

QUT will also host Queensland's first hydrogen refuelling station at its Kelvin Grove campus. The state-of-the-art station will be able to refuel hydrogen fuel-cell electric vehicles in under three minutes and is being delivered by BOC Australia as part of its development of a renewable hydrogen production plant at its Brisbane industrial facility. In support of BOC's hydrogen initiative, the Queensland Government will trial up to five hydrogen fuel-cell electric vehicles in its fleet once the refuelling station is operational.



A Concentrated Photovoltaic (CPV) array is being tested in joint QUT and Sumitomo Electric Industries project.

Griffith University

National Hydrogen Materials Reference Facility

Griffith University has established the National Hydrogen Materials Reference Facility, a state-of-the-art reference laboratory focusing on hydrogen storage materials and hydrogen embrittlement. A key project has been looking at materials for energy storage and conversion.

The project addresses the globally critical issue of energy storage and conversion by developing diverse energy sources to reduce the environmental impact of energy supply and help address climate change. The research has focused on solid-state hydrogen storage; embrittlement of high-strength materials by hydrogen; energy-related materials such as superconductors, magnetic materials, battery materials and photovoltaic cells; modelling and simulation of materials, components and systems for energy supply; hydrogen production; and biophotonics.

Sir Samuel Griffith Centre – world's first hydrogen building

Griffith University also operates the \$40 million Sir Samuel Griffith Centre at its Nathan campus in Brisbane – the first Australian teaching and research facility powered by photovoltaics and hydrogen-storage technology.

The building is fitted with more than 1,000 solar panels on its roof and window shades. On sunny days, this generates more than enough electricity to power the whole building. Excess solar energy produced by the photovoltaic system is stored in batteries and powers an electrolyser that splits water to make hydrogen. The hydrogen is then stored in a stable form as metal hydrides. On overcast or wet days, hydrogen can be brought from storage and used to generate electricity in a hydrogen fuel cell.

The centre has been designed to generate zero carbon emissions.

International research collaborations

Queensland is working closely with international partners through collaborative research and development, and is supporting renewable hydrogen projects with global implications.

The initial focus has been on collaborating with key trading partners in Asia, including Korea and Japan. The Queensland Government is also keen to explore opportunities with European companies seeking to invest in renewable hydrogen projects.

Queensland is home to 173 operating or proposed renewable energy projects. Combined, they have a generating capacity of more than 22,500MW annually. These projects are complemented by exciting new hydrogen energy projects, demonstrating Queensland's commitment to clean, green energy solutions.

Renewable energy project pipeline

The Queensland Government has set a target of 50% renewable energy by 2030. Queensland was the renewable energy construction capital of Australia in 2018, with more than one-third of Australian renewables projects commissioned in 2018 located in Queensland. Queensland has 27 operating facilities that incorporate solar and wind technologies, with a total capacity of 2,288MW in the National Electricity Market. A further four solar and wind projects with a total capacity of 262MW are committed and under construction, while solar and wind projects with a total capacity of 12,668MW are being investigated. The opportunity exists to integrate renewable hydrogen into these projects as a variable load and balancing mechanism.

Renewable energy target

The Queensland Government has set a state target to reach zero emissions by 2050, with an interim target of a 30% reduction in emissions by 2030. Renewable hydrogen has the potential to play a significant role in achieving these targets and will reinforce Queensland's position at the forefront of global climate action. Queensland also has a number of government-owned corporations in the energy portfolio, including Stanwell, CS Energy, Ergon Energy, Yurika, Powerlink, Energy Queensland and Cleanco. Several are already investing in hydrogen research and development projects.

Alternative technologies for remote power stations

Queensland's Ergon Energy currently owns and operates 33 isolated power stations providing electricity to communities that are too remote to connect to the national electricity grid. These power stations are located throughout western Queensland, the Gulf of Carpentaria, Cape York, some Torres Strait Islands and on Palm Island and Mornington Island. These power stations currently use diesel-powered generators, and Ergon is investigating alternative and renewable technologies to support them. Achieving reliable and cost-competitive renewable hydrogen generation in regional and remote environments represents a significant opportunity for Queensland.

Hydrogen transport projects

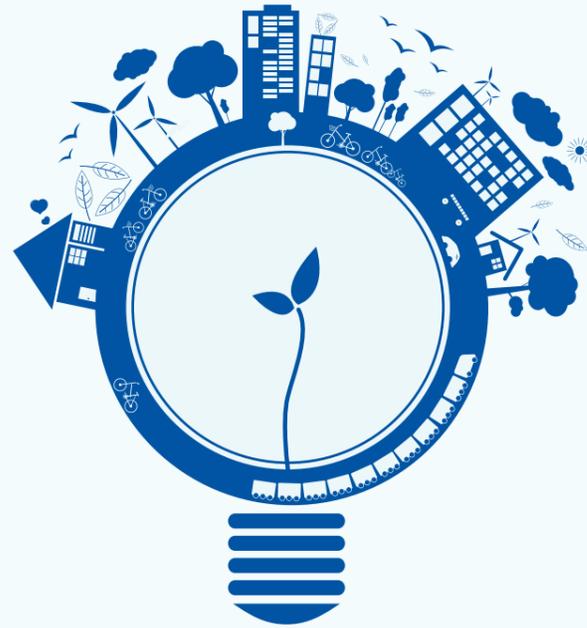
In 2019, the Queensland Government announced it would trial hydrogen fuel-cell electric vehicles in its fleet to accelerate the state's drive towards a hydrogen-fuelled future. These vehicles will be integrated into the government's vehicle fleet as part of the \$19 million Queensland Hydrogen Industry Strategy 2019–2024. The transport sector is one of the largest contributors to carbon emissions. A number of countries are already investing in hydrogen-fuelled transport, including trucks, trains and buses. There are opportunities in Queensland to explore the use of hydrogen for long-distance heavy-duty transport, and the development of associated refuelling infrastructure.



Renewables 400

The Queensland Government is conducting a reverse auction for up to 400MW of renewable energy capacity, including up to 100MW of energy storage. Ten projects have been shortlisted to submit detailed bids.

For more information, visit www.business.qld.gov.au, search for 'Renewables 400'.



Australian Gas Networks Injection Facility

An Australian-first \$4.2 million gas injection facility will be built in Gladstone to deliver renewable hydrogen into the city's gas network, thanks to the first grant from the Queensland Government's \$15 million Hydrogen Industry Development Fund. Australian Gas Networks has been offered more than \$1.7 million through the fund to build a blending facility to deliver 10% renewable hydrogen into the gas network.

Hydrogen Park Gladstone (HyP Gladstone) will be Australia's first renewable hydrogen production facility, able to deliver up to 10% blended hydrogen across the city's total 770 residential, small commercial and industrial customer base.

The facility will include a 175kW polymer electrolyte membrane electrolyser, water demineralisation system and process cooling equipment. As the facility will be of modular design, it will be able to be readily scaled up in the future to produce hydrogen for wider domestic and even export markets.

It is anticipated that plant construction will commence in November 2020, with commissioning by October next year and the plant becoming fully operational in December 2021.

BOC Limited Renewable Hydrogen Production and Refuelling Project

The Renewable Hydrogen Production and Refuelling Project aims to demonstrate renewable hydrogen production at a commercially viable scale and help progress the commercialisation of hydrogen for vehicle transport in Australia.

BOC will install a 220kW electrolyser supplied by ITM Power and 100kW solar array to produce renewable hydrogen through electrolysis at its Bulwer Island site. The electrolyser will have capacity to produce up to 2,400kg of renewable hydrogen per month. The \$3.1 million project will supply industrial customers and the first hydrogen vehicle refuelling station in Queensland at QUT's Kelvin Grove Campus. The refuelling station will also facilitate the trial of hydrogen fuel electric vehicles, consistent with the Queensland Government's commitment to the integration of zero-emission vehicles into the government fleet.

CS Energy projects

CS Energy's core business is the generation and sale of electricity in the national electricity market, where they have a trading portfolio of 3,535MW. CS Energy operates three power stations. They have an offtake agreement with hybrid renewable energy project the Kennedy Energy Park, and are investigating other renewable energy offtake opportunities. In the retail market, they have a 50/50 joint venture with Alinta Energy to supply electricity to customers in South East Queensland.

CS Energy is a project partner for an \$8.5 million research and development project in Brisbane to produce hydrogen from renewable energy. The project has also received more than \$3 million in financial support from the Australian Renewable Energy Agency, with project partners including QUT, Sumitomo Electric Industries, Energy Developments Limited, Swinburne University of Technology, Griffith University and The University of Tokyo contributing the remainder.

Dyno Nobel Moranbah Feasibility of Renewable Green Hydrogen

The world's largest green ammonia plant powered by renewable hydrogen could be built in Queensland, thanks to support from the Australian Renewable Energy Agency (ARENA). ARENA has committed \$980,000 for Dyno Nobel Moranbah Pty Ltd, a business of Incitec Pivot Limited, to conduct and assess the feasibility of building a renewable hydrogen and ammonia facility at its existing Moranbah ammonia plant. The \$2.7 million feasibility study will look at the potential to use renewable hydrogen produced via electrolysis to increase ammonia production at its facility to meet increased demand in the region for ammonium nitrate. If feasible, the proposed green ammonia facility would include up to a 160MW electrolyser and 210MW solar farm co-located at Moranbah.

H2U-Hub Gladstone

Gladstone has been selected as the location for The Hydrogen Utility's latest project, H2-Hub™ Gladstone, a proposed multi-billion dollar chemical complex for the production of green hydrogen and ammonia at industrial scale. The project will integrate mature technologies, such as electrolysis and ammonia synthesis at industrial scale, powered by 100% renewable power to meet the emerging demand for decarbonised products in the energy, chemicals and mobility markets of north Asia.

Northern Oil Advanced Biofuels Pilot Plant

In Gladstone, Northern Oil processes waste such as tyres, green, agricultural and forestry waste and bio-solids into bio-crudes that are ultimately refined into drop-in fuels. More recently, Northern Oil has announced the trial of a hydrogen production process that utilises this bio-crude material. This hydrogen will then be exported to a fuel cell to generate on-site power for the processing plant.

Queensland Nitrates Feasibility Study for a Green Hydrogen and Ammonia Project

\$1.9 million in funding from the Australian Renewable Energy Agency has also been provided to Queensland Nitrates Pty Ltd (QNP) to assess the feasibility of the construction and operation of a renewable ammonia plant at its existing facility near Moura in Central Queensland. The consortium, led by QNP and partners Neoen and Worley, proposes to produce 20,000 tonnes per year of ammonia from 3,600 tonnes of renewable hydrogen. The new plant would provide up to 20% of QNP's current ammonia requirements, which is presently manufactured from natural gas. The renewable hydrogen would also fill an ammonia production gap that QNP currently procures from third party suppliers.

The study's aim is to determine the technical and economic feasibility of producing renewable ammonia at a commercial scale, helping to further progress the commercialisation of renewable hydrogen production for both domestic and international use.

If this is proven feasible, QNP would produce hydrogen via electrolysis for one-fifth of its ammonia production. The electrolyzers would be powered by a hybrid supply of wind, solar and stored renewable energy from facilities owned and operated by Neoen.

Stanwell Hydrogen Project

Stanwell is investigating the feasibility of a large (10MW or bigger) hydrogen demonstration plant at Stanwell Power Station near Rockhampton. The project would be located approximately 1km north of the existing power station.

Stanwell will produce hydrogen using electrolysis. Electrolysis uses an electrical current to split water and create hydrogen, with oxygen as the only by-product. The hydrogen would be trucked to end use customers or utilised on site for secondary production processes such as ammonia, methanation or power generation.

Queensland Hydrogen Project Map

This interactive project map provides information about publicly released renewable hydrogen projects in Queensland. A range of other projects are still confidential, and the map will be regularly updated as projects become public.



Trade and Investment Queensland

Trade and Investment Queensland (TIQ) is the Queensland Government's dedicated global business agency, providing a central point of contact to navigate investment opportunities and services in Queensland. With 16 offices in 12 international markets, TIQ has one of the largest and most dynamic networks of any Australian trade agency. Our team can provide expert advice, make the right introductions, and streamline the process of investing in Queensland or establishing a business here.

TIQ's services include:



Providing detailed industry knowledge about business costs



Preparing business cases



Arranging site visits



Arranging introductions to industry and service providers



Liaising with government agencies



Researching market intelligence



Partnering with local councils, economic development agencies and private service providers to identify investment-ready projects.

Contact

In Europe, contact Queensland Trade and Investment Commissioner for Europe Ms Linda Apelt, at london@tiq.qld.gov.au

Connect. Be Connected



+61 7 3514 3147



tiq.qld.gov.au



@tradeinvestqld



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