



HYDROGEN DEVELOPMENTS
GUIDANCE FOR LOCAL GOVERNMENT
IN PLAN DRAFTING

Queensland Treasury

Planning Group

INVESTED IN PLANNING FOR YOUR FUTURE



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Introduction

Purpose

The Queensland Government is committed to developing a sustainable hydrogen industry.

Hydrogen activities may take many different forms, ranging from production and storage to transferring and use. A hydrogen activity is not a defined use in Queensland but will form part of different types of development.

This guidance will help to ensure local planning schemes are drafted to appropriately support a sustainable hydrogen industry in Queensland.

About hydrogen

The hydrogen industry is an emerging sector both in Queensland and nationally.

The **Queensland Hydrogen Industry Strategy 2019-2024** (Queensland strategy) was released in May 2019. The objective of the strategy is to drive the development of an economically sustainable and competitive hydrogen industry that creates economic growth, opportunities for new export markets, generates highly skilled jobs of the future, while supporting the transition to a low-emission economy.

While the production of hydrogen can be from green (renewable), blue (carbon capture storage) or brown (non-renewable) sources, the Queensland strategy focusses primarily on renewable hydrogen. Renewable hydrogen is produced using water electrolysis, that is powered by renewable energy. Local government will need to consider all types of production when drafting planning schemes.

Hydrogen is already produced in large volumes globally, primarily for the production of ammonia, methanol, plastics, and in metal processing and petroleum refinery operations. The majority of hydrogen produced globally is via steam methane reforming of natural gas.

In November 2019 the Commonwealth government released the **National Hydrogen Strategy** (National strategy) through the Council of Australian Governments (COAG). The focus of the national strategy is to move Australia towards more affordable and reliable renewable energy and make it our next key energy export. The Australian Renewable Energy Agency estimates demand for hydrogen to be over 3 million tonnes and worth up to \$10 billion a year by 2040¹.

Hydrogen production methods

Hydrogen is produced through a number of different processes. Each production method varies in terms of the environmental impacts from the production and release of carbon dioxide (CO₂).

¹ <https://arena.gov.au/renewable-energy/hydrogen/>

Green hydrogen

Green hydrogen is produced using renewable energy sources such as solar, wind or biomass and may also be referred to as renewable hydrogen. Production from these sources means it is carbon-free both during the production process and end use.

Renewable hydrogen is produced through the process of water electrolysis. Water electrolysis is the process of splitting water into hydrogen and oxygen. Hydrogen can be produced by processing fossil fuels, such as natural gas or coal.

Blue hydrogen

Blue hydrogen is produced using carbon capture storage technologies which avoids the release of CO₂ emissions into the air. The CO₂ is instead stored or utilised in a secondary product.

Brown hydrogen

Brown hydrogen is produced by gasification of fossil fuels, such as coal. Carbon dioxide is released to the atmosphere.

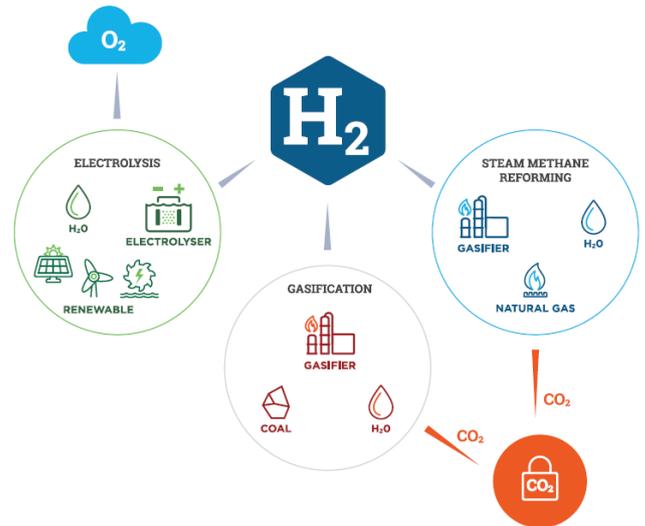


Figure 1: Hydrogen production sources
Source: National Hydrogen Strategy

How is hydrogen used?

Hydrogen is a versatile energy carrier. Almost anything that uses energy can be powered by hydrogen.

Hydrogen is already used in a number of industrial activities as a chemical feedstock for the production of ammonia, metal processing and food manufacturing. Renewable hydrogen is a clean and flexible energy carrier that can help reduce carbon emissions from transport, power generation and industrial sectors.

Production - Electricity grid stabilisation

Hydrogen can be used to stabilise the electricity grid and enable integration of more renewables into the grid. When excess energy is produced from renewable sources, it can be used to produce hydrogen that is then stored onsite. Using an electrolyser, the hydrogen can be produced with very little initialisation time, making it possible to store renewable energy until demand increases. Hydrogen can improve management of energy demands and smooth out the pressure currently placed on the electricity grid during times of peak use.

Another example of hydrogen production is peak shaving. This is where hydrogen is produced and then stored. The production and storage of hydrogen is then used to export to the grid during high energy demand or is sold direct to consumers. The production of hydrogen can be either green, blue or brown depending on where the source of energy comes from.

Storage - Off grid and remote power systems

Hydrogen can be used as a replacement for diesel generators in remote and off-grid power systems. The hydrogen can be produced on-site and stored until required or produced remotely and transported to the site. The hydrogen can be used to power fuel cells or a turbine to generate electricity for the remote power system. The hydrogen might be stored as a compressed gas and therefore requirements on safety and setbacks to certain land uses would be relevant.

Transfer - Natural gas supplementation

Hydrogen can also be used to supplement the current domestic natural gas supply through transferring into the existing gas pipeline networks. Both the National strategy and the Queensland strategy identify the potential for the substitution of natural gas with hydrogen at a rate of 10% in domestic gas lines.

Use -Transport fuel

Hydrogen is used to power fuel cell electric vehicles (FCEV). FCEV's have a similar driving range and refuelling process to current internal combustion engine vehicles. FCEV's can also overcome many of the limitations of battery electric technologies for heavy vehicles, making this technology ideal for public transport, long distance freight and small vehicles such as forklifts.

FCEV's are refilled at a facility which is much like a traditional service station. The compressed hydrogen is transferred to the FCEV using a gas dispenser, which is similar to traditional LPG dispensing equipment.

Hydrogen refuelling facilities may be built as stand-alone units, i.e. within a bus depot for refuelling FCEB's or incorporated into existing service stations.

Hydrogen production can be strategically located to maximise the benefits for local communities. For example, there is an opportunity to co-locate hydrogen production facilities with the local wastewater treatment plants. The hydrogen plant is mainly for providing fuel for a hydrogen powered public transport bus, however the special advantage of locating it with the wastewater treatment plant is the possibility of applying the pure oxygen, generated as by-product during electrolysis, to the wastewater treatment process.

The different types of activities are illustrated in Figure 2 below.

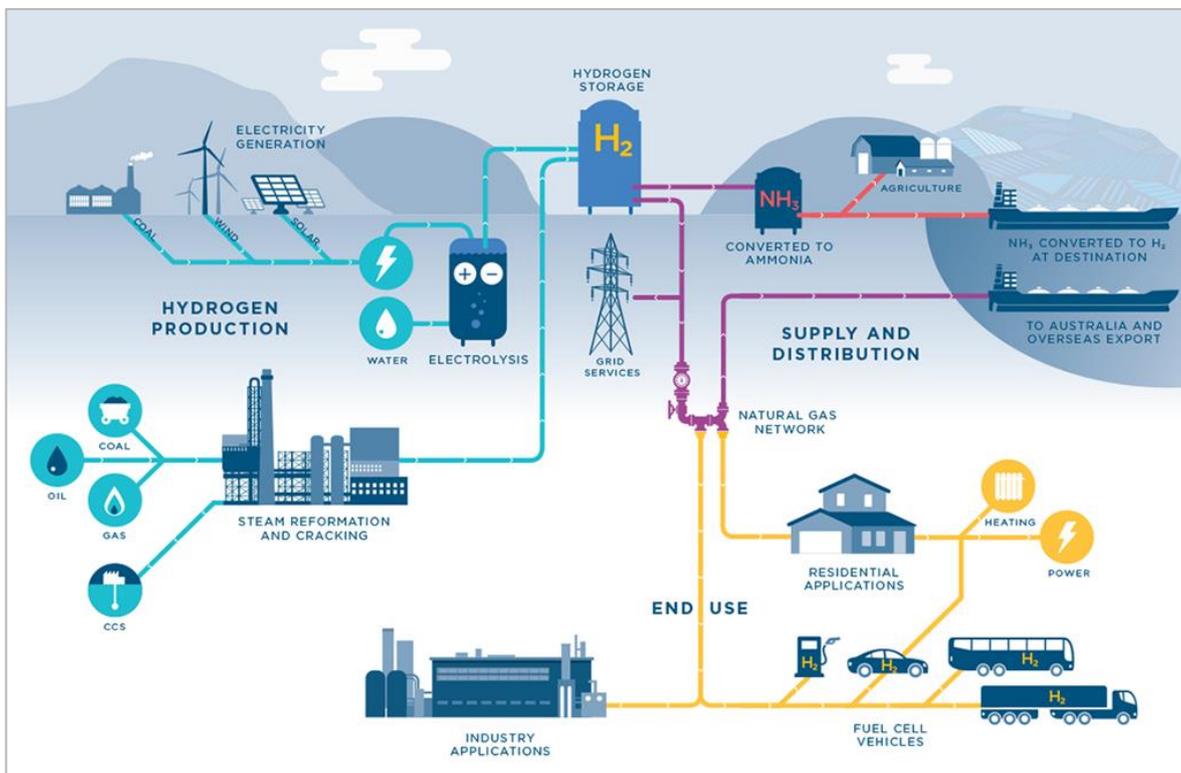


Figure 2: Hydrogen activities in development – Developing Green Hydrogen Projects by Herbert Smith Freehills

Hydrogen in planning

Regulatory framework

Planning Act 2016

Hydrogen development is not a land use under the *Planning Act 2016* (the Act).

The Act is supportive of renewable hydrogen activities that advance the purpose of the Act through section 5(c):

'promoting the sustainable use of renewable and non-renewable natural resources, including biological, energy, extractive, land and water resources that contribute to economic development through employment creation and wealth generation'.

The use of hydrogen in a development will form part of how a defined use may operate, similar to liquid natural gas.

Planning Regulation 2017

Schedule 10 – Development Assessment of the Planning Regulation includes triggers for different types of hydrogen activities that are relevant to development assessment. These may include:

- Part 5, Division 2 – Material Change of use for an environmentally relevant activity (ERA). This would include chemical storage, chemical production and energy production
- Part 7 – Hazardous chemical facilities.

The State Development Assessment Provisions **State Code 21 Hazardous chemical facilities** provides matters that may be relevant for certain hydrogen activities where they are triggered through Schedule 10 of the Planning Regulation.

The definition of 'hazardous chemical facilities' is contained in Schedule 15 of the Work Health and Safety Regulation 2011. The Office of Industrial Relations Major Hazards Unit can provide technical assistance to local governments in relation to hydrogen included in the definition of hazardous chemical facilities.

State Planning Policy

The State Planning Policy identifies several state interests that are relevant to hydrogen activities such as emissions and hazardous activities, energy and water supply and infrastructure integration.

Each state interest has particular policies which may be relevant depending on the type of hydrogen production and the proposed activities envisaged in the planning scheme area.

Refer to the **State Planning Policy** and the supporting guidance documents for further information on how to integrate these matters appropriately.

Regional Plans

Regional plans may have policies that are relevant to hydrogen activities.

For example, the North Queensland Regional Plan identifies Renewable Energy Investigation Areas (REIAs) as locations that are considered most suitable for new commercial-scale solar and wind farms. The plan also includes a specific regional policy, Regional policy 1.5.4, which is illustrated in Figure 3 below.

Renewable Energy Investigation Areas

Facilitating investment in new commercial-scale renewable energy facilities is an economic priority for the region and areas have been identified where these activities will be encouraged.

Renewable Energy Investigation Areas (REIAs) are those locations considered most suitable for the establishment of new commercial-scale solar and wind farms. Factors considered in their determination include solar suitability indices, proximity to substations and high voltage transmission lines, slope, environmental and landscape constraints and fragmentation of good quality agriculture land. These areas are shown on Map 2.

Regional policy 1.5.4

Plan for and support the establishment and on-going operation of emerging renewable energy and allied technologies, such as hydrogen energy and battery storage projects in suitable locations.

Figure 3: REIAs – Regional policy 1.5.4

Source: North Queensland Regional Plan

While the REIAs provide guidance on suitable locations for large scale solar or wind farms, these types of activities may also be associated with green hydrogen production as a way for the energy to be converted to hydrogen. The hydrogen may then be stored for transfer off site or fed back into the existing electricity grid at times when renewable energy production is low.

Supporting hydrogen in planning schemes

Each local government in Queensland should consider how their planning scheme supports hydrogen development.

The key areas in the planning scheme where hydrogen development can be supported are set out in this section.

Consideration should be given to how the regulated requirements identified are relevant when determining appropriate policy or assessment benchmarks in the planning scheme for hydrogen activities.

For general guidance on drafting a planning scheme refer to the department's [**Guidance for drafting a local planning scheme**](#).

Strategic outcomes

The local government should consider how the strategic outcomes of the planning scheme support the development of hydrogen activities. Activities that would support this include:

- developing a policy direction to support particular types of hydrogen activities, for example those produced by green energy production, through consultation with the local community
- identifying whether the planning scheme supports the policy direction for hydrogen activities
- referencing any identified hub locations – similar to those considered for Gladstone and Townsville in the National strategy
- determining a scale and types of development the local government seeks to attract.

Where large scale hydrogen production hubs are supported by the policy direction, additional studies into other suitable criteria such water and existing infrastructure (i.e. gas pipelines and existing power network) may be required.

The requirements for supporting infrastructure will vary depending on how the hydrogen is produced and for what purpose. Refer to the [**Australian Hydrogen Hubs Study – Technical Study**](#) for other matters which may be relevant.

Zoning

When looking at the zones used in the planning scheme, including overall outcomes, code provisions and assessment benchmarks, local government should consider the following:

- Do the existing zones support the local governments policy direction for renewable energy, and do they address any specific hydrogen requirements?
- Are additional or more refined overall outcomes required to support hydrogen development?
 - For example, an overall outcome in an industry zone: development supports renewable energy through use of clean hydrogen production.
- Are suitable zones, areas or locations in the local government area identified in which hydrogen development is supported?
 - For example: industrial zones, research and technology hubs, ports (with the opportunity for export), or rural areas where hydrogen development is less likely to conflict with identified or protected agricultural land practices.
- Are the high-level policy intentions for hydrogen activities in the planning scheme drawn down through the scheme by identifying and setting appropriate categories of development and assessment?
- Is it appropriate to differentiate between the different forms of hydrogen production?
- Does the local government seek to promote green production over other forms?
- Are small scale hydrogen activities supported in zones such as residential, tourist or centre zones?

- Small scale activities may be activities such as the production of hydrogen from renewable energy for on-site storage and electricity generation or, the production of hydrogen on the premises to service public transport.

Categories of development and assessment

Local government may consider whether it is appropriate to provide specific provisions for uses that include hydrogen activities to separate such uses from the other activities which may occur. This can be done through the categories of development and assessment in a planning scheme.

As the types of uses will also vary, it may be appropriate to set thresholds or triggers within the use terms. Matters to consider may include:

- Do the existing categories of development and assessment need to be adjusted for a certain use where it includes a hydrogen activity, according to the method of production (green, blue or brown)
 - For example, where local government has a strategic policy identifying the support for and growth of clean energy production, is the category of development and assessment reflective of this? If not, could it be lowered, or additional particular provisions be prescribed to allow for a lower category to be determined as appropriate?
 - Another example may be a medium impact industry in a Rural industry zone that is categorised as impact assessable by the planning scheme. If the development proposes to use renewable (green) hydrogen as part of an integrated energy solution, rather than brown, this may meet the strategic outcomes of the planning scheme for the purposes of promotion and development of clean energy sources. The local government may determine it is appropriate to lower the category of assessment.
- Is the use in a zone that also includes a sensitive land use such as a dwelling house, childcare centre or a community care centre? Will this require specific setbacks relative to the quantity of hydrogen produced and the safety setbacks?
- Is the inclusion of thresholds appropriate for particular zones, development codes or local plans which will provide a finer layer of detail to the development that are particular to hydrogen?

Definitions

A hydrogen activity does not fit into a single use definition due to the various purposes for which it may be processed and produced. Hydrogen may be used for various purposes such as in industrial processes, for energy production and storage, and as a transport fuel.

Activities that may include the use of Hydrogen are provided below.

Examples of use definitions for various hydrogen activities

Use term	Potential hydrogen related activities
Renewable energy facility	The production of hydrogen through a renewable energy source, such a solar or wind. Where hydrogen is produced from a non-renewable source such as coal, the defined use of <i>renewable energy facility</i> would no longer apply, and the use may become a utility installation or an industry use. A key consideration when determining this use is looking at how the hydrogen is produced - if it is from a brown source it will not meet the definition.
Research and technology industry	The use of hydrogen in an innovative or emerging industry. This may include activities such as a demonstration plant for the use of solar energy generation to produce hydrogen, or the development of hydrogen fuel cells and associated new technology.

Low impact, medium impact, high and special industry	The type of industry use a hydrogen activity is may be affected by whether a local government has an industry thresholds table in the planning scheme. Refer below to the section of this guidance on thresholds for further information.
Service station	Inclusion of hydrogen refuelling stations at a service station. This definition would apply to the usage of hydrogen for selling fuel regardless of how the hydrogen was produced.
Major electricity infrastructure	Transmission lines are an example of transferring energy where hydrogen is used to generate electricity.

Industrial thresholds

Thresholds can be used by a local government to provide a finer level of detail to the way uses are categorised in the planning scheme. As hydrogen activities fall under a variety of use terms the use of thresholds may be useful. Thresholds may be a way to provide parameters to differentiate a hydrogen activity from another type of activity under a use term.

Where a planning scheme has industrial thresholds tables the local government should consider whether these appropriately cover hydrogen activities or if further parameters are required.

Assessment benchmarks

The department’s [Guidance for drafting a local planning scheme](#) provides advice on the preparation of appropriate assessment benchmarks. Following a review of the planning scheme the local government may determine that the existing assessment benchmarks for the hydrogen related uses are sufficient.

However, where additional or more specific measures are required, the local government may wish to provide further detail and refinement taking into consideration the following:

- Are limitations on production quantities required or necessary?
- Depending on the type of use proposed, such as a renewable energy facility or a service station, is there a minimum land size needed in particular zones?
- Are setbacks to any other land uses required that are not already captured? For example, will the quantity of hydrogen production at a school have a minimum setback to sensitive land uses?
- Are there any key considerations to hydrogen activities related to access such as for infrastructure or water?

Key resources

Source	Content
<u>Queensland Hydrogen Industry Strategy 2019-2024</u>	Queensland's strategy focuses on 5 key areas: supporting innovation, facilitating private sector investment, ensuring an effective policy framework for sustainable development, building community awareness and confidence and facilitating skills development for new technology.
<u>Queensland Hydrogen Investor Toolkit</u>	The tool kit has been prepared to assist investors with project planning for hydrogen developments in Queensland. It includes useful contacts to assist with projects and will be regularly updated as new information is gathered from practical experience with facilitating renewable hydrogen projects in Queensland.
<u>National Hydrogen Strategy</u>	Australians nation strategy for hydrogen industry sets out the vision for Australia to be a major contributor and leader in the hydrogen industry for providing a clean, innovative, safe and competitive industry. It identifies strategic actions to be undertaken to deliver the strategy including hubs and sector coupling, assessing infrastructure needs, supporting research trials and demonstrations and ensuring a responsive regulation.
<u>Australian Hydrogen Council</u>	A peak industry-based body for the hydrogen industry. Focused primarily on the use of hydrogen in fuel cell technology for the purposes of transport, export, storage and stationary applications. Information on current technology and the range of applications of hydrogen.
<u>Australian Renewable Energy Agency</u>	Commonwealth government established agency with content on renewable energy project, funding opportunities, Latest news and research and a knowledge bank on types of renewable energy including hydrogen.
<u>Centre for Hydrogen Safety</u>	Global United States of America based not for profit organisation. Source for best practices in hydrogen use.
<u>Prospective hydrogen production regions of Australia</u>	Identifies various low emission hydrogen production methods and identifies key resources relevant for consideration such as grid access, water and existing infrastructure. The study is supported by maps
<u>Australian Hydrogen Hubs Study</u>	Provides information on potential key requirements for the establishment of hydrogen hubs including site requirements, infrastructure needs and matters such as environmental and heritage considerations as well as end of market requirements for transportation or use.
<u>Geoscience Australia hydrogen mapper</u>	<p>The Australia Hydrogen Opportunities Tool (AusH2) provides free access to geoscience data and tools for mapping and understanding the potential for hydrogen production in Australia.</p> <p>The Hydrogen Mapper is a multi-criteria assessment tool that shows areas with high potential for future hydrogen production. It uses key national-scale datasets to map the</p>

potential for hydrogen production and considers hydrogen production by electrolysis using renewable energy sources and also via fossil fuel hydrogen coupled with carbon capture and storage (CCS). Users can customise weightings and settings in each of the five different hydrogen production scenarios presented in the [Prospective Hydrogen Production Regions of Australia report](#).



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