Hydrogen developments

Guidance for local government in plan drafting

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Queensland Government

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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.

This guidance about hydrogen focuses on the Queensland planning framework and seeks to assist local government in appropriately regulating hydrogen activities in their local planning schemes.

A hydrogen activity is not a defined land use in the Queensland planning system but will form part of different types of development.

This guidance will support a sustainable hydrogen industry and contribute to meeting the 70% Renewable Energy by 2032 target included in the *Queensland Energy and Jobs Plan*.

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 development of an economically sustainable and competitive hydrogen industry to create economic growth, opportunities for new export markets, generate 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 (fossil fuel with carbon capture storage) or brown (non-renewable) sources, the Queensland strategy focusses on renewable hydrogen. Renewable hydrogen is produced using water electrolysis powered by renewable energy. Local government will need to consider all types of production when drafting a planning scheme.

Hydrogen is already produced in large volumes globally, primarily to produce ammonia, methanol, plastics, and in metal processing and petroleum refinery operations. Most of the hydrogen currently produced globally is via steam methane reforming of natural gas (blue hydrogen).

In November 2019 the Australian 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 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 2040[1].

Hydrogen production methods

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

> *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 - Vision

[1] https://arena.gov.au/renewable-energy/hydrogen/

Green hydrogen

Green hydrogen is produced using renewable energy sources such as solar, wind, biogas (landfill gas) or biomass and may also be referred to as renewable hydrogen. Renewable energy may also be sourced from the grid. 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.

Blue hydrogen

Blue hydrogen is produced using a fossil fuel source and carbon capture storage technologies which avoid the release of carbon dioxide (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.

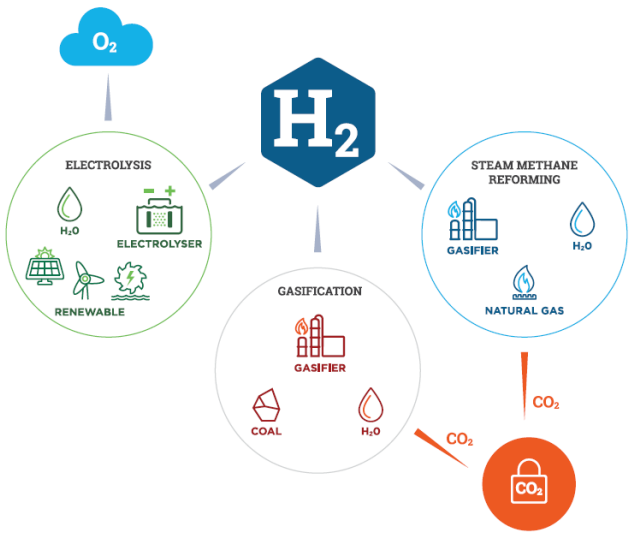


Figure 1: Hydrogen production sources.
Source: National Hydrogen Strategy

Use of hydrogen

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

Hydrogen is already used in many industrial activities as a chemical feedstock to produce 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 with a future focus to also use in our homes.

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. This 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 via a fuel cell or turbine generator 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 and how any emissions are managed.

Off grid and remote power systems (storage)

Hydrogen can be produced onsite or transported to a site and stored physically as a gas or liquid. Storage of hydrogen as a gas typically requires high-pressure tanks and therefore will have specific considerations of safety and setbacks to certain land uses are likely to be appropriate. It can then be used as an alternate power source, such as replacing a diesel generator or powering a fuel cell.

Natural gas supplementation

Hydrogen can 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 up to 10% in domestic gas lines.

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 may be refilled at standalone facilities or at traditional service stations with FCEV facilities. The compressed hydrogen is transferred to the FCEV using a gas dispenser, similar to traditional LPG dispensing equipment.

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

Hydrogen production may be strategically located to maximise benefits. For example, hydrogen production facilities can be co-located with wastewater treatment plants. The wastewater treatment plant can then use the pure oxygen that is generated as by-product of electrolysis.

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

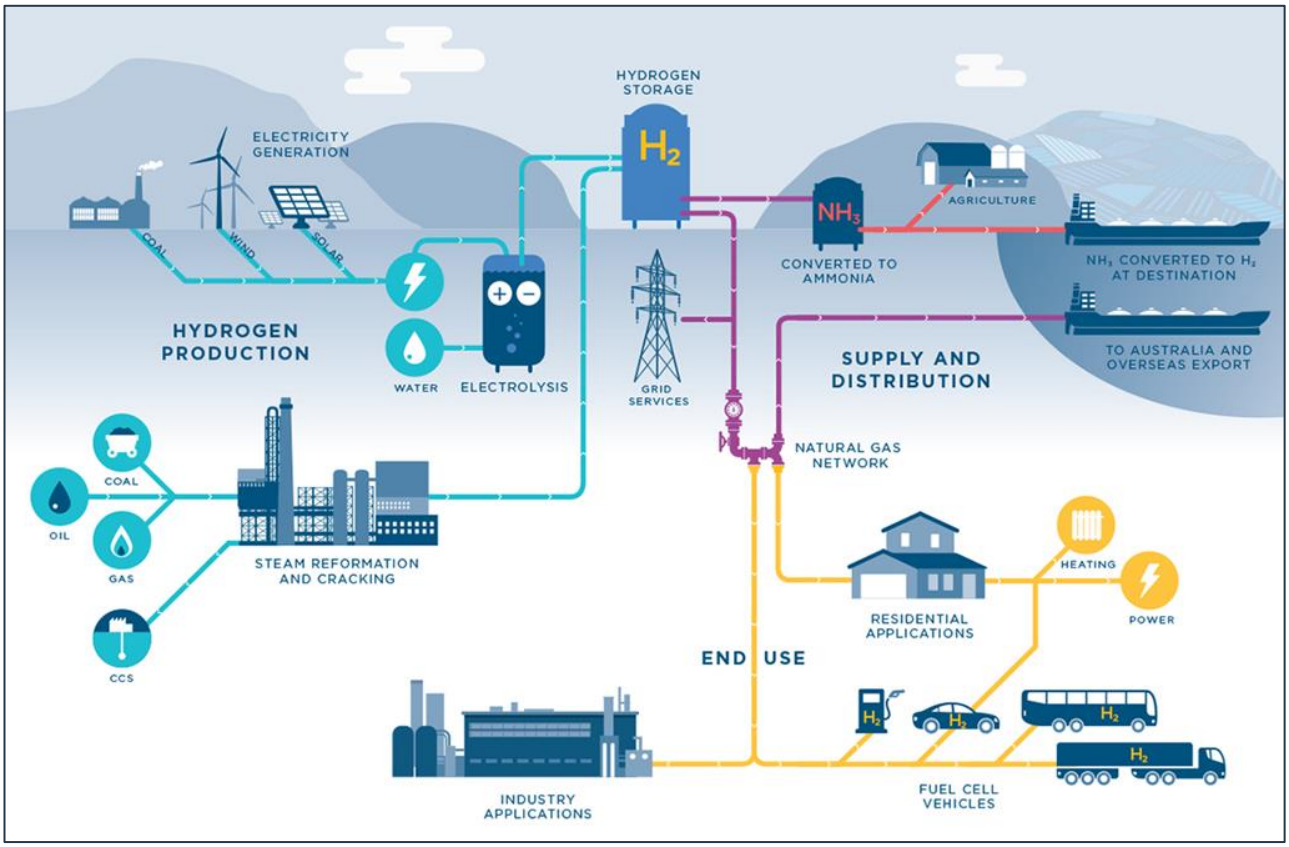


Figure 2: Hydrogen activities in development – Developing Green Hydrogen Projects by Herbert Smith Freehills

Hydrogen in planning

Regulatory framework

Planning Act 2016

The *Planning Act 2016* (the Act) supports renewable hydrogen activities through its purpose and other aspects like land use definitions. Non-renewable hydrogen activities are also supported through the Act.

Specifically, the Act supports renewable hydrogen activities 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 is not a land use but will form part of how a defined use may operate for any development, similar to liquefied natural gas.

Planning Regulation 2017

The Planning Regulation 2017 (the Regulation) supports the operation of the Act and prescribes various requirements relevant to hydrogen activities. This includes identifying the appropriate planning assessment pathways, assessment manager for development applications and requirements for planning instruments.

It is important these provisions are considered by local government when preparing or amending a planning scheme.

There are several land use definitions and zones that may be suitable for different types of hydrogen activities.

When a development application is prepared, the assessment manager for a development is identified under Schedule 8 of the Regulation. Relevant to hydrogen, the State Assessment and Referral Agency (SARA) is the assessment manager for most ***Hazardous chemical facilities***.

An application may also be required to be referred to SARA or another referral agency under Schedules 9 and 10 of the Regulation. This can have implications for local government and the assessment of the proposal. Examples of referral triggers that may be relevant to hydrogen include:

- Part 5 – Environmentally relevant activities (ERA). This includes chemical storage, chemical production and energy production
- Part 7 – Hazardous chemical facilities.

A facility that stores 5 tonnes or more of hydrogen is likely to be a *hazardous chemical facility* and captured by the *hazardous chemical facility* trigger. Further, where other chemicals (e.g. ammonia) are also stored on site that are captured under schedule 15 of the WHS Regulation, a combination of chemicals that include less than 5 tonnes of hydrogen could be defined as a *hazardous chemical facility*.

'***Hazardous chemical facilities***' are defined under Schedule 24 of the Planning Regulation 2017 as follows:

...the use of premises for a facility at which a prescribed hazardous chemical is present or likely to be present in a quantity that exceeds 10% of the chemical's threshold quantity under the Work Health and Safety Regulation, schedule 15.

The scale of the proposal is important, for example, many domestic scale hydrogen activities, like battery cells for a dwelling, would not meet the definition of a hazardous chemical facility.

State Development Assessment Provisions

Where a state interest is triggered through the Planning Regulation, the State Development Assessment Provisions (SDAP) apply and are used by SARA to assess a development application. Both State Code 21 Hazardous chemical facilities and State Code 22 Environmentally relevant activities are examples of assessment benchmarks within the SDAP that may apply to proposed developments that contain hydrogen activities.

State Planning Policy

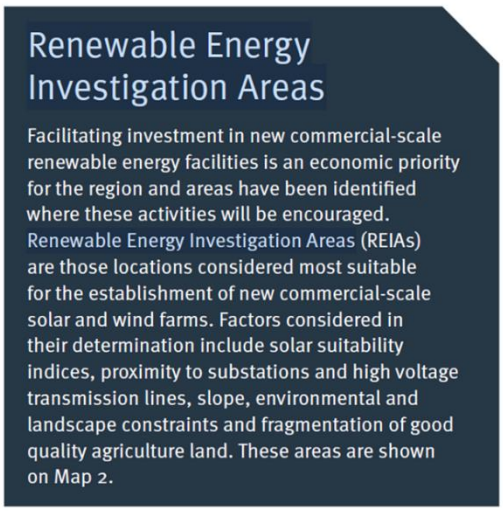
The State Planning Policy identifies several state interests that are relevant to hydrogen activities including emissions and hazardous activities, energy and water supply and infrastructure integration.

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

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

Regional Plans

Regional plans may have policies 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 regional plan also includes a specific regional policy, Regional policy 1.5.4, illustrated in Figure 3 below.



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 electricity grid at times when renewable energy production is low.

State Development and Public Works Organisation Act 1971 - State Development Areas

The Coordinator-General has powers under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) to declare a 'coordinated project'. A large scale, regionally significant and complex hydrogen project may be declared a coordinated project where rigorous assessment and whole-of-government coordination is required. The declaration of a coordinated project does not exempt a development from obtaining other necessary development approvals and complying with relevant planning and environmental laws.

The Coordinator-General is also responsible for the declaration and management of State Development Areas (SDAs) in accordance with the SDPWO Act. SDAs are clearly defined areas that support industrial development of State and regional significance.

Hydrogen projects may be located in SDAs to capitalise on an area's strategic location, including proximity to key transport linkages and Queensland's ports. Ongoing planning and regulation of land use in SDAs is assessed by the Coordinator-General in accordance with the SDPWO Act and an approved development scheme.

Further details on the coordinated project process can be found here.

Further assistance

In addition to support provided by DSDILGP, the following state agencies can assist local government in how to appropriately address hydrogen activities in a planning scheme:

- **The Office of Industrial Relations - Major Hazards Unit**

  Contact: hcfplanning@oir.qld.gov.au

  The Major Hazards Unit can provide assistance to local governments in relation to hydrogen and their location, including assistance with *Hazardous chemical facilities* and State Code 21.

- **Resources Safety & Health Queensland (RSHQ)**

  Contact: hydrogensafety@rshq.qld.gov.au

  RSHQ can provide assistance and support to a local government in relation to hydrogen, including hydrogen refuelling stations, blending facilities or hydrogen production facilities.

Additional useful contacts can be found in the *Queensland Hydrogen Investor Toolkit*.

Supporting hydrogen in planning schemes

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

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

Consideration should be given to how the regulated requirements (e.g. zone names, zone purpose statements, use terms, and administrative terms) identified are relevant when determining appropriate policy, requirements or assessment benchmarks in the planning scheme for hydrogen activities.

For general guidance on drafting a planning scheme refer to the department's *Drafting a planning scheme - Guidance for local governments*.

Strategic outcomes

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

- identifying whether the existing planning scheme supports the local governments policy direction for hydrogen activities
- developing a policy direction to support types of hydrogen activities through consultation with the local community, for example those produced by green energy production.
- referencing any identified or preferred hub locations – similar to those considered for Gladstone and Townsville in the National strategy
- working with adjoining local governments where regional opportunities exist
- determining both scale and types of hydrogen 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 a planning scheme, including overall outcomes, code provisions and assessment benchmarks, local government should consider:

- Do the existing zones support the local governments policy direction for renewable energy and the types of hydrogen related development they wants to encourage? 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 the production of green hydrogen by accommodating renewable energy facilities.
- 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 or native vegetation.

- 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?
- Has the local government identified what types of hydrogen activities will be likely to occur or they wish to see developed in the area, e.g. pipeline or renewable energy facility?
- Does the local government seek to promote green hydrogen production over other forms? Is the planning scheme clear on its position?
- Are small scale hydrogen activities supported in zones such as residential, tourist or centre zones? Would it be appropriate? What type is appropriate, e.g. battery cells? Is it supported in the zone? How will engagement with the community be undertaken to ensure their awareness? What category of development and assessment is appropriate? As an example, a small-scale hydrogen activity might be:
    - Accepted development where for the purpose of production of green hydrogen for on-site storage and electricity generation for use on a site in a centre zone, or
    - Code assessable development where green hydrogen is produced on the premises and used to service public transport for a transport depot.
- Large scale green hydrogen developments involving a material change of use where meeting the definition of a hazardous chemical facility or a major hazard facility will need to consider which zones are most appropriate such as the high-impact industry or special industry zones which would provide appropriate separation from sensitive land uses.
- Have appropriate separation distances been provided from existing or future sensitive land uses? The Office of Industrial Relations - Major Hazards Unit and the RSHQ can assist with this.

Categories of development and assessment

Local government may consider whether it is appropriate to provide specific provisions for uses where hydrogen activities are included to separate them 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. 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, do the categories of development and assessment reflect this? If not, can they be lowered, or additional provisions prescribed to allow lower categories to be 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 blue or 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 or used and setbacks for safety purposes?
- 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, like LNG. 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 *renewable energy facility* 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. This may also include development that manufactures machinery to support the hydrogen industry and the establishment of a hydrogen industry hub.
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 land uses are categorised in a planning scheme. As hydrogen activities fall under a variety of use terms, the use of thresholds may be helpful. Thresholds may be a way to provide parameters to differentiate a hydrogen activity from another type of activity under the same use term.

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

Assessment benchmarks

The department's *Drafting a planning scheme – Guidance for local governments* provides advice on the preparation of appropriate assessment benchmarks. Following a review of the planning scheme, a 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, a 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 preferred in certain zones?
- Are particular setbacks to other land uses required that are not already captured? For example, will the quantity of hydrogen produced at a school require a minimum setback to other sensitive land uses?
- Are there any other key considerations to hydrogen activities related to access such as infrastructure or water?

When is an activity ancillary to the primary use?

In many instances hydrogen may be used to replace parts of the existing electricity or gas networks for providing energy to our homes, businesses, and industries. But how do we know whether it requires a new development application or is simply part of the existing use lawfully occurring on the premises?

Determining whether a use is an ancillary use should be ascertained on a case-by-case basis.

An ancillary use must be subservient to and have an exclusive functional relationship to the principal use. For example, where the owner of an existing residential dwelling seeks to use a hydrogen cell as a way to store electricity to use when no solar power is being created (i.e. at night) or when there is a loss of power to the energy grid.

Questions to consider whether a use is ancillary include:

Question	Example
1. Is the ancillary use related to the primary use?	An existing dental surgery is looking to install five hydrogen battery cells to store the energy currently created by their solar panels to reduce their electrical costs over the long term. As this does not change the approved use for a dental surgery occurring on the site the battery cells are ancillary to the existing use. However, if the dental surgery decided to instead install the battery cells to store their solar energy to sell the electricity to neighbouring land uses this would no longer be ancillary to the primary use of the site as a dental surgery.
2. What proportion of the property is used for the ancillary use?	A transport depot includes a hydrogen refuelling station to support the refuelling of its fleet of vehicles. The refuelling station takes up 10% of the premises while the remainder is used for storing fleet vehicles and undertaking maintenance. The owner of the site decides to scale back the number of fleet vehicles they store on the premises and increase the hydrogen refuelling stations to cover 60% of the site. In this instance the change in percentage of the site used for refuelling is unlikely to remain as ancillary to the transport depot as it is no longer subservient in its operation.
3. What are the impacts associated with the ancillary use compared to the primary use?	A large-scale manufacturer is producing steel using coal-based energy. The company is seeking to upgrade its facilities and move towards more efficient and sustainable production methods. As part of this they will be trialling replacing coal-based power with green hydrogen for a small number of their products. As the trial is only temporary and there are no other impacts associated with the trial other than using a different form of energy it is ancillary to the existing use.

Key resources

Source	Content
Queensland Hydrogen Industry Strategy 2019–2024	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.
Queensland Hydrogen Investor Toolkit	The toolkit 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.
Queensland Renewable Energy Zones	The development of the Queensland Renewable Energy Zones (QREZ) seeks to ensure investment is coordinated to support the development of transmission and generation infrastructure for Queensland. The state is broken up into three key areas; northern, central and southern which have been identified as having characteristics suitable for renewable energy.
National Hydrogen Strategy	Australia's 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.
Australian Hydrogen Council	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.
Australian Renewable Energy Agency	Australian 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.
Department of Climate Change, Energy, the Environment and Water	The Department of Climate Change, Energy, the Environment and Water provides key information for the national goals towards the use of hydrogen including: • Prioritising hydrogen to reduce emissions • Setting up international partnerships to support the export of hydrogen

	• Collaborating on the establishment of an international Guarantee of Origin Certification scheme for green energy • Creating regional hydrogen hubs for greater efficiencies in its development and running costs
Centre for Hydrogen Safety	Global United States of America based not for profit organisation. Source for best practices in hydrogen use.
Prospective hydrogen production regions of Australia	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
Australian Hydrogen Hubs Study	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.
Geoscience Australia hydrogen mapper	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. 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 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.
National Hydrogen Roadmap	The CSIRO has produced the *National Hydrogen Roadmap* which provides a blueprint for the development of the hydrogen industry in Australia. The roadmap includes information about international safety standards, different uses for hydrogen and also case studies of a range of developments.
Queensland Energy and Jobs Plan	The Queensland Energy and Jobs Plan outlines the State's pathway to a clean, reliable, and affordable energy system to provide power for generations.
Draft Hydrogen Safety Code of Practice (Dated September 2022)	The Code has been developed to provide a consolidated document of requirements of the petroleum and gas safety legislation that apply to applications using hydrogen as a fuel gas. This code provides information that may be relevant to the planning framework. Further assistance on this Code and how ongoing regulation occurs can be sought from RSHQ or through the government's Hydrogen safety regulation in Queensland page.

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