



Resources Safety & Health
Queensland

Developing a Hydrogen Safety Code of Practice

Discussion Paper

October 2021

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Have your say

The Queensland Government is seeking industry feedback on proposals outlined in this discussion paper to develop a Hydrogen Safety Code of Practice.

How to make a submission

The Inspectorate welcomes written feedback on the issues and proposals for the Code of Practice raised in this paper. You can email submissions in the template provided in Appendix A to hydrogensafety@rshq.qld.gov.au by close of business **Friday 12 November 2021**.

RSHQ will progress sector specific information webinars. You will receive an invitation to webinars relevant to your industry sector.

Please indicate whether you would prefer any elements of your feedback to remain confidential. Submissions not marked as confidential may be published in full or quoted in public documents or may be available to applicants under the Right to Information Act 2009.

Summary

Hydrogen generated from sustainable sources is a clean, renewable fuel that can be used as a transport fuel, for power generation and in a range of industrial processes. Hydrogen is currently used in many manufacturing, food processing industrial and chemical applications.

As Australia and the world shifts towards net zero carbon emissions. New opportunities to use hydrogen as a fuel to replace fossil fuels are developing rapidly.

A Queensland hydrogen industry has the potential to deliver significant economic, employment, energy security and environmental benefits for Queensland as well as contributing to a future reduction in carbon emissions. The Australian and Queensland Governments are committed to developing a safe and sustainable hydrogen industry.

The Petroleum and Gas Inspectorate within Resources, Safety & Health Queensland (RSHQ) is the primary safety regulator for hydrogen when it is used or intended to be used as a fuel ¹.

RSHQ's objective for safety regulation of the hydrogen industry is to achieve effective, risk based and flexible fuel gas safety regulation that responds to emerging applications. Workplace Health and Safety Queensland and the Electrical Safety Office also have a role to ensure Queensland's hydrogen industry is safe and the Petroleum and Gas Inspectorate is working collaboratively with these safety regulators.

Current safety requirements in the *Petroleum and Gas (Production and Safety) Act 2004* relate to traditional fuels such as natural gas and LPG and do not specifically target hydrogen fuel applications.

To meet the needs of the rapidly growing hydrogen industry, RSHQ is developing a **Code of Practice for Hydrogen Safety** to set out safety requirements for hydrogen fuel gas applications. The Code of Practice will be a practical, timely and accessible means of providing industry with guidance about safe operations, regulatory compliance and approval processes.

Queensland will be the first state to have a clear pathway for hydrogen system compliance.

¹ Gas safety regulation under the *Petroleum and Gas (Production and Safety) Act 2004* applies to hydrogen when it is used or intended to be used as a fuel. Hazardous chemical and major hazard facility provisions in the *Work Health and Safety Act 2011* and hazardous area provisions in the *Electrical Safety Act 2002* also apply to hydrogen applications and must be satisfied.

Purpose

The purpose of this Discussion Paper is to seek feedback from industry and other stakeholders to assist the development of the Code of Practice. Feedback received will be used to inform the technical elements and considerations of the Code of Practice for Hydrogen Safety.

Scope

This discussion paper will consider the following:

- Safety regulation frameworks applying to hydrogen in Queensland
- Approvals for hydrogen gas devices (including fuel cells in vehicles)
- Gas work licenses and authorisations including training and competencies for hydrogen gas work
- Hydrogen suppliers and delivery networks
- Hydrogen fuel stations
- Odour requirements for fuel gas containing hydrogen
- Hydrogen in pipelines and gas distribution systems

Acronyms and Glossary

Acronym / Term	Description ²
Conformity Assessment Body	An entity that holds accreditation with the Joint Accreditation System of Australia and New Zealand for operating a product certification scheme for gas-related products in accordance with AS/NZS ISO/IEC 17065 'Conformity assessment— Requirements for bodies certifying products, processes and services'
Fuel gas	A substance prescribed under a regulation including hydrogen when used or intended to be used as a fuel (as prescribed in GP Regulation)
Gas Device	A device used, designed or intended for use for the production of heat, light or power using fuel gas
Gas device Type A	A gas device that has been approved by a conformity assessment body or Gas Device Approval Authority (GDAA) and which is listed in Schedule 1 of the Safety Regulation as defined by section 724 of the Act
Gas device Type B	A gas device defined by section 724 of the Act and that is not listed in Schedule 1 of the Safety Regulation
Gas Work Authorisation	Granted under the Act to authorise the holder, or an individual working under the holder's authority, to undertake gas work in relation to a gas device type B
Gas Work Licence	Granted under the Act to authorise the holder to undertake gas work in relation to a gas device type A or a fuel gas refrigeration device
GDAA / gas device approval authority	Granted under the Act to authorise the holder to undertake gas device approval work
Hydrogen rich blend	A blend of natural gas and hydrogen that does not meet the specification for general purpose natural gas (as defined in AS 4564)
MHF	Major Hazard Facility
Operating plant (in relation to hydrogen)	A facility that is defined as operating plant under section 670 of the Act and requires a safety management system. For hydrogen types of operating plant include: <ul style="list-style-type: none"> - Dispensing of hydrogen to a vehicle - Hydrogen delivery networks - Hydrogen distribution systems and authorised pipelines
PGI	The Petroleum and Gas Inspectorate
safety management system	A comprehensive and integrated system for managing health and safety risks at operating plant. Content requirements are outlined in section 675 of the Act
the Act	<i>Petroleum and Gas (Production and Safety) Act 2004</i>
the Code	the proposed Code of Practice for Hydrogen Safety
the GP Regulation	Petroleum and Gas (General Provisions) Regulation 2017
the Safety Regulation	Petroleum and Gas (Safety) Regulation 2018
WHSQ	Workplace Health and Safety Queensland

² Definitions have been simplified for the purpose of this paper. Refer to the Act, the Safety Regulation and the GP Regulation for complete definitions of terms.

Safety Regulatory Framework by Hydrogen Use

The info-graphic below illustrates how various uses of Hydrogen are regulated from a safety perspective in Queensland. The following principles determine which regulator is the lead:

- WHSQ are the lead regulator for all MHFs in Queensland, including hydrogen MHFs
 - o Export scale projects will most likely be major hazard facilities
- Below the MHF threshold, PGI are the lead regulator where the hydrogen is used, or intended to be used, as a fuel
 - o Most new projects use hydrogen as a fuel. For example: fuel cell systems for mobile and stationary applications as well as hydrogen blends in gas networks
- For other uses of hydrogen, WHSQ are the lead regulator.
 - o This includes for fertiliser production, chemical processes, steel making, food industry applications

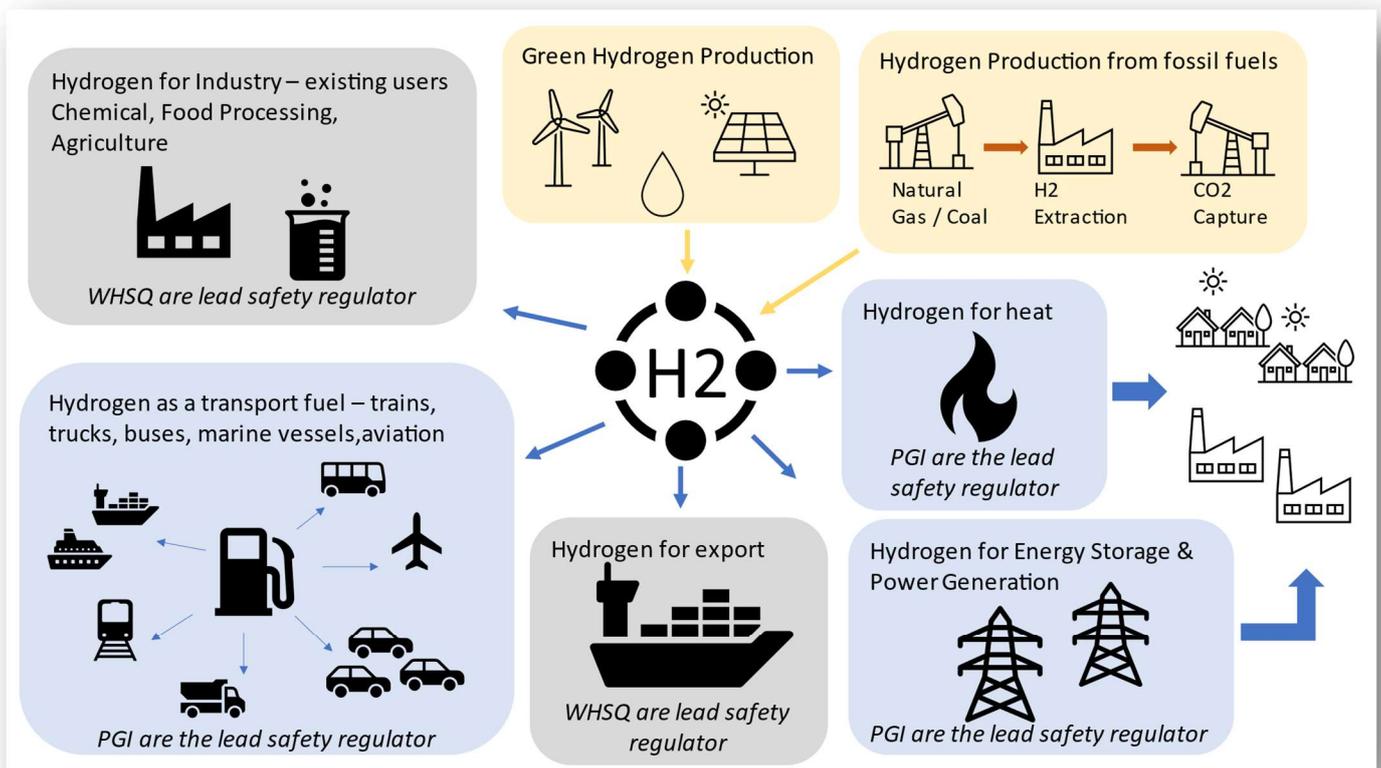


Figure 1 Hydrogen Uses

Discussion

Gas devices and approvals

Current state

- All gas devices must be approved for installation and use
- Gas devices must be assessed against the relevant safety requirements in order to be approved
- In Queensland, a fuel cell is a Type B gas device
- Type B gas devices require individual approval by a GDAA
- Many hydrogen applications, including vehicles, use fuel cells
- Traditional Type A gas devices are approved for use with LPG or natural gas that meets the quality prescribed in the Safety Regulation
- Type B gas devices are approved for the gas that is being supplied to the device. For example: natural gas, LP gas, biogas, biomethane or hydrogen

Issues

- The safety requirements listed in Schedule 2 of the Safety Regulation are not suitable for fuel cells
- Currently, there are limited GDAA holders that are authorised to approve hydrogen gas devices, including fuel cells. There are no current approvals for hydrogen fuel cells in Queensland
- Queensland require additional GDAA for fuel cells
- Supply of fuel gas that does not meet the prescribed quality (e.g. hydrogen rich blends) requires gas devices to be re-approved

Proposal

- The code will list safety requirements for fuel cells (i.e. relevant Australian and International standards)
- The code will outline an approval pathway for fuel cells and gas devices that use hydrogen or hydrogen blends
- Requirements for approval of fuel cells by a GDAA holder will be included in the [Gas Device Approval Authority Requirements](#) document. Companies and individuals may apply to be authorised as a GDAA holder to approve fuel cells.

The info-graphic below shows a typical hydrogen supply chain for a fuel cell electric vehicle. The hydrogen supplier and refueller may be the same or separate operating plants. The fuel cells supplied are gas devices.

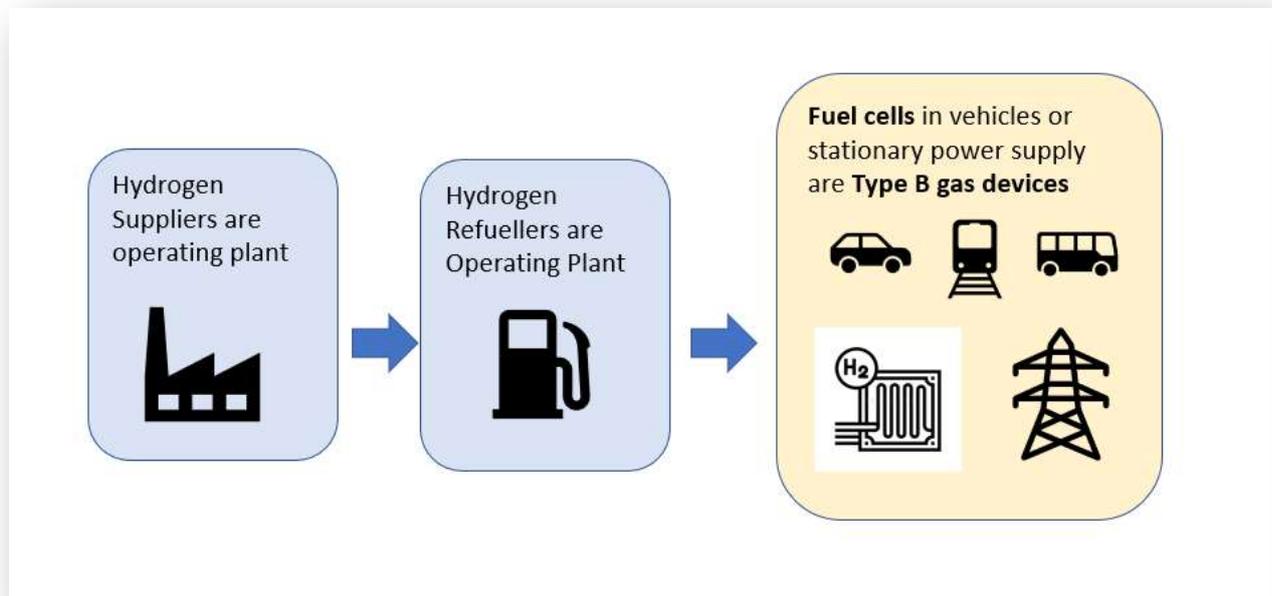


Figure 2 Typical Hydrogen supply chain

Gas Work Licences, Authorisations and Competencies

Current State

- To conduct gas work in Queensland a person must hold a gas work licence (Type A devices and fuel gas refrigeration devices) or a gas work authorisation (Type B devices)
- Schedule 2 of the Safety Regulation sets out mandatory and preferred standards for gas work
- Schedule 5 of the Safety Regulation sets out qualifications or experience requirements for gas work licences and gas work authorisations

Issues

- The safety requirements listed in Schedule 2 of the Safety Regulation may not be suitable for all hydrogen gas systems
- The qualifications listed in Schedule 5 of the Safety Regulation do not currently include specific competencies for working with hydrogen
- Gas work authorisations for Type B devices are targeted at industrial appliances and LPG fuelled vehicles

Proposal

- The code will list qualifications and experience requirements to work on hydrogen gas systems
- The code will list additional safety requirements that can be used for hydrogen systems (i.e. relevant Australian and International standards)

Hydrogen Delivery Networks including Hydrogen Fuel Stations

Current State

- A network that dispenses fuel gas to a vehicle meets the definition of operating plant under the Act (e.g. Hydrogen Fuel Station)
- Supply of hydrogen as a fuel gas also meets the definition of operating plant under the Act (e.g. supply of hydrogen to a fuel station, supply of hydrogen in cylinders or packs for use as a fuel)
- Operating plant must have a safety management system that complies with the Act
- The Safety Regulation prescribes quality and odour for fuel gas
- The Act requires fuel gas to have the prescribed odour when supplied to a consumer
- The Safety Regulation sets out preferred and mandatory safety requirements

Issues

- Sulphur based odourants that are currently used to odourise fuel gases cause damage fuel cells
- There is no prescribed quality for hydrogen
- There are no safety requirements in Schedule 2 of the Safety Regulation for hydrogen fuel stations or hydrogen delivery networks

Proposal

- The code will provide an alternate safety requirement to odourant
- The code will prescribe quality requirements for hydrogen
- The code will list safety requirements for hydrogen delivery networks and fuel stations

Hydrogen in Pipelines and Gas Distribution Systems

Current State

- Fuel gas pipelines and distribution systems are operating plant
- Operating plant must have a safety management system that complies with the Act
- The regulation prescribes quality and odour for fuel gas
- Gas that does not meet the prescribed quality may be approved if supply is acceptable to relevant consumers
- The Safety Regulation prescribes quality and odour for fuel gas
- Gas devices are approved for use with LPG or natural gas that meets the prescribed quality
- The Act requires fuel gas to have the prescribed odour when supplied to a consumer

Issues

- There is no prescribed quality for hydrogen or hydrogen blends that do not meet the specification for general purpose natural gas (AS 4564)
- Gas devices supplied with fuel gas outside current prescribed quality must be re-certified for the quality of fuel gas with which they will be supplied

Proposal

- The code will prescribe a minimum quality requirement for hydrogen when hydrogen is to be used as a fuel gas
- The code will outline an approval pathway for gas devices that use hydrogen or hydrogen blends thereby enabling supply of hydrogen and hydrogen rich blends to consumers

Timeframe

The timeline below indicates key milestones in the development of the Code.



Appendix A – Feedback Form

Feedback form – Developing a hydrogen safety code of practice discussion paper 2021	
Company or Entity Name:	
Representative Name/Email:	
Feedback	
<ul style="list-style-type: none"> • do the proposals resolve the issues raised in the discussion paper? • what are likely impacts from the proposals? • what alternative proposals would resolve the issues raised in the discussion paper? and • are there other emerging issues for hydrogen safety not covered in this discussion paper? 	
Gas Devices and Approvals <ul style="list-style-type: none"> • The code will list safety requirements for fuel cells (i.e. relevant Australian and International standards) • The code will outline an approval pathway for fuel cells and gas devices that use hydrogen or hydrogen blends • Requirements for approval of fuel cells by a GDAA holder will be included in the Gas Device Approval Authority Requirements document. 	
Gas Work Licences, Authorisations and Competencies <ul style="list-style-type: none"> • The code will list qualifications and experience requirements to work on hydrogen gas systems • The code will list additional safety requirements that can be used for hydrogen systems (i.e. relevant Australian and International standards) 	
Hydrogen Delivery Networks and Hydrogen Fuel Stations <ul style="list-style-type: none"> • The code will provide an alternate safety requirement to odourant • The code will prescribe quality requirements for hydrogen • The code will list safety requirements for hydrogen delivery networks and fuel stations 	

<p>Hydrogen Pipelines and Distribution Systems</p> <ul style="list-style-type: none">• The code will prescribe a minimum quality requirement for hydrogen when hydrogen is to be used as a fuel gas• The code will outline an approval pathway for gas devices that use hydrogen or hydrogen blends thereby enabling supply of hydrogen and hydrogen rich blends to consumers	
<p>Any other feedback?</p> <ul style="list-style-type: none">• What is the issue?• What is the consequence or impact of the issue?• What is your recommendation?	