



## Renewable Hydrogen Vehicle Refuelling Stations

An overview of the regulatory landscape

Prepared for the Department of Primary Industries  
and Regional Development

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- heavily simplifies and summarises key legislation, and in so doing deliberately omits important qualifications and complexities
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The Government of Western Australia asked Jackson McDonald to undertake a review of the regulatory landscape as it relates to hydrogen refuelling stations (**HRSs**) and fuel cell electric vehicles (**FCEVs**) in Western Australia, in the context of a hypothetical project in which a business wished to build an HRS to service its own FCEV fleet. This scenario did not include any sale of hydrogen to third parties or the public.

This overview of the regulatory landscape is extracted from that review.

Hydrogen is a flammable and potentially explosive gas, typically stored under high pressure, and consequently requires safe and careful handling and management.

Our review identified the following areas of regulation as potentially applying to such a project:

- Environmental laws
- Zoning and planning laws
- Occupational safety and health laws
- Dangerous goods and materials handling laws
- Gas sector laws
- Vehicle standards and licensing laws
- Fuel quality laws
- Water access laws

Each of these areas is governed by Acts (usually more than one) and supporting regulations, often also involving a substantial body of other subordinate instruments such as standards, protocols, procedures and codes.

At the lowest of these levels, there are considerable gaps in codes, procedures, standards etc for dealing with hydrogen. This may create both policy and operational challenges.

In some areas of law, the current regulatory regime either already regulates hydrogen activities, or contains adequate general powers and duties (eg. duties to provide a safe workplace, or to avoid environmental harm) such that it is capable of providing an appropriate framework even though it does not deal specifically with hydrogen. This is the case in relation to **laws for protection of the environment, zoning and planning laws**, and (if it proves necessary as projects scale up) **rights to water**.

However, even in these areas, early renewable hydrogen proponents may face **regulatory delays and uncertainties**, as regulatory decision makers grapple with a lack of established decision-making criteria and standards. Different regulators may have different levels of experience and sophistication at dealing with novel technologies and systems. This represents a regulatory risk for project proponents. It's an area in which the Government may assist, by developing guidelines to assist decision makers tasked with considering the necessary authorisations. Project proponents may also need to collaborate with decision makers to come to a common understanding on risks and appropriate mitigations.

In some areas, especially **occupational safety and health**, the lack of established procedures and standards may be a substantial practical barrier. Project proponents will want to

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implement a safe workplace, but in the face of this lack of documented protocols, may find it hard to ascertain *how in practice* this should be done.

In other areas there are **potential gaps or unintended consequences** due to aspects of current regulation being premised on the regulation of natural gas or the use of internal combustion engines, for example, **occupational health and safety** and **fuel quality**. In these areas regulatory intervention will be needed, for example to adapt existing regulatory frameworks to ensure adequate safety, control and regulatory oversight.

Finally, laws governing the **gas sector** respond unpredictably, sometimes catching hydrogen as “gas” and sometimes not. The laws regulating gas fitting and gas appliances ostensibly catch hydrogen work and appliances, but likely will require amendment to work safely and effectively. Policy development is needed as to what other aspects of gas sector regulation should apply to the hydrogen sector, and at what stages of its evolution.



## The future of hydrogen in Western Australia

Western Australia's energy future is changing rapidly. Globally, key hydrogen technologies have matured, with significant private and public investment flowing into the development of hydrogen as a medium for storing and transporting renewable energy.

Renewable hydrogen presents an exciting alternative as a transport fuel. Renewable hydrogen is produced using electricity from renewable energy sources such as solar PV and wind, and is created through electrolysis – running an electric current through water to produce hydrogen gas and oxygen gas.

The opportunities that might arise from the use of renewable hydrogen as a zero carbon fuel source are often discussed. However, amidst the excitement around this possibility, there remains uncertainty about the practical steps needed to facilitate this transition.

Industry investment will be key, and regulatory certainty is a prerequisite for such investment. The Government of Western Australia recognises this and is actively considering its role in the regulatory reform process.

Our review involved a “wide-angle lens” review of the regulations that could regulate the use of renewable hydrogen as a fuel source for electric vehicles. We focussed on the WA context, with national regulation considered only to a lesser extent. This overview presents some extracts from that review.

## A hypothetical project

We considered a hypothetical project in which a business is planning a trial Fuel Cell Electric Vehicle (“FCEV”) project in WA, to trial hydrogen-fuelled vehicles for its light vehicle fleet.

FCEVs are electric vehicles, but use a fuel cell in place of a battery as their primary source of electric power. A fuel cell chemically combines the hydrogen (carried in a high pressure tank) with oxygen from the outside air, to produce electricity and water.

To support this FCEV fleet, the company plans to build a hydrogen refuelling station (“HRS”), which will create hydrogen by electrolysis – running an electric current through water to produce hydrogen gas and oxygen gas. The oxygen will be released into the atmosphere. The hydrogen will be captured, compressed and stored in high pressure tanks. It will be delivered into the FCEV by a relatively normal driver-operated bowser and hose system – much like LPG-powered cars today.

This scenario **does not consider bulk hydrogen transport, or supply to anyone but the business's own fleet.**

Our review included the State's mining legislation, because mine site light vehicle fleets represent an opportunity for early adoption of this technology.

Hydrogen is of course a flammable gas, with a relatively broad explosive envelope. As a gas, it is stored in high pressure vessels.

# Environmental laws

# Zoning and planning laws



## Ambit

Regulate the protection and management of environmental impacts including extracting and emission.

## Ambit

Regulate the use and development of land, including construction of facilities, within specific geographic zones.

## Key take-aways

No regulatory barriers have been identified for a small scale HRS. We recommend that any reform process maintain the current regulatory approach of scaling regulation to suit the scale of output, so as to avoid small projects with low emissions and low likely impact having to undergo lengthy environmental approvals processes.

This also follows recommendations made in the European [HyLAW report](#) to amend European regulations so that electrolysers below a certain capacity are exempt from permitting requirements. Currently, those regulations do not differentiate between hydrogen production on an industrial scale and on a non-industrial scale. As such, permits are assessed on a case by case basis, requiring even small facilities to undergo long permitting procedures.

The current statutory regime adequately and appropriately caters for HRSs with minimal changes needed. Environmental regulators are relatively experienced at assessing new technologies and risks, and we would expect them to cope with this one as well. Over time, new systems and standards will be added, but the lack of these should not present too great a barrier for early projects.

## Key take-aways

Zoning and planning laws may not need specific reform to cater for an HRS. However, due to approving authorities' lack of familiarity with HRSs, the practical and timing challenge of zoning and planning approvals do represent a material project risk for proponents, as decision makers grapple with unfamiliar new technology and new, unknown risks. Project proponents will likely need to work with local governments to explain key project risks and concepts.

In California, building codes require canopies used to support gaseous hydrogen systems to be constructed in a way that stops hydrogen gas accumulating. WA will likely need similar standards.

A lesson learned from Japan is that specific standards for hydrogen have increased operating costs, in turn hindering development. Japan is looking at ways to loosen HRS regulation, eg. by replacing a specific requirement to install shade canopies over storage vessels with broader requirements for temperature control.

Decision-makers in this space may be less experienced in dealing with uncommon proposals, have less sophisticated processes, and be more dependent on precedent. Novel proposals which don't fit within existing approval criteria may encounter delays, and a conservative approach to risk.

## Key legislation and regulation

- *Environmental Protection Act 1986 (WA)*
- *Environmental Protection Regulations 1987 (WA)*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*

## Key legislation and regulation

- *Planning and Development Act 2005 (WA)*
- *The applicable town planning scheme*
- *Building Act 2011 (WA)*
- *Building Regulations 2012 (WA)*



## Ambit

Regulate the exploration and extraction of minerals, and a wide range of associated facilities and activities. Creates various forms of land tenure, including for the construction of facilities such as any HRS to be located on mining tenure.

## Key take-aways

A mining lease granted under the *Mining Act* confers broad rights to do all things necessary to effectively carry out mining operations, and project proponents will most likely already operate diesel refuelling stations on the relevant mining tenement. Although some new safety conditions may be added, there are unlikely to be any tenure restrictions to an HRS being located on a mining tenement.

Operating an HRS on a mining tenement will fall within the definition of 'mining operations' for the purposes of the *Mining Act* and the *Mines Safety and Inspection Act*. There may not be specific standards etc yet in place, but the miner will be required to comply with its general obligation to mine safely. There is a gap with regard to the regulation of FCEVs operating underground.

The lack of detailed safety protocols will make regulators cautious. However, mining regulators are relatively sophisticated, and accustomed to innovation. They will likely be prepared to work with the miner, and to develop a practical safety regime in advance of detailed standards and protocols.

## Key legislation and regulation

- *Mining Act 1978 (WA)*
- *Mining Regulations 1981 (WA)*
- *Mines Safety and Inspection Act 1994 (WA)*
- *Mines Safety and Inspection Regulations 1995 (WA)*
- The relevant mining tenements

## Ambit

Regulate the safety, health and welfare of people at work. Creates standards of conduct for various practices including hazardous practices. (Occupational, safety and health in a mining context is dealt with under mining laws, at left.)

## Key take-aways

Occupational safety and health regulation in Western Australian will capture HRS in a generic sense (ie the general duty of care for safety and health in a workplace) and specifically due to hydrogen being a hazardous substance (flammable; under pressure).

The GHS classification system, which includes physical as well as chemical hazards, is not yet mandated in Western Australia. However, Western Australia is currently undertaking a major reform and modernisation of its OSH laws, presenting an opportunity to mandate any specific additional requirements deemed necessary for the regulation of a HRS.

OSH regulation and management both depend heavily on standards and codes of practice. As a result, a project proponent will face practical operational difficulties trying to implement the HRS project in the absence of appropriate detailed protocols and standards, even though the overarching legislation and general duties do respond adequately.

## Key legislation and regulation

- *Occupational Safety and Health Act 1984 (WA)*
- *Occupational Safety and Health Regulations 1996 (WA)*
- *Mines Safety and Inspection Act 1994 and Regulations 1995 (WA)*
- *Petroleum and Geothermal Energy Safety Levies Act 2011 (WA) and associated regulations*
- *National Code of Practice, Control of Workplace Hazardous Substances [NOHSC:2007(1994)]*



## Ambit

Regulate the manufacture, storage, possession, handling, transport and use of dangerous goods.

## Key take-aways

Hydrogen is classified as a dangerous good, so there are existing specific requirements for handling, transporting and storing it, including standard signage.

The current and proposed reforms of WA's dangerous goods safety legislation present an opportunity to consider any specific additional requirements which might be necessary to regulate an HRS.

California has promulgated specific fire and safety awareness requirements for a HRS. This may be a consideration for Western Australia.



## Key legislation and regulation

- *Dangerous Goods Safety Act 2004 (WA)*
- *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 (WA)*
- *Dangerous Goods Safety (Road and Rail Transport of Non-explosives) Regulations 2007*
- *Dangerous Goods (Major Hazard Facilities) Regulations 2007*

## Ambit

Regulate business activities (distribution and retail) in the gas sector, imposes quality and licensing requirements for gasfitting.

## Key take-aways

Gas sector legislation responds variably and rather arbitrarily to hydrogen. Some statutory definitions catch it, and some do not. Even when hydrogen is caught by an Act's definition, its regulations and subordinate instruments generally assume the gas in question is a hydrocarbon, usually methane, and may not work with hydrogen.

Clearly, in the short term regulation is needed for hydrogen appliances and hydrogen fitting. As soon as hydrogen is to be sold for use by consumers, hydrogen quality control will be needed and retail market regulation may need to be considered. There are specific gas quality requirements for LPG used as a vehicle fuel.

Although the current regime clearly needs reform and may not work desirably, or at all, with hydrogen, we anticipate that pending reform of these laws, safety regulators will nonetheless seek to apply them, despite the laws' assumption that the gas in question is natural gas, to ensure that hydrogen fitting work is done safely by suitably qualified workers.

## Key legislation and regulation

- *Energy Coordination Act 1994*
- *Gas Standards Act 1972*
- *Gas Standards (Gas Supply and System Safety) Regulations 2000*
- *Gas Standards (Gasfitting and Consumer Gas Installations) Regulations 1999*



# Vehicle standards and licensing laws

# Fuel quality laws



## Ambit

Regulate the design and use of motor vehicles.

## Ambit

Regulate the quality of fuel supplied.

## Key take-aways

The motor vehicle industry appears to be further developed in preparedness for FCEVs than other aspects of hydrogen regulation and there are a number of reforms already underway. However it will take time for the specialist skills to be developed to appropriately service and maintain FCEVs. Specific standards in this area have been adopted in California.

The present model in which a national approach is adopted in relation to vehicle standards which are then implemented under state legislation, seems sensible and should continue to be followed. WA's role in this space will likely be limited to participating in federal discussions, and ensuring its State laws remain in step.

Although the industry is well developed in its thinking, the legislation, regulations and ADRs are to some extent lagging. This can be a risk for project proponents – the automotive industry relies very heavily on published design rules and standards, and progress can be slowed if these lack clarity.

## Key take-aways

There is no current regulatory regime which appropriately governs fuel quality for FCEVs. Whilst this may not be a problem for a HRS used for refuelling only the business' own vehicles such as is contemplated in the current hypothetical scenario, this does represent a gap if hydrogen is produced for commercial sale. Fuel quality was cited as one of the key limitations of the Perth buses trial. The hydrogen purity was inadequate for fuel cells and had to be further purified before use.

## Key legislation and regulation

- *Motor Vehicle Standards Act 1989 (Cth)*
- *Motor Vehicles Standards Regulations 1989 (Cth)*
- *Australian Design Rules, third edition*
- *Road Traffic (Vehicles) Act 2012 (WA)*
- *Road Traffic (Vehicles) Regulations 2014 (WA)*
- *Road Vehicles Standards Act 2018*
- *Road Vehicles Standards Rules 2019*

## Key legislation and regulation

- *Fuel Quality Standards Act 2000 (Cth)*
- *Fuel Quality Standards Regulations 2001 (Cth)*, NOTE: replaced by *Fuel Quality Standards Regulations 2019 (Cth)* on 1/10/19
- *Gas Standards Act 1972 (WA)*



## Ambit

Regulate the protection and management of waterways and their foreshores.

## Key take-aways

Access to water may not be an issue for small projects, whose consumption is modest. When it does emerge as an issue, the existing regime will likely deal adequately with a hydrogen project.

A licence will be required, and in this developing area decision makers may be uncertain as to what standards and conditions to impose. This represents a regulatory risk for project proponents.

Even though the existing regulatory regime should be able to accommodate HRS projects, we think that the environmental and societal sensitivity around water rights and water quality means that the emergence of a new source of demand competing for this scarce resource may not be welcomed. For example, the anti-fracking movement is driven to a considerable degree by concerns about water.

This issue may impact both on a project's social licence to operate, and on the attitude of regulators to this new purpose for water-taking.

## Key legislation and regulation

- *Rights in Water and Irrigation Act 1914 (WA)*
- *Water Services Act 2012 (WA)*