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What's all the hype about hydrogen? – Development of the hydrogen industry in Australia

There has been much hype around hydrogen recently, and its potential to decarbonise a range of industries and create a multi billion dollar export industry for Australia. This article examines the potential for hydrogen, what Australia is doing to develop a lucrative hydrogen industry, the regulatory framework required to support this and concludes with a suggested legal strategy to safeguard commercial interests.

Hydrogen has a wide range of applications. It can be used to power fuel cell vehicles and generate electricity in power stations. Hydrogen can be injected into the existing natural gas pipelines and used as a replacement for natural gas for domestic heating and cooking. It can also be used in other industries such as farming, metal processing or manufacturing (particularly if mixed with other chemicals to create products such as ammonia and niche fertilisers).

If 'green' hydrogen is used to replace hydrogen in existing industries, or new hydrogen industries emerge to replace those dominated by fossil fuels (such as transport, manufacturing and electricity generation), then there is a huge potential to decrease global carbon emissions.

'Green' hydrogen can be produced using an electrolyser and a renewable energy source (such as wind or solar power) to separate water water (H_2O) into hydrogen and oxygen. If a fossil fuel feedstock is used to produce hydrogen, carbon capture and storage can also be utilised to produce zero net carbon hydrogen.

As costs associated with the production, storage and use of hydrogen decreases and the ability to produce 'green' hydrogen becomes more cost effective, hydrogen is being hailed as a new growth industry.

Hydrogen converted to a liquid form (or other suitable material) can be readily transported, meaning it can become a tradeable source of energy that can be exported. In fact, hydrogen could be Australia's next multi-billion export opportunity according to Australia's National Hydrogen Strategy Working Group. Australia has renewable solar and wind energy readily available to produce hydrogen and if Australia can export 'green' hydrogen to the rest of the world, it can help meet global demand for renewable energy solutions and help reduce global carbon emissions. Modelling for the Australian Renewable Energy Agency (ARENA) has forecast Australian hydrogen exports could contribute $1.7 billion and 2,800 jobs to Australia's national economy by 2030.

What is Australia doing to capitalise on this?

There are a number of national and state based initiatives aimed at developing and scaling up the hydrogen industry in Australia.

Australia's national science agency, the CSIRO, has developed a National Hydrogen Roadmap, focusing on the economic opportunities associated with hydrogen and how those opportunities can be realised. This is intended to inform investment and ensure the industry can continue to develop in a coordinated manner. One of the key findings of the Roadmap is that lack of supporting infrastructure and the cost of hydrogen supply are both barriers to the development of the industry, but these can be overcome by strategic investments.

The Australian federal government has recognised this, and has developed a National Hydrogen Strategy, setting out a path to accelerate the commercialisation of hydrogen and build Australia's hydrogen industry.

As part of this strategy, it established the $300 million 'Advancing Hydrogen Fund' to specifically invest in the emerging hydrogen industry and provide concessional finance for projects that will advance the industry. This fund will focus on hydrogen production, developing export and domestic supply chains and hydrogen hubs, and those projects that help grow local demand for hydrogen.

Further, on 17 September 2020, the federal government announced an extra $1.62 billion for the Australian Renewable Energy Agency (ARENA) to invest, as well as expanding the focus of ARENA and the Clean Energy Finance Corporation (CEFC) to back new technologies that will cut emissions in agriculture, manufacturing, industry and transport.

One of the projects is to fast track commercialisation of hydrogen production using large scale electrolysis to reduce the cost of hydrogen. On 20 July 2020, ARENA announced that 7 hydrogen electrolyser projects have been shortlisted for $70 million funding under the ARENA Renewable Hydrogen Deployment Funding Round. These electrolysers are at least 10MW in capacity and the projects are for a range of end uses including transport, gas injection, renewable ammonia production, power and industrial applications. It is anticipated that two of these projects will ultimately be awarded the funding.

States are also backing key projects to position themselves to capitalise on the potentially lucrative hydrogen industry. The South Australian government, aiming to establish Adelaide as the world's first carbon neutral city, is prioritising investment in low carbon industries and renewable electricity generation to help achieve this. As part of this, the South Australian government has provided grants totaling $17 million and loans totaling $25 million to hydrogen projects within the state. This includes a $4.9 million grant to Hydrogen Park South Australia to build a $11.4 million demonstration plant, housing a 1.25 MW proton exchange membrane electrolyser to produce hydrogen. The project will demonstrate the feasibility of blending 5% renewable hydrogen with natural gas, utilising the existing gas network, for domestic use, such as cooking and heating.

Regulatory framework

As part of the National Hydrogen Strategy, a report has been commissioned to review the legislation, regulations and standards potentially relevant to the development of a hydrogen industry in Australia and to provide initial recommendations regarding the next stages in further developing law required to facilitate a hydrogen industry in Australia.

This review highlights the importance of ensuring regulation of the industry is not a barrier to investment and that it supports the future development of the industry. As part of this it will be critical to ensure that the development of regulation and laws aligns with the technological and commercial developments of the emerging industry. Further, national consistency and alignment of laws and regulations between states and with international standards will make compliance easier, with lower costs.

Safety has been identified as a key area that requires considerable regulatory attention and this will also be very important to community acceptance of the hydrogen industry.

There are several risk factors associated with hydrogen. This includes the fact that hydrogen is highly flammable and has a lower ignition energy than other fuels (such as petroleum), meaning that the risk of a fire or explosion is increased. Liquefied hydrogen is highly compressed and therefore very cold, so skin contact can result in severe frostbite.

Therefore, there needs to be rigorous controls around the use, handling, storage and transport of hydrogen to prevent death or injury. This will likely need to focus on safety aspects associated with injecting hydrogen into the existing gas pipelines, hydrogen fuel cell technology and re-fueling stations and storage and transport of hydrogen. Work health and safety, training for personnel and the development of technical safety standards by Standards Australia will be a crucial part of the regulatory regime. Consistency across states and with international safety standards will also assist to ensuring the smooth development of the industry both domestically and for export, and to keep compliance costs to a minimum.

Minimising environmental impacts will be another significant area of regulation. The development of 'green' hydrogen industries is likely to ultimately have a positive impact on the environment, by assisting the decarbonisation of industries and reducing carbon emissions, so any environmental approval regime for hydrogen projects must be adequate and suitable but not so burdensome that it creates unreasonable impediments to the development of the industry.

The regulation of access to infrastructure will also be fundamental part of the industry. As with Hydrogen Park SA, hydrogen may be injected directly into existing gas networks. Similarly, the hydrogen industry will also need access to other existing infrastructure such as electricity networks, ports, road and rail. As the existing regulations of these infrastructure do not contemplate a hydrogen industry, work will need to be done to overhaul the existing regulatory framework to allow for this.

The regulatory regime should also ensure that there is an attractive investment environment for hydrogen projects in Australia. Investment will be required for projects involved in the production of hydrogen and in supply chain infrastructure (such as refueling stations, storage tanks, pipelines, power lines, ports and other facilities needed for hydrogen supply). Investments could be at project level or company level and could be debt or equity (or a hybrid of both) or some other form of collaboration. Government policies to support industry investment should address availability of grants and incentives, foreign investment restrictions, sovereign risk and social risk (such as community acceptance) and should ensure there is a stable regulatory environment to promote confidence in investment.

To add complexity, the regulatory regime will need to be able to be applicable or readily adaptable to new technologies and applications as they are developed. Priority will need to be given to those technologies closest to commercialisation to ensure that the law can keep up with the technology.

Accordingly, an appropriate regulatory regime will be essential for attracting investment and ensuring that the industry can develop in safe, coordinated and expeditious manner.

Finally, all companies intending to participate in this promising industry should be aware of the need to develop collaborative relationships with other industry players as well as the need to safeguard their intellectual property from local and overseas competitors. Companies should design project-specific legal strategies for this purpose.