Ministry of Foreign Affairs

Summary Handbook to the Australian Hydrogen Industry

Commissioned by the Netherlands Enterprise Agency

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Summary Handbook to the Australian Hydrogen Industry

Diplomatic Mission of the Kingdom of the Netherlands in Australia

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Cover note: This report was commissioned by the Diplomatic Mission of the Netherlands in Australia, and represents GPA's observation on the Australian hydrogen market at the time of issue. It does not necessarily cover every part of the market and is not investment advice. Readers of the report should complete their own due diligence before proceeding with any decisions.

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Foreword

Hydrogen is a topic that has fascinated me in my time as Ambassador to Australia. In the last three years, I've witnessed firsthand the rapid pace of progression of the global hydrogen industry, with Australia and the Netherlands in the forefront, and it shows no sign of slowing down. Where for example three years ago no one expected that Australian hydrogen would be shipped to Europe, today we know that that is exactly what is going to happen.

Australia is known as the Land of Plenty. Australia's vast lands are 175 times larger than the Netherlands by land mass, and Australia has all ingredients needed to realize a hydrogen (export) economy. Not surprisingly Australia has the ambition and the potential indeed to become a renewable energy super power.

The Netherlands and Australia have a longstanding relationship which is over 400 years old. This relationship has adapted to the needs of time and I foresee that the next chapter in our collaboration will be around innovation, iteration and improvement of much needed solutions to decarbonize the global economy.

I want to thank my team at the consulate in Sydney for taking the initiative to have the Australian Hydrogen Industry Guide produced by GPA Engineering. It is filled with pragmatic market insights, analysis and practical hints & tips on the Australian hydrogen market. I hope this guide helps you to take advantage of the wide range of research, innovation, trade and investment opportunities available in Australia.

Our team at the embassy in Canberra and consulate in Sydney has been working on this topic for quite some time and developed a deep understanding of the potential and needs of the hydrogen economy in Australia. Please feel free to contact them with further questions to utilize their knowledge, network and resources to succeed.

The idea that the plentiful Australian sun and wind will one day help to power homes and industries in the Netherlands and Europe is certainly an exciting one. When I leave Australia at the end of my term as Ambassador, I'm glad I can look forward to having a little bit of that beautiful Australian sunshine with me in the form of hydrogen, in the Netherlands.

Ambassador Marion Derckx

Ambassador of the Kingdom of the Netherlands to Australia.

September 2022.

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1 INTRODUCTION & HOW TO USE THIS SUMMARY HANDBOOK

This summary handbook was commissioned by the Diplomatic Mission of the Kingdom of the Netherlands in Australia for the use of Dutch investors and small to medium enterprises seeking to sell services, products and technologies to the Australian hydrogen industry.

It is a short-hand summary of the Australian Hydrogen Industry Guide. It considers the Australian hydrogen industry in the five years from early 2023 to 2028. It focuses on green hydrogen production as well as associated hydrogen research, transport, storage, refuelling and end-use applications from mobility to industrial and domestic applications. It excludes activities and investments by Dutch companies in The Netherlands hydrogen market.

The purpose of this handbook is to provide Dutch entrepreneurs and businesses active in the hydrogen sector a brief overview of:

- The Australian hydrogen industry,
- Business opportunities in Australia for Dutch companies, and
- Practical advice on market entry.

All monetary values provided in this report are in Australian Dollars (AUD) unless stated otherwise.

For more detail on the above and additional reference materials, refer to the Australian Hydrogen Industry Guide.

2 AUSTRALIAN HYDROGEN INDUSTRY OVERVIEW

2.1 INTRODUCTION AND OVERVIEW

Australia is a highly prospective location for the development of the green hydrogen industry. It has abundant space and an abundance of low cost renewable energy. As a stable, export oriented economy, Australia is well placed to supply to major markets in East Asia. The global market for hydrogen may be a trillion dollar market by 2050 and large importers are likely to be South Korea and Japan, as well as China and Europe.

Like in other countries around the world, a hydrogen market, beyond the manufacture of ammonia for industrial use, does not yet exist. Similarly, growth in clean hydrogen demand between 2022 and 2028 will be slow in absolute terms (tonnes of clean H_2) but high in percentage terms. It is expected that large scale hydrogen production and use will accelerate after 2030. It is important to keep in mind that while there is considerable uncertainty in the range of long-term market demand for hydrogen, if the world is to decarbonise, hydrogen is likely to become a trillion dollar industry.

In the 5 years to 2028, initial growth in demand for clean hydrogen will be slow as it moves through the early-adoption phase. In this phase, the primary markets for clean hydrogen will be in mobility and in replacing existing grey/black hydrogen at industrial locations.

Mobility, particularly for heavy long-distance road transport, buses, back-to-base heavy vehicles and mining equipment sectors are expected to account for the majority of clean hydrogen demand in Australia to 2028. Other prospective smaller markets may include ferries and low-emission industrial feed stocks (e.g. alumina refining).

Export scale markets are expected to appear later this decade. Early projects are likely to be collaborations between importers/industrial conglomerates in Asia (especially South Korean and

Japanese industrial houses such as POSCO and Marubeni) and hydrogen project proponents and possibly feedstock suppliers in renewable energy and gas/coal with carbon capture and storage (CCS). Australia could become one of the world's largest suppliers in this global market with a number of competitive advantages including closer proximity to East Asia than Middle Eastern and South American suppliers.

As no market currently exists, partnerships between companies across the value chain will be integral to enabling that market to be built. The strength of those partnerships will likely be major drivers in the pace of project development. Several such projects and partnerships have already been formed and more are forming.

2.2 DEFINING CHARACTERISTICS

The Australian hydrogen market could be characterised by the following:

A **focus on hydrogen production**, particularly for **export**; and to a lesser degree on **replacement of gas** for heating in domestic and industrial applications, and increasingly for **mobility**

Limited equipment manufacturing and development within Australia

Strong bipartisan government support across all levels of government and political parties

Political support is complicated by separate regulatory regimes across different states and territories

A development **focus on hubs**

A domestic market driven by **demand in the mobility sector** – particularly in heavy haul transport and diesel use in remote areas

Early stage investment led by Asian (especially Japanese and Korean) energy and resources trading houses

Potential for many hundreds of **billions of dollars of investment** over the coming decades

2.3 MARKET OVERVIEW

2.3.1 The Australian Hydrogen Industry by Numbers – August 2022

4x H_2 **refuelling Stations** in operation	2x **Green** H_2 **electrolyser sites** in operation	79x **Green** & **Blue** H_2 **production projects** publicly announced	11x H_2 Hubs announced
1.75 MW total installed **green** H_2 electrolyser capacity	100,000 MW Proposed **green** H_2 **electrolyser capacity** by 2050	188 TWh of **new renewable generation** by 2050 to meet CSIRO '"Targeted Deployment" strategy	AUD$45 billion value of the **Australian diesel market** in 2021

$11 billion/p.a. potential **value of the Australian H_2 industry** by 2050 under the CSIRO "Targeted Deployment" strategy

$3.66 billion of **funding for H_2 projects** by state & federal government	0x H_2 trains, ferries and mining equipment **using hydrogen fuel cells**	28x H_2 **mobility pilots** announced	151 kg/day installed H_2 refuelling capacity
0% Australian H_2 Original Equipment Manufacturers **(OEMs)**	10x Hydrogen Ministers across State and Federal Government	38x H_2 **research papers** published since 2015	464 H_2 patents filed in Australia since 2015

Figure 1: Hydrogen by Numbers

2.3.2 A Snapshot of the Australian Hydrogen Industry

Lots of hype, but few operational or "in construction" projects

In 2022, in Australia, the hydrogen sector could be considered to be in a state of high-levels of excitement and hype (and a very large number of "announced" early-stage projects), but with few formally announced invested (FID) projects. As of 2022, only two green hydrogen projects are operational (HyPSA in Adelaide and Western Sydney Green Gas in Sydney) – both were commissioned before 2020. Nonetheless, there is a broad feeling of optimism for the industry in Australia and that it is an industry with a bright future with currently 12 projects under construction at the time of writing.

Projects and Investment Relying on Government Subsidies

Almost all projects and related investments in the Australian hydrogen industry currently rely on government funding as the economics are still very challenging. This is a primary reason why there are many feasibility and concept studies, but few sanctioned projects under construction. The industry expects the economics to improve over the coming years and many companies are actively looking to position themselves for that opportunity. As in other countries, there remains a "chicken and egg" problem in the Australian hydrogen industry as there is no demand for suppliers and a lack of supply for offtakers. As such, supply/demand matchmaking as a core success factor for new developments.

Scale is Increasing Rapidly

As of publication, investment is occurring at two scales. Firstly, several smaller "Local Scale" 1-5 MW production facilities, often as pilots, and associated hydrogen refuelling and storage facilities are in advanced design. These are focused almost exclusively on the domestic mobility, and in a handful of cases, industrial feedstock markets. Secondly, investment is occurring in the 10-20MW scale, often as a follow on to small-scale local pilots. These are focused on similar markets.

Larger 100MW+ and 1GW+ projects have numerous early stage feasibility and, in some instances, concept studies but no formal investment decisions as of the time of publication.

Hydrogen Production – A few big players, many smaller players

Investment in the Australian hydrogen industry is occurring along similar lines to its other major industries in mining and energy. The focus in Australia is on investment in hydrogen and renewable energy production facilities. Large industry champions (for example Fortescue Future Industries, East Asian resource trading houses and the large Australian energy companies) are focused on developing the industry for export. In particular, the Japanese and South Koreans are investing in projects as part of long-term strategic initiatives in energy security and decarbonisation. For these large companies,

investment in production for domestic use is currently seen as a "means to develop export capability". While at the same time, there are a large number smaller companies who are focused on developing domestic mobility projects.

Manufacturing and Technology – Looking Offshore?

Australia does not have a strong manufacturing or technology base and therefore does not manufacture or develop a large proportion of the equipment to be used in the hydrogen industry. However, that does not mean that there are not successful and competitive local manufacturers. In lieu of a well-developed and high capacity manufacturing capacity, Australian hydrogen project proponents are generally willing to source and purchase equipment from overseas based OEMS. There is however still a very strong desire to ensure that any equipment purchased has strong local support for engineering, maintenance and operations. Proponents generally try to source equipment from locally based manufacturers or partnerships of overseas companies.

Services Well Developed

The hydrogen services sector in Australia is generally well developed and strong. Australian service companies have great experience with supporting oil and gas and transport projects. These companies include support from engineering consultancies, advisory services, finance and insurance, permitting and approvals, and marketing.

Research is Active

Australia has a large number of universities and research institutions active in the hydrogen sector. Research efforts cover a wide array of technologies but are focused on areas of import to the Australian hydrogen economy such as storage, integration into mining and heavy equipment, hydrogen production/electrolyser technologies etc. Australia's leading government funded science agency, the CSIRO (equivalent to TNO), is heavily involved in hydrogen technology research. There are a number of applied research vehicles, several of which are setup as start-ups that have been spun out of Australian universities to commercialise technologies. There are also several "Cooperative Research Centres" (CRCs) which involve experts from a range of businesses and universities working together, with funding, to solve technological problems.

The Geography of Australian Hydrogen Projects

Figure 2 below shows a map of Australian hydrogen projects and hubs as of the time of publication. It is noted that most hydrogen projects in Australia are located one of several hydrogen hubs spread nationwide, most of which are along coastal areas.

These hubs include the following shortlist (in approximate order of study survey results):

- Gladstone, Queensland.
- Port of Newcastle, New South Wales.
- Port Bonython, South Australia.
- Port Headland/Pilbara, Western Australia.
- Bells Bay, Tasmania.
- Townsville, Queensland.
- Darwin, Northern Territory.
- Geelong, Victoria.
- Port Kembla, New South Wales.
- Kwinana, Perth, Western Australia.

Several other hubs exist and it is recommended that reader refer to the Australian Government map of hydrogen projects https://www.csiro.au/hydrogen-map as this resource is continually updated. Other resources include the S&P Global Renewable Energy Projects Interactive Map: https://storymaps.arcgis.com/collections/1e05ebf390554cb8b7cefa80e521afda?item=3

Industry Sector Analysis

The nature and scale of activity varies considerably across the many sub-sectors of the Australian hydrogen industry. GPA has prepared a reference database summarising our review of the Australian hydrogen industry. This can be found in the Guide.

Case Study: The Gladstone Hydrogen Hub

The city of Gladstone has become arguably the leading Australian hydrogen hub through a combination of natural port and renewable energy resources, strong industrial infrastructure including high voltage power, existing large energy and ammonia demands, existing LNG and other heavy industry, local community support, state government support and strong local labour force. This has led to a disproportionate number of the more advanced green hydrogen projects being announced for the Gladstone hub.

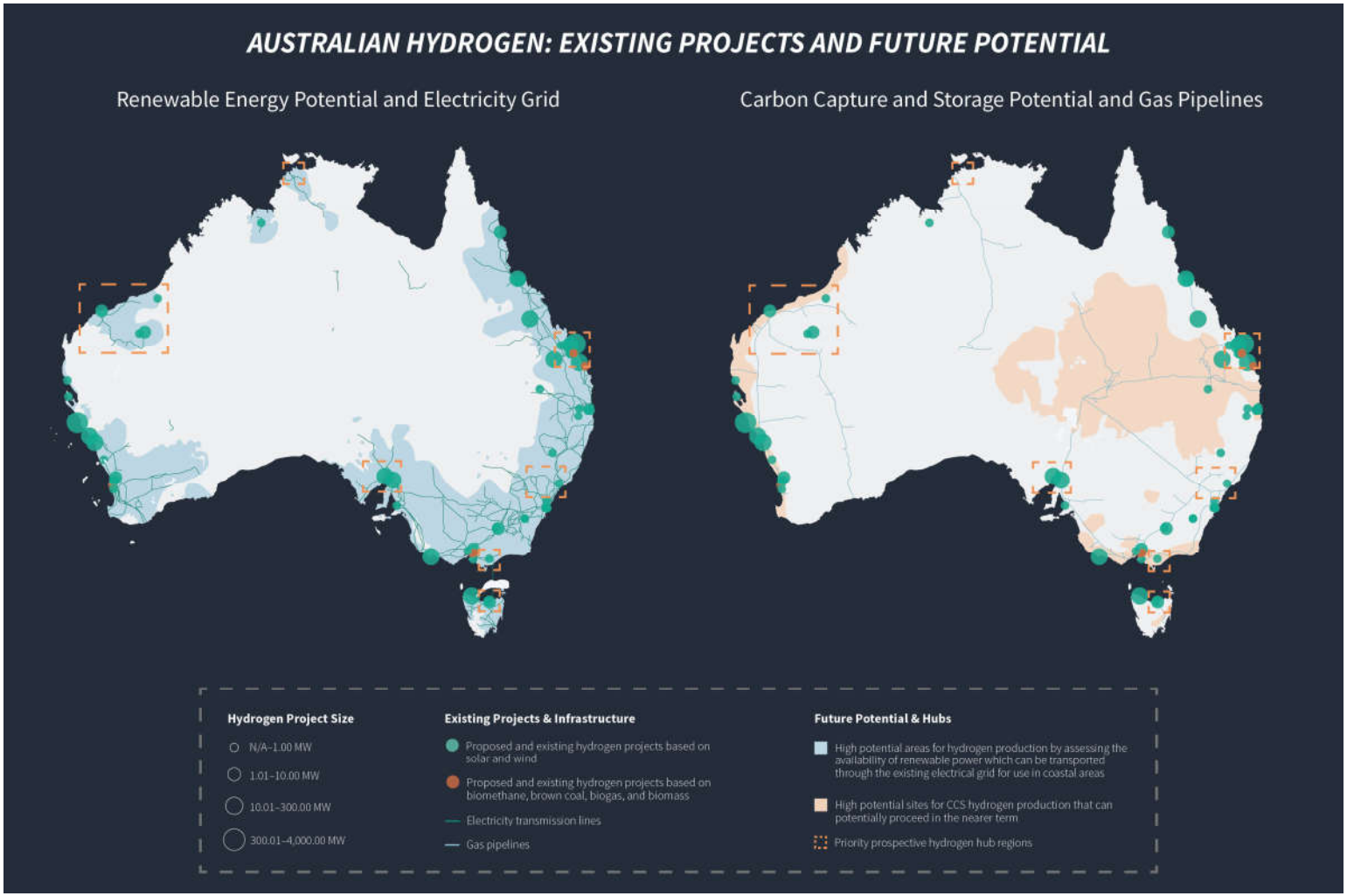


Figure 2: Map of Australian Hydrogen Projects and Hubs [1]

2.3.3 Future Growth Potential

Short –Term Outlook

Diesel displacement (in heavy vehicles and equipment) is a key short-term growth opportunity for domestic hydrogen in Australia. Australia has a huge diesel market, of which only 25% is used for private retail consumption with the majority of diesel consumed across the heavy line-haul road freight, back-to-base heavy vehicles, rail, mining, and agriculture sectors [2].

There is recent anecdotal reports of electrolyser prices increasing by 15% in 2022 and lead times increasing from 12 to 15-18 months. Despite this, long-term cost trends for hydrogen are as favourable in Australia as in Europe and other regions.

At current cost trends it is possible that hydrogen fuel cell vehicles will reach a life-cycle cost parity (in Australia) with diesel in the coming 5 years, firstly in the back-to-base heavy vehicle then line-haul freight. Industrial feedstock displacement, especially for ammonia production, but also in emissions sensitive applications/industries is also a promising short-term market.

Hydrogen injection into local, low-pressure, gas distribution networks at lower concentrations is expected to increase from the current pilot scales but is a long way from cost competitiveness with natural gas. Larger scale injection, including into high-pressure transmission pipelines is likely to occur, especially once the Federal Government introduce a commercial market mechanism/regulations to allow hydrogen trading.

2.4 KEY DRIVERS OF CHANGE

Several key themes are influencing the development of the Australian Hydrogen Industry including:

The hydrogen market will be **heavily influenced** by government policy, particularly in relation to **decarbonisation targets**

The **economics** in all parts of the hydrogen value chain are **changing rapidly** – there's a big prize, but timing is key.

Regulators are beginning to factor **CO_2 emissions** into their **approvals conditions** for resource projects.

From a social perspective, there are added pressures and a number of market drivers, including on customers.

Green hydrogen is becoming a **land grab**, and for blue hydrogen, there are **limited locations** to easily sequester carbon.

Technology, along with research and development investments, is **rapidly evolving**, which creates a level of **uncertainty**.

2.4.1 Industry Threats and Opportunities

An assessment of the Strengths, Weakness, Opportunities, Threats of the Australian Hydrogen Industry is shown below.

Strengths	Weaknesses
- A number of state and federal government funding apparatus. - Large, low cost renewables resources including wind and solar will make Australian H_2 cost competitive. - Many opportunities across multiple regions and hubs. - A large number of interested and experienced hydrogen project proponents. - Strong existing liquid natural gas industry with transferable skills. - Growth supported through existing hydrogen industry demand. - Numerous applications in stationary and transportation markets across Australia. - Strong emphasis on safe operating culture. - Seen as low sovereign risk location.	- Currently undeveloped market with little demand and immature value chain pathways. - Lack of comprehensive and complete policies, regulations, codes and standards. - Lack of international equivalence in regulations, codes and standards - Transporting hydrogen across Australia's long distances or to export markets remains a challenge. - High procurement and installation costs. - Weak supply network and limited manufacturing base. - Limited initial demand for green hydrogen. - Lack of awareness of capabilities and potential benefits of hydrogen. - As yet, immature market regulatory policies and strategies. - Unclear regulatory plans regarding implementing hydrogen into energy systems. - Incomplete infrastructure and integration at this stage. - Low project returns on investment (ROI).
Opportunities	**Threats**
- Very large potential for industry growth domestically and for export – it can be considered a situation of "a rising tide will lift all boats". - Various production methods and sources requiring a wide range of equipment – providing opportunities for various suppliers. - Asian commodities trading houses clearly see Australian hydrogen as central to their long-term strategies and are willing to invest now. - European energy firms are also likely to invest in Australian hydrogen projects for supply diversification but are generally in pre-project stages - Emission free mobility is seen favorably by consumers. - High potential for use in energy production for remote areas. - Diesel displacement likely to be primary domestic market due to approaching cost parity	- More cost effective energy alternatives are currently available. - Competition with other renewable technologies (batteries, solar, wind). - Public acceptance is un-tested. - Limited practical experience in producers and consumers. - Potential resistance from other energy actors in the country. - Strong position of fossil fuel producers. - Inadequate commercialisation plans. - Incomplete legislation, regulations, codes and standards.

Figure 3: SWOT

2.4.2 Trends Analysis Summary

The key trends affecting the Australian hydrogen industry in the short to medium term are outlined below in Figure 8.

Political	Economic	Social
- Strong, and increasing trend towards government, and corporate, carbon reduction targets = increasing demand/investment for hydrogen from end users and energy firms seeking sustainable business models. - Considerable federal and state government support, in various forms, to developing a hydrogen industry. - Sovereign energy security and manufacturing capability becoming a more important topic in lieu of trade coercion practices and supply chain dependencies on China. - Government legislation/regulation weak but rapidly improving. - Standards may/may not align with international norms. - General political consensus towards supporting a hydrogen industry exists and is strengthening. - Governments generally favour investment in the regions over investment in capital cities. - Hydrogen policy by all levels of government is still relatively immature and evolving, but it is improving. - Strong support for foreign investment and expertise in the Australian hydrogen sector.	- No market for hydrogen currently exists – but market is developing. - Economics of hydrogen projects & hydrogen use-cases currently uncompetitive but are rapidly improving. - Equipment costs are currently increasing due to demand outstripping manufacturing supply. Cost expected to drop quickly as manufacturing scale rapidly increases. - Renewable energy costs are falling quickly and are expected to continue falling, with an increase in renewables capacity. - Project scale rapidly increasing. - Battery and EV charging costs & technologies rapidly improving – these will compete against hydrogen. - A lot of hype – “everyone has a hydrogen project”. - Potential for a global hydrogen market driving investment in export oriented projects. - Asian trading houses investing heavily in H2 projects. - Transport sector increasingly looking to hydrogen.	- Limited public understanding of hydrogen. Social acceptance of hydrogen improving. - Significant de-carbonisation and emissions reductions .pressure across society applying to businesses and firms in all industries – trend increasing. - Skills and labour shortages exist. Applied hydrogen specific skills are likely to become even more in demand
PESTEL		
- Emissions regulations tightening. - Approvals for major projects, especially resources projects, is being increasingly being tied to emissions reductions targets. - Regulatory oversight is minimal currently but increasing. - Labour shortages expected in hydrogen project approvals departments in state governments. - Regulations and standards are immature (in technical, safety and commercial aspects), but improving quickly.	- Large amounts of land and renewable resources available, - Perceived water scarcity is currently an issue – this is expected to become less of an issue as industry knowledge improves (water won’t be a technical issue, only political), - Truly huge quantities of new renewables capacity will be required to support the scale of hydrogen production being discussed,	- Many new hydrogen technologies under development across the whole industry. - Unclear in some cases which technology will become “standard” - Battery technology improvements will have a major impact on the hydrogen market in the mobility sector (increase or decrease in demand). - Storage technologies a particular focus area - Liquefaction likely to become an important technology
Legal	Environmental	Technology

Figure 4: PESTEL

3 AUSTRALIAN HYDROGEN POLICIES AND STRATEGIES

Australia has three levels of government made up of local, state/territory and federal governments. The state / territory governments and federal government have concurrent jurisdiction over energy. There are legislative and regulatory differences between all levels. Local governments in Australia are the primary government body responsible for planning and development considerations and are often also involved in the provision of local infrastructure and services. Each state/territory has some differences in standards for engineering, safety, codes of practice, development approvals, labour laws and other factors pertaining to community safety, employment and environmental impacts. The Australian Federal Government sets national standards and certification requirements which are highly relevant to equipment suppliers and manufacturers seeking to sell into the Australian market.

Unlike in The Netherlands, industry policy is a combination of state governments and the federal government. Both can provide funding, tax concessions and other support to investments in hydrogen projects or manufacturing sites. Fortunately, the Australian government has released two key documents to assist industry with development, "Australia's National hydrogen Strategy" [11] and the "National Hydrogen Road Map" [12].

Each state and territory in Australia has setup a dedicated hydrogen industry development team. All state and territory governments have announced funding programs to foster investment and development of the hydrogen industry in their state.

The Federal government has been a strong supporter of the development of the hydrogen industry. A number of policies and strategies have been released. GPA recommends that Dutch firms considering entering the Australian market familiarise themselves with key documents such as The Australian National Hydrogen Strategy [11] and The State of Hydrogen Report [14].

The Federal government, through the Australian Renewable Energy Agency (ARENA), the Clean Energy Finance Corporation (CEFC) and to a lesser extent the CSIRO, (Australia's government science and research agency) are currently the primary source of funding for a whole range of studies, pilots, projects and other investments and research across the full spectrum of the Australian hydrogen industry.

Case Study: Local Government Approvals

An Australian firm, with a strong track record in hydrogen, had the approvals for its proposed pilot green hydrogen project in Gladstone rejected by the local council. The council was not satisfied that community concerns regarding the risks of hydrogen production and storage (even at a very small scale) had been adequately addressed. The pilot project was located in a suburban area of Gladstone and several industry pundits have suggested that better engagement and communication with the local stakeholders may have improved the projects chances of receiving local government approval.

4 AUSTRALIAN STANDARDS, REGULATIONS AND CODES OF PRACTICE

Australia (together with New Zealand) has its own set of standards ("ANZ Standards") that apply to all equipment and engineering design that occurs in Australia. *In Australia, equipment that does not have compliance certification confirming it officially meets Australian standards, cannot be sold or used.* In many cases, these align with international standards, in many cases they do not. In most cases gas and electrical equipment is subject to unique ANZ standards that differ from European and international standards that apply in The Netherlands and Europe. This includes equipment that is used in much hydrogen production, storage, handling, compression, refuelling and end-use equipment.

Many codes and standards for the Australian hydrogen industry are still being developed and clarified. There are gaps. In these areas, authorities are accepting applicable international standards until ANZ standards (even those based on or referring to international standards) are published. This is an area of focus currently by state and federal regulatory authorities.

GPA stresses the importance of undertaking compliance certification for Dutch companies/OEMs wishing to enter the Australian market.

Case Study: Asian Original Equipment Manufacturer

An Asian based OEM was successful in finding a number of potential partners for installing their equipment on the basis of low cost versus comparable products. The company however was not able to proceed with its sales ambitions, and lost reputation, when it was realised that their equipment was not certified to Australian standards and would be very difficult to do so.

5 KEY OPPORTUNITIES FOR THE DUTCH HYDROGEN SECTOR

5.1 BUSINESS OPPORTUNITIES TO 2028

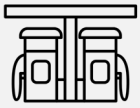
In a nascent industry that is rapidly evolving, there are many opportunities. Generally, there is likely to be a lot of opportunities on the production side of the hydrogen supply chain, but also on the end-use side. Surveys and interviews with key hydrogen market stakeholders, combined with the industry trends and SWOT analysis discussed earlier identified several perceived "gaps" in capability in the Australian hydrogen industry in the coming 5 years. GPA therefore notes the following shortlisted sectors as offering the best opportunities for Dutch SME's to enter the Australian hydrogen market in the coming 5 years to 2028:

Hydrogen storage technologies and associated equipment

Storage technologies and equipment will be in very high demand. Current industry procurement is focused on gaseous storage, but liquefied hydrogen manufacture and storage as well as metal hydride technologies will be highly attractive.

Electrolyser technologies and equipment

There are several non-Dutch electrolyser OEMs already active in the Australian market. These firms are likely to build and maintain a strong sales pipeline. Nonetheless, the sheer scale and demand for electrolysers in the future will mean that there will be many opportunities for Dutch electrolyser OEMs to successfully market their offerings into Australia.



Hydrogen refuelling systems and associated equipment

There are several non-Dutch refuelling system OEMs already active in the Australian market. These firms are likely to build and maintain a strong sales pipeline. Nonetheless, the sheer scale and demand for refuelling equipment in the future translates into many opportunities for Dutch firms to successfully enter the market - particularly in the domestic mobility market for back-to-base and line haul vehicles (bus companies, trucking companies, waste collection, etc.). Opportunities will also exist with pilots in the marine (ferry) and mining equipment/trucks refuelling. Focus will be on gaseous refuelling, but liquefied hydrogen is likely to be a very important technology.

Fuel cell integration – especially into heavy vehicles, heavy equipment

Considerable opportunities exist for the manufacturing and supply of hydrogen fuel

Industrial use applications

While industrial use applications are quite specific, active investment is occurring in this space

Water purification technologies

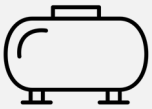
Considerable quantities of purified water will be required

Case Study: Large Australian Hydrogen Player

An Australian firm investing in hydrogen projects received strong state government support for all aspects of its project in Gladstone plus secured its supply chain for its project by investing in an electrolyser manufacturing facility in conjunction with its green hydrogen project.

5.2 RESEARCH OPPORTUNITIES TO 2028

Surveys and interviews with key hydrogen market stakeholders showed that while research and technology programs are broad in their scope, there are several areas of primary focus in the coming 5 years. These include the commercialisation of technologies in sub-sectors such as:



Hydrogen storage technologies (especially denser, non-gaseous forms of storage)

Export vectors technologies and scaling thereof including Liquefied H2 (LH2) and Liquid Organic Hydrogen Carriers (LOHCs)

Scaling of hydrogen production storage and handling facilities to 100Mw to 1GW scale

Fuel cell (and storage) integration efforts into various end use cases (particularly in relation to compliance with Australian standards) – this includes integration into various heavy vehicles, vessels and mining/heavy equipment and the refuelling technology to quickly fuel these vehicles

Industrial feedstock applications where hydrogen may be a pathway to decarbonisation of industrial processes

The above sectors are perceived to have both gaps between technology readiness levels (TRL) and commercial ambitions by Australian industry.

A number of investments and start-ups in pilot programs aimed at commercially proving technologies are in development. These include industry focused efforts by key companies in the mining and rail sector and also integrate technology development projects such as the Kwinana Energy Hub in Western Australia as well as applied research organisations that some universities have spun out as technology start-ups.

A reference listing of research projects and applied research can be found in the Guide.

5.3 GENERAL OBSERVATIONS

In addition to the above notes, the following additional general observations are noted with respect to the Australian hydrogen industry.

- Dutch firms should not just consider other European (or American) firms as competitors but should be very aware of competition from Asian firms. Japanese and Korean firms are highly competitive in Australia. Chinese firms are likely to try and undercut the market from a pricing perspective.
- In the energy industry, companies from The Netherlands are often held in high regard in Australia.
- The next tranche of industry-leading green hydrogen projects will focus on developments of >10MW. These will become high-profile industry leading projects. Dutch firms should aggressively target these projects. They will provide excellent profiling and leverage for future market growth.
- If Australia is to achieve its aims in hydrogen export, it will need to develop numerous new ports and associated port infrastructure. As The Netherlands is one of the leading nations globally in port technology, strategy and infrastructure, this may be an area of strong potential for Dutch firms.
- Access to export credit finance potentially offers a good opportunity for Dutch firms. Other European firms have put in place export credit finance systems for firms to export equipment and services to the Australian market. This may also assist in project finance and make a Dutch SME more attractive to Australian partners and customers. This can be a good alternative to bank finance but may take several months to put in place.

6 MARKET ENTRY PRACTICALITIES

6.1 KEY SUCCESS FACTORS IN THE AUSTRALIAN HYDROGEN INDUSTRY

1.

Find a strong partner to be your local, on the ground, champion

Finding a strong local partner to be your local "champion" is key to unlocking the complex business networks and relationships in Australia. Furthermore, Australian customers and partners are looking for foreign partners to provide support services to their equipment – not just sales. This often includes considering co-investing in projects or capabilities.

2.

Take a long-term view and collaborate through the whole value chain

Hydrogen is not a short-term play and the transition is expected to occur over a decade. Currently, the industry in Australia is still at early adopter phase – i.e. it is undeveloped and in a pre-competitive stage - but there is real potential. Through collaboration across the value chain, investors are able to set up a route to market and ensure that the complementary segments mature at the same pace. The value chain for clean hydrogen is currently too complex, immature and diverse for any one company to vertically integrate. Partnering across the value chain "enables the market" by allowing each partner to bring their expertise and technologies to bear on selected value chain components and to share risk. This inherently feeds into greater returns and mitigates risk for all parties.

3.

Do your homework and make sure your equipment is "Australia ready"

Before coming to Australia for any market development, it is vital that your equipment has, or has a route to, Australian regulatory certification and that there is clear evidence of this. Australian firms will also want to see operational and performance evidence of your equipment or technology – particularly with respect to Australian operating conditions.

Case Study: Major European Original Equipment Manufacturer

Despite having excellent technology and having a local sales rep in Australia, a major European OEM has significantly underperformed its peers in the Australian market as they a) did not have a team supporting equipment specification, installation or operations/maintenance in Australian and b) was purely seeking to enter the Australian market through a "sales only" strategy rather than co-investment with a local partner.

6.2 OTHER IMPORTANT CONSIDERATIONS

- It has been observed that some tier 3 -4 companies that have good relationships with tier 1 – 2 companies, and have been able to effectively use their tier 1 -2 connections to create dialogues, make connections and to establish relationships. Doing this with a local tier 1-2 partner could be a fast way to build credibility in the Australian market.
- Regardless of where a foreign firm choose to base themselves, it's important to do research on their connections/networks/contacts BEFORE they come over. They need to embed themselves into the local networks and contacts – not just business, but also government and universities.
- It's important that Dutch firms have a clear short and long term strategy of what they are looking to do and how they are going to approach and grow – partners/customers are looking for a plan for longer term presence and support going forward. This gives those potential local partners/ customers the confidence that they can grow with that foreign company.
- Really give some thought to what rivals and competitors are doing. Where the overlaps are and the gaps – consider how you could cooperate as the demand is going to be so large, that joining forces and collaborating to grow the pie together instead of dividing the pie may be a much more successful strategy. There's so much need for equipment – Dutch firms are likely to be more successful by collaborating to scale up, enter the market and support each other than by going it alone.
- A firm should be able to explain why their technology is superior to other European and Asian technologies. Pitch technologies in the context of how they compare to your competition, and how the technology can perform in the Australian environment. Consider benchmarking technology against other companies.
- Being selective about where you can pitch your technology – if you are just at early stage pilot, don't shoot for scaled up commercial project. Shoot for a demonstration pilot.
- The market is changing and evolving rapidly – coming to Australia more than once per year is very important to stay abreast of all developments and maintain relationships.

6.3 FINDING THE RIGHT PARTNER OR CUSTOMER

6.3.1 Who's who in the Australian Hydrogen Sector?

Understanding who's-who in the Australian hydrogen sector can be challenging – it is still a dynamic situation where there's few established firms or people. There are also a lot of firms and individuals promoting themselves with little or no track records in Australia. Genuine stakeholders in the Australian hydrogen industry generally seek to work with those they know and have demonstrated credibility.

The Major Cities Are Where the Key Stakeholders Often Are

Most companies active in the Australian hydrogen sector, even those with projects in regional areas, are based in the state capital cities. The most active major cities for the hydrogen sector in Australia are arguably those with strong resource industry sectors. These include Brisbane, Perth and also Adelaide. Industrial cities that have been designated as hydrogen hubs also have a large number of companies active in the industry.

Adelaide and Melbourne have well developed manufacturing industries and governments supportive of investment in new manufacturing capabilities, as do the other Australian state capital cities.

The focus on actual investment will occur in the hydrogen hubs listed in Section 2.

It's a Concentrated Industry

In most parts of the Australian hydrogen ecosystem, investment, IP and capability is concentrated with a handful of key companies and organisations in each sector. In each of engineering services, electrolyser and hydrogen equipment supply, storage and handling vessels, industrial use projects, finance and hydrogen production projects there are a small number of companies who are leading the industry in their area of expertise.

Follow the Money

Most of the real money is coming from three groups. Firstly, investment is coming from large Australian companies in the resources (mining and gas), power and fuels and energy infrastructure sectors. For example: Fortescue Future Industries (FFI), Origin Energy, Santos, Australian Gas Industry Networks (AGIG), AGL, APA Group and so forth. Many of these firms see large scale hydrogen production as one of only a handful of viable business models following the decarbonisation transition.

The second group of investors are Japanese and Korean major energy trading houses. These are focused on the export sector for long-term strategic energy supply and security models as part of national energy strategies. These companies are often partnering with the above Australian firms and include companies such as ENEOS, Sumitomo, KoreaZinc, POSCO, KOGAS, Hyundai, Marubeni, Kansai Electric, Chiyoda, Mitsubishi, Idemitsu Iwatani, and others.

The third group are a range of small to mid-sized Australian companies, often in fuels or transport/logistics sectors who are investors in smaller hydrogen refuelling and domestic mobility projects.

Some companies, such as Fortescue Future Industries (FFI) have been explicit in their ambitions to build a large number of very large (gigawatt scale) green hydrogen export projects. FFI has spent a lot of money and has shown a willingness to lead the industry and "move fast and break things" – with a number of very large projects on the books.

Generally, such companies focusing on gigawatt scale export projects are looking to build integrated supply chains with their main customers/partners – often in East Asia – who can also supply equipment and services at the very large scales/volumes required. Small to medium sized Dutch enterprises should carefully consider the risks and challenges of such large and fast moving projects and consider whether their business models fit that type of project/partner.

It may be preferable for Dutch SMEs to focus on the domestic mobility, logistics, end-use integration and medium scale (<100MW) hydrogen projects.

A database of publicly announced hydrogen projects can be found in the Guide and online at the CSIRO HyResource website: https://research.csiro.au/hyresource/

Cooperative Research Centres (CRCs) – a great avenue to exposure

CRCs have proven productive forums for both solving technical challenges and building strong networks with influential members of the Australian hydrogen industry. Three of the best known in the hydrogen sector include:

- Future Fuels CRC (FFCRC) – with a focus on solving the problems in the transition to new low-carbon fuels such as hydrogen and hydrogen derivatives. These include challenges like developing cost modelling for hydrogen value chains but also technical challenges such as how

to transport hydrogen through Australia's natural gas transmission pipelines and networks.

- Heavy Industry Low Carbon Transition CRC (HILT CRC) – with a focus on solving the problems for Australia's heavy industries (notably minerals processing) to decarbonise including through the use of hydrogen.
- Scaling Green Hydrogen CRC – this new (as of publication) CRC is focused on unlocking the pathways to scale for green hydrogen production and export.
- The Australian Hydrogen Council and other industry bodies are also effective forums to generate exposure and build networks.

6.3.2 How to Find That Partner or Customer?

There are number of pathways to finding that all important partner or strategic customer. Here are some of those suggested by influential Australian hydrogen stakeholders (in rough order of effectiveness):

6.3.2.1 Focus Your Efforts

Be focused on what you are trying to achieve, where you may wish to invest and what type of partner you are looking for. While there often a few key players in each sector of the industry, it is important to be targeted in your efforts and not waste valuable money and time. Speak to an engineering advisory firm or tier 1 EPC firms – these are the firms that will be managing tender processes, proving technology advice and designing plants. Get your equipment in front of these companies.

6.3.2.2 Engage a local industry expert – particularly engineering advisory firms

A consistent response in interviews and surveys from this study was the advantage of engaging a local industry expert to provide an overview of specific sub-sectors in the market, identify potential partners and customers and lastly to open doors to them. Local engineering firms with strong reputations in the sector can provide valuable technical/standards advice while also having an independent perspective on the industry and the credibility to help open doors.

6.3.2.3 Get Out To Australia

It is very important to get out to Australia. Australians place a lot of value on relationships in business and want to meet the people they do business with. It is also very important for Dutch businesses to learn more in person about the industry in Australia and the people in it.

6.3.2.4 Join an industry CRC or other forum

Joining and contributing to a CRC is an excellent route to building networks in areas of specific interest to Dutch firms. They also offer the opportunity to build credibility with important stakeholders in the Australian hydrogen sector.

6.3.2.5 Leverage the resources of the Diplomatic Missions of the Kingdom of the Netherlands in Australia

The Diplomatic Mission has developed strong networks in the Australian hydrogen industry and is an excellent choice for advice and also to request specific assistance in identifying contacts. They can be contacted at syd-ez@minbuza.nl.

6.3.2.6 Attend Industry Specific Conferences and Trade Fairs

Review the list of trade fairs prepared for this report. Note that the large trade fairs often have large delegations from competing countries such as Germany and USA. Dutch firms may wish to either focus on smaller, more targeted trade fairs/conferences or alternatively seek to come at a time when there is more "clear air" and they are likely to get more attention and time from prospective partners and customers and then focus on the ability "follow up" after the delegation.

Leverage the state government H_2 departments to get access to and arrange events. This can also allow the conversations to be more meaningful around what specifically Dutch firms can offer and to build the relationships. Share and promote (to the Australians) what the capabilities are of the Dutch firms coming on the delegation early on – so that the Australian companies can get engaged earlier.

6.3.2.7 Follow the Money

Seek to develop relationships first with those firms who are actually investing hard money. These can be found by reviewing the partners in those projects that are either operational or under construction. Many Japanese and Korean firms are committed to developing projects in Australia but may prefer firms from their own countries

6.4 COMMON MISTAKES

Industry stakeholders were asked what common mistakes they see foreign firms entering the Australian hydrogen market make. Here is a summary of their answers:

- "Not investing in understanding (or pricing in) Australian approvals and regulatory standards and requirements (including unique regional requirements)".
- "Assuming local conditions are similar to their own – Australia has a demanding environment"
- "Thinking they can bid/support bids from overseas and succeed".
- "They don't provide the specialist support capabilities to their products".
- "Not having a clear development plan ahead of market entry".
- "Not understanding that each region or hub is different with different stakeholders".
- "Not developing strong local relationships".

6.5 YOUR AUSTRALIAN HYDROGEN INDUSTRY MARKET PRE-ENTRY CHECKLIST

6.5.1 Do Your Homework and Prepare

- Get across the relevant codes & standards - make sure your equipment/service is compliant or that you have a definitive plan to do so. Australian companies will look dimly on you if you can't answer this question.
- Understand who your competitors are and may be – especially those from outside Europe.
- Understand how your equipment may differ to your competitors – particularly those from Asian countries.
- Have a plan on how you will support your new partnership/investment/sale from The Netherlands.
- Document the performance records of your equipment to be able to demonstrate its performance.

6.5.2 Consider who you should partner with and what they may want

- Consider what type of partner you may wish to partner with and in what form:
  - Scan the Australian market for potential partners.
  - Consider another international partner – to enable a more comprehensive offering.
  - How will you partner?
    - Are you looking for an Australian JV partner?
    - Are you considering licensing your equipment?
    - Are you thinking to setup an Australian sales office/representative?

6.5.3 Understand the Australian regional/state regulatory framework and mindset

- Consider what sector and, if applicable, which region you may be best placed to target.
- Travel to the regions and hydrogen hubs you are considering supporting to understand them better.
- Seek out the relevant state and territory government hydrogen industry teams – they are highly connected, keen to encourage investment and extremely knowledgeable.

6.6 WHERE DO I START?

Some of the considerations you may wish to consider to start with are:

- Speak to the trade and economic team at the Dutch Embassy and Diplomatic Mission of the Kingdom of the Netherlands in Australia,
- Engage a local advisor,
- Research conferences/trade fairs,
- Consider where you should base yourself?
- Consider if you need a “person on the ground”?
- Consider the legal entities/legal structure for how you may wish to enter the market.

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