Submission No 34

INQUIRY INTO DEVELOPMENT OF A HYDROGEN INDUSTRY IN NEW SOUTH WALES

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Australian Hydrogen Council

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About the Australian Hydrogen Council

The Australian Hydrogen Council is the peak body for the hydrogen industry, with 65 members from across the hydrogen value chain.

Our members are at the forefront of Australia's hydrogen industry, developing the technology, skills and partnerships necessary to build Australia's hydrogen economy.

Introduction

The Australian Hydrogen Council (AHC) welcomes the opportunity to provide a submission to the NSW Standing Committee on State Development's *Inquiry into the development of a hydrogen industry in New South Wales.*

This is an important opportunity for NSW – and for Australia as a whole – and we are pleased to see the NSW Government's commitment to understanding what needs to happen to realise hydrogen's potential in NSW. This work aligns neatly with the NSW Electricity Infrastructure Roadmap and will also provide a means for meeting the state's net zero target.

The main point we would make is that the new industry will not become competitive with the incumbent fossil fuels without scale, and scale will not be achieved without serious funding and policy commitments from governments.

As the global Hydrogen Council states:

> Reaching the scale required will call for funding an economic gap until a break-even point is reached – an investment to offset the initially higher costs of hydrogen as a fuel and of hydrogen equipment compared to alternatives. Instead of being perceived as costs, this should be seen as an investment to shift the energy system and industry to low-carbon technology.[1]

This submission proposes some ways for the NSW Government to demonstrate its seriousness about the hydrogen opportunity through:

- Establishing what is required to develop the industry and clarifying the government support available.
- Setting policy to design the market and incentivise demand.

Hydrogen's important role in future energy systems

Hydrogen provides the versatility required by future energy systems in a carbon constrained world.

This is because hydrogen is a uniquely valuable energy carrier. Like electricity, hydrogen is not an energy source. It can be made anywhere, and in different ways. Hydrogen can be made by releasing the energy in fossil fuels or capturing energy from renewable sources.

However, electricity is made up of electrons only. Hydrogen in its molecular form (usually as a gas or liquid) contains the electrons within its molecular structure, which allows it to store energy for long periods relative to batteries.

This means that:

- Hydrogen can store renewable electricity across seasons, which provides enhanced electricity grid security.
- Hydrogen can displace natural gas. Unlike electricity, hydrogen can also be combusted, to be used as a substitute for heating and cooking with natural gas.

[1] Hydrogen Council (2020) *Path to hydrogen competitiveness: a cost perspective*, p.66, https://hydrogencouncil.com/en/path-to-hydrogen-competitiveness-a-cost-perspective/

- Hydrogen can be transported, without losses, over long distances, whether by truck, ship or pipeline, which helps communities maintain access to energy when needed. It is also exportable as a result. Countries such as Japan and South Korea are eager to explore how Australia can be a key partner in their future hydrogen economies.
- Hydrogen can replace diesel and petrol (and other fuels) for cars, trucks, ships and planes. Hydrogen has a high energy value by weight, which makes it particularly suitable for heavy transport, where battery weight compromises effective payload. It is suitable for long distances and commercial use, where range anxiety and recharging/refuelling times affect the bottom line.

When we combine these features with the possibility of hydrogen being created at scale with renewable or clean energy, we can see the great potential for hydrogen in the new energy ecosystem. The versatility of hydrogen also allows it to connect different sectors of the economy, supporting Australia's economic and energy security.

We have an enormous opportunity in this country to create a vibrant hydrogen industry, both for domestic and export use. Australia has the renewable energy resources, the technical skills, and the track record with international partners to become a global hydrogen leader.

We are already seeing significant investment from local and international businesses, and the National Hydrogen Strategy (NHS) and jurisdictional announcements have signalled the value that the Australian Government and states and territories see in the developing industry.

The value for NSW

New South Wales is well-positioned to play a key role in Australia's emerging hydrogen industry, and to even establish itself as a leader. With its existing ports infrastructure, highly skilled workforce, and history of policy leadership, NSW can grow, and capitalise on, the current momentum for hydrogen project development.

NSW has also committed to a target of net zero emissions by 2050, so decarbonisation is high on the agenda. Hydrogen can play an important role in achieving this and can do so while growing regional economies and creating new manufacturing opportunities.

The value to NSW of the new hydrogen industry has been recognised in a range of government documents to date, including:

- The NSW Department of Planning, Industry and Environment's *Net Zero Plan Stage 1: 2020-2030*, which predicts that the market for hydrogen could be worth $1 billion by 2030.[2]
- The NSW Department of Planning, Industry and Environment's *NSW Electricity Infrastructure Roadmap: Building an Energy Superpower* which notes the hydrogen opportunity for NSW and how hydrogen can support the grid.[3] Certainly a significant increase in renewable

[2] Department of Planning, Industry and Environment (2020a) Net Zero Plan Stage 1: 2020-2030, March, p. 30. See https://www.environment.nsw.gov.au/topics/climate-change/net-zero-plan.

[3] Department of Planning, Industry and Environment (2020b) *NSW Electricity Infrastructure Roadmap: Building an Energy Superpower*, Detailed Report, November, pp. 7, 10, 26. See https://energy.nsw.gov.au/sites/default/files/2020-12/NSW%20Electricity%20Infrastructure%20Roadmap%20-%20Detailed%20Report.pdf.

electricity as envisioned in the roadmap would both provide for and require the storage capabilities of hydrogen.

- The NSW Chief Scientist and Engineer's *Opportunities for prosperity in a decarbonised and resilient NSW: Decarbonisation Innovation Study*, which goes into the hydrogen opportunities for NSW in some depth.[4]
- The Accelerating R&D in NSW Advisory Council's *Turning ideas into jobs: Accelerating research and development in NSW* which explores R&D investment and opportunities in NSW.[5]
- NSW Treasury's *2040 Economic Blueprint: Investing in the state's future* which notes the value of hydrogen as 'a major economic opportunity for Australia' and for NSW and proposes there is a policy on hydrogen production and export.[6]

Unlocking the value

A major focus of the NHS is the need for the emerging Australian industry to achieve scale because projects to produce and deliver hydrogen are not yet commercially viable. Through well considered policy NSW can play a key part in achieving the Australian scale objective.

Since the development of the NHS, it has become apparent that the speed of industry development is accelerating faster than anticipated. This is particularly true for exports: Asian customers are looking for product as early as mid-2020s and states like Western Australia have bought forward their hydrogen plans by years.

Getting to scale is also a focus of the Australian Hydrogen Council. Industry requires governments as partners to share risk and commercialise projects to scale. We need to bring down the cost of hydrogen so that it can more effectively compete with existing carbon-emitting (and often subsidised) energy/fuel sources.

The 57 actions in the NHS have been endorsed by the NSW Government. However, there is not yet NSW government policy to establish the market. Industry does have appetite to test the waters, but it does not yet have the means to harness this to get to scale, such as through targets that provide bankable support for investors, so we can get major projects deployed.

This is not a technology matter; it is an economic matter. Hydrogen is competing with incumbent fuels that are currently cheaper – they are subsidised by governments and the carbon costs are not valued. A 2019 International Monetary Fund paper calculated Australia's post-tax fossil fuel

[4] NSW Chief Scientist and Engineer (2020) *Opportunities for prosperity in a decarbonised and resilient NSW: Decarbonisation Innovation Study, August,* see for example pp. 60, 83. See https://www.chiefscientist.nsw.gov.au/independent-reports/decarbonisation.

[5] NSW Government (2021) *Turning ideas into jobs: Accelerating research and development in NSW, Action plan*, Accelerating R&D in NSW Advisory Council, January. See https://www.dpc.nsw.gov.au/assets/dpc-nsw-gov-au/publications/Accelerating-research-and-development-in-NSW-listing-1690/Accelerating-RD-in-NSW-Turning-ideas-into-jobs-web.pdf.

[6] NSW Treasury (2019) *NSW 2040 Economic Blueprint: Investing in the state's future*, pp. 18, 55. See https://www.treasury.nsw.gov.au/sites/default/files/2019-11/0909-02_EconomicBlueprint_Web.pdf.

subsidies in 2015 as US$19 billion (A$28 billion), or US$1,198 per capita (A$1745).[7] Post-tax subsidies were defined as the differences between "actual consumer fuel prices and how much consumers would pay if prices fully reflected supply costs plus the taxes needed to reflect environmental costs and revenue requirements".[8]

The need to value decarbonisation has been recognised by the NSW Chief Scientist and Engineer, who has stated:[9]

> The extent to which NSW is able to successfully capture potential economic opportunities from technologies and services that address decarbonisation, depends upon governments, businesses and consumers, valuing decarbonisation and recognising the economic imperatives of adopting and building markets for decarbonised technologies and services. If NSW businesses, consumers and government recognise the inherent and increased value of decarbonised products and services due to their environmental and social benefits, this will accelerate the uptake of new technologies and services, incentivise industries and governments to decarbonise, and open new economic opportunities. Failure to recognise this increased value could lead to missed economic opportunities.

This is also not about leaving market development to the private sector – this would mean we are asking an industry to create itself at a loss. The market cannot exist without the economic foundations in place, which include access to infrastructure and the closing of the investment gap between clean hydrogen and traditional fossil fuels.

These include hydrogen:

- Production, such as electrolysers and carbon capture and storage for blue hydrogen.
- Delivery, such as fit-for-purpose pipelines, vehicles, ports and roads.
- Storage, including long term storage requirements to support energy security and inter-seasonal support of the electricity grid.
- Use, such as refuelling infrastructure for fuel cell electric vehicles (FCEVs), the vehicles themselves, and relevant appliances and industrial processes for coal and natural gas replacement in the longer term. This also includes closing the cost gap between the cost of natural gas and the hydrogen that can replace it.

Governments must drive and lead the creation of the clean hydrogen industry. With the world moving to net zero there is no real alternative.

[7] Coady, D., Parry, I., Le, N-P., and B. Shang (2019) *Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates*, IMF Working Paper, Fiscal Affairs Department, WP/19/89.
[8] Ibid., pp. 7-8.
[9] NSW Chief Scientist and Engineer (2020) *Opportunities for prosperity in a decarbonised and resilient NSW: Decarbonisation Innovation Study*, August, p. 21. See https://www.chiefscientist.nsw.gov.au/independent-reports/decarbonisation.

Summary of recommendations

Recommendation 1

The NSW Government commits $400 million to hydrogen projects in three tranches, and across a mix of applications as discussed in subsequent recommendations:

- Tranche 1 (2021-2024): $100m for hydrogen production and associated infrastructure in two hubs or precincts (at the equivalent of 10MW electrolyser output).[10]
- Tranche 2 (2025-2028): $100m for hydrogen production and associated infrastructure as required to support current or new projects (at the equivalent of >50MW electrolyser output). Focus on getting FCEVs to market, including government-managed light and heavy vehicles such as buses.
- Tranche 3 (2029-2030): $200m for hydrogen production and associated infrastructure as required to support current or new projects (at the equivalent of >100MW electrolyser output).

Recommendation 2

The NSW Government applies other investment incentives and support such as:

- An investment model that will leverage other support, particularly from ARENA and CEFC.
- Export credits.
- Underwriting common use infrastructure, such as refuelling infrastructure for FCEVs.
- Explicit government support to close the funding gap between the cost of hydrogen and the cost of natural gas over the next 10 years.
- TUoS exemptions or better targeted network pricing structures.

Recommendation 3

The NSW Government supports resourcing and planning at the national level.

Recommendation 4

The NSW Government develops a detailed strategy that sets out its approach and trajectory for all government assets and procurement to meet its 2050 net zero target.

Recommendation 5

The NSW Government establishes a cross-sector task force of government staff who are tasked with supporting the NSW hydrogen strategy and engagement with the NHS project team.

Recommendation 6

The NSW Government considers and plans for future hydrogen storage needs, starting with setting out a research project for geoscience experts to advise on the matter.

[10] This is not to say that hydrogen should be produced only from electrolysis, but to use a common term to provide an illustration of the size of a project.

Recommendation 7

The NSW Government considers a new direct compensation measure to replace diesel standalone power systems.

Recommendation 8

The NSW Government legislates its 10% (by volume) natural gas blending target as soon as possible and sets a clear policy pathway to get there.

Recommendation 9

The NSW Government coordinates with DISER and the Australian Energy Market Commission to investigate possible rule changes to allow for and value hydrogen blending into natural gas networks.

Recommendation 10

The NSW Government advocates at a national level for emissions standards for vehicles.

Recommendation 11

The NSW Government develops a grant programme to directly support the installation of hydrogen refuelling infrastructure for FCEVs.

Recommendation 12

The NSW Government sets a 50% zero emissions vehicle targets for fleets of cars, buses and ancillary vehicles by 2030. This would include privately operated public transport fleets and government owned logistics providers.

Recommendations in detail

Supporting hydrogen infrastructure and driving demand

Until the industry has reached commercial scale, grant funding is essential; currently a funding gap exists even with the presence of concessional financing.

The Hydrogen Council's 2020 *Path to hydrogen competitiveness* report (supported by McKinsey analysis) estimates that US$70bn (A$100bn) of investment in hydrogen is required across the globe by 2030 to meaningfully activate the global hydrogen economy.[11] Although US$70bn (A$100bn) by 2030 seems sizable, the report notes that this accounts for less than 5% of annual global spending on energy. In comparison, support provided to renewables in Germany totalled roughly US$30 billion (A$43 billion) in 2019.[12]

BNEF analysis goes further, estimating that US$150 billion (A$214 billion) will be needed globally until 2030 to bridge the cost gap between hydrogen and the *cheapest fossil fuels*, not just the cheapest low-carbon alternative.[13]

Public investments and policies to fill the gap can then unlock several times their value from the private sector. For example, the RBA notes that the:

> Clean Energy Finance Corporation (CEFC) and the Australian Renewable Energy Agency (ARENA) have played an important role in helping developers obtain finance by directly financing projects and encouraging private investment. These agencies have directly invested around $8.5 billion in clean energy-related projects since inception. They estimate that this investment has encouraged a further $25 to $30 billion of additional private sector investment. [14] [15]

These data were from ARENA and CEFC's 2018-2019 Annual Reports. Assuming all else is equal, these figures suggest that government funding in hydrogen might be expected to unlock at least three times as much private investment.

Funding for Australian hydrogen production and use is currently *unlikely* to unlock private investment to get the industry to scale. This situation could be improved by individual states and territories helping draw through investment by co-investing in the right local projects.

[11] Hydrogen Council (2020) *Path to hydrogen competitiveness: a cost perspective*, p.66, https://hydrogencouncil.com/en/path-to-hydrogen-competitiveness-a-cost-perspective/.
[12] Ibid.
[13] BNEF (2020) *Hydrogen Economy Outlook: key messages*, March 30, pp. 4-5, https://data.bloomberglp.com/professional/sites/24/BNEF-Hydrogen-Economy-Outlook-Key-Messages-30-Mar-2020.pdf
[14] De Atholia, T., Flannigan, G. and S. Lai (2020) 'Renewable energy investment in Australia', Reserve Bank of Australia https://www.rba.gov.au/publications/bulletin/2020/mar/pdf/renewable-energy-investment-in-australia.pdf.
[15] If we take advice from the Hydrogen Council across two recent reports, a similar expectation of the ratio of public to private funds emerges: the 2020 report says around US$70 billion is required from government, and in a 2017 report the Council states that 'building the hydrogen economy would require annual investments of [US]$20 to 25 billion for a total of about [US]$280 billion until 2030' (p. 66). See Hydrogen Council (2017) *Hydrogen Scaling Up: A Sustainable Pathway for the Global Energy Transition*, November, https://hydrogencouncil.com/en/study-hydrogen-scaling-up/.

Funding to close the investment gap

In assessing the level of funding that may be required, we need to look at the likely input costs for this early development stage. These are shifting, and are also confidential, so the below is a rough estimate based on what is publicly known.

Current data from ARENA has suggested that:

- The cost of electrolysers is around $2-$3m a MW, with a need to get this cost down to $0.5m a MW to be competitive. This suggests that a 10MW electrolyser (the topic of ARENA's current funding round) costs around $30m. It needs to get down to $5m.
- The ARENA funding round is likely to cover only two projects, which means one project – including the electrolyser and all other project costs – costs an average of $35m today. This will be higher or lower in practice depending on the end use for the hydrogen; for example, the project cost may need to include refuelling infrastructure and equipment upgrades, or it might include direct subsidies for hydrogen to initially compete with fossil fuels.

If we assume that the ARENA funding represents around 75% of the total current cost of a hydrogen project, then the estimated cost for one project is closer to $50m. (We can assume 75% now and that this will drop as overall costs drop and the market develops – perhaps in five years grants would be required for a much smaller proportion of project costs. This would also allow grant coverage for more projects.)

We note that neither of ARENA's final two projects for its current funding round will be in NSW – the seven projects that have been shortlisted are based in other states. This requires the NSW Government to start growing the NSW hydrogen industry itself; this may also put its projects in a more compelling position for future ARENA funding.

Finally, it is important to note that market demand far outstrips current funding from the federal government. In its media release about its $70m funding round, ARENA advises that during the initial application stage ARENA received 36 expressions of interest, totalling more than $3 billion of renewable hydrogen projects. Seven projects were shortlisted to submit a full application, with the total grant money requested for all seven projects being over $200m, of a total project value of almost $500m.[16]

This is where the NSW Government must step in if it wishes to be a serious player in the hydrogen industry. NSW Government investment in the hydrogen industry is in line with the *NSW 2040 Economic Blueprint* which identifies 13 future industries with the potential to drive growth and jobs, one of which is hydrogen.[17]

[16] ARENA (2020) 'Seven shortlisted for $70 million hydrogen funding round', 20 July, see https://arena.gov.au/assets/2020/07/seven-shortlisted-for-70-million-dollar-hydrogen-funding-round.pdf.
[17] NSW Treasury (2019) *NSW 2040 Economic Blueprint: Investing in the state's future*, p. 18, see https://www.treasury.nsw.gov.au/sites/default/files/2019-11/0909-02_EconomicBlueprint_Web.pdf.

Recommendation 1

The NSW Government commits $400 million to hydrogen projects in three tranches, and across a mix of applications as discussed in subsequent recommendations:

- Tranche 1 (2021-2024): $100m for hydrogen production and associated infrastructure in two hubs or precincts (at the equivalent of 10MW electrolyser output).[18]
- Tranche 2 (2025-2028): $100m for hydrogen production and associated infrastructure as required to support current or new projects (at the equivalent of >50MW electrolyser output). Focus on getting FCEVs to market, including government-managed light and heavy vehicles such as buses.
- Tranche 3 (2029-2030): $200m for hydrogen production and associated infrastructure as required to support current or new projects (at the equivalent of >100MW electrolyser output).

Policy to activate the market

Governments can also implement a range of incentives and rules to reduce the investment gap. Government policies to activate markets can support the supply side (to reduce the cost of production and delivery) or the demand side (to reduce the cost of purchase and create market pull).

For example, electrolysers can provide services such as demand response, frequency control ancillary services (FCAS) and voltage support. Their ability to interact with the national electricity market (NEM), when grid connected,[19] is one of their key benefits.

These characteristics add value to the grid, and it can be argued that this value could be recognised by exempting hydrogen from transmission use of system (TUoS) charges. Alternatively, electrolyser-specific electricity network tariffs (both TUoS and DUoS) could be developed to reflect the specific cost structures and underlying economics of electrolysers. Early-stage support to encourage common use infrastructure and attractive tax, credit and financing solutions are also recommended to attract private investment.

We also note the strong national and NSW-specific support for hubs and Special Activation Precincts. These not only help efficiencies through co-locating supply and demand(s) but can also showcase local capabilities and attract investors to the region.

[18] This is not to say that hydrogen should be produced only from electrolysis, but to use common terminology to provide an illustration of the size of a project.

[19] As recently noted in an article from the Australian Energy Market Commission:

> Hydrogen can provide significant services to the NEM, given its flexibility. It can help to absorb large amounts of renewable energy, it can relieve congestion issues on the network, provide system services such as frequency response and provide significant flexible demand response. In turn, hydrogen projects may derive additional revenue from providing these services and they may be able to source cheaper and more reliable energy supply in the near and longer term.
>
> The right policy settings can help turn this opportunity into reality.

See https://www.aemc.gov.au/hydrogen-new-australian-manufacturing-export-industry-and-implications-national-electricity-market.

Further, NSW Treasury notes in its *NSW 2040 Economic Blueprint*: [20]

> Hydrogen industry facilities could be located in regional areas in providing potential opportunity to aggregate with the development of transport, logistics and utility infrastructure. The regional hydrogen supply chain could provide co-locational benefits to other industries such as agriculture, manufacturing, mining and waste management in further driving economic development and job growth.

Recommendation 2

The NSW Government applies other investment incentives and support such as:

- An investment model that will leverage other support, particularly from ARENA and CEFC.
- Export credits.
- Underwriting common use infrastructure, such as refuelling infrastructure for FCEVs.
- Explicit government support to close the funding gap between the cost of hydrogen and the cost of natural gas over the next 10 years.
- TUoS exemptions or better targeted network pricing structures.

Planning and coordination

Customers, communities, investors and trading partners will be looking for some degree of regulatory certainty and consistency. Major hydrogen projects also need a degree of regulatory certainty to start planning for multi-year construction.

None of this is impossible, and there are existing regulatory regimes that can be used.

However, the task is still complex and is made more complex by one of the great benefits of hydrogen, which is its versatility. Connecting different sectors of the economy is a good thing for energy diversity and economic resilience to shock. But it also has the effect of connecting separate regulatory regimes, which vary further over different layers of government and multiple jurisdictions. For example, the electricity and gas regulatory frameworks were not designed with hydrogen in mind: the current RIT-T and RIT-D processes require electricity networks to identify credible options, but there is no incentive to consider co-optimised solutions with gas networks.

The hydrogen industry needs integrated governance; that is, to make sure that the relevant regulatory regimes across different sectors (such as electricity, gas and water), different issues (such as safety, environmental protection and training) and different parts of the various value chains (such as producing and transporting for different uses) are suitably consistent and do not unnecessarily hinder market development.

[20] NSW Treasury (2019) *NSW 2040 Economic Blueprint: Investing in the state's future*, p. 18, see https://www.treasury.nsw.gov.au/sites/default/files/2019-11/0909-02_EconomicBlueprint_Web.pdf.

We consider this vital to facilitate the success of hydrogen hubs, such as Port Kembla, and the NERA-facilitated hydrogen clusters, such as the Hunter Region Technology Cluster, which will likely see the co-location of a range of hydrogen applications.

Ideally policy would also be the result of planning and coordination across states and territories. This is a national task and we have asked for a national Hydrogen Market Development Plan that works toward hydrogen production at less than $2 a kilo by 2030 and involves a cross-jurisdictional group of regulators to inform and help deliver the necessary regulatory component.

We ask that the NSW Government supports this idea, and also provides leadership to harmonise policy and regulatory approaches. This can align with the *NSW Economic Blueprint*'s Recommendation 6.1, which is that NSW works with the Commonwealth Government and the states to agree a national energy policy, which should consider a mix of energy sources such as nuclear, gas, coal and renewables.

We also support the NSW Chief Scientist and Engineer's recommendation[21] that the NSW Government developed a detailed strategy that sets out its approach and trajectory for all government assets and procurement to meet its 2050 net zero target.

If New South Wales is to capture the full economic benefit of hydrogen, a cross sectoral task force is needed. This should bring together a range of stakeholders from across the NSW Government to identify and eliminate any unnecessary cross-sectoral barriers.

Recommendation 3

The NSW Government supports resourcing and planning at the national level.

Recommendation 4

The NSW Government develops a detailed strategy that sets out its approach and trajectory for all government assets and procurement to meet its 2050 net zero target.

Recommendation 5

The NSW Government establishes a cross-sector task force of government staff who are tasked with supporting the NSW hydrogen strategy and engagement with the NHS project team.

Understanding hydrogen storage needs

Much of the value of hydrogen is in its ability for longer term energy storage relative to batteries. The large-scale industry of the future should have adequate storage capabilities, whether this is to hold the hydrogen until it is used domestically (including for storage to support the electricity grid) or to hold it for export.[22]

[21] NSW Chief Scientist and Engineer (2020) *Opportunities for prosperity in a decarbonised and resilient NSW: Decarbonisation Innovation Study*, August, p. 53. See https://www.chiefscientist.nsw.gov.au/independent-reports/decarbonisation.

[22] Although we note that for states that are looking at export it seems to have been put aside to some degree in planning – the hydrogen is expected to be shipped at the point of production.

Hydrogen storage has not received much attention to date. We recommend that the NSW Government should actively address this in planning and investment strategy.

Recommendation 6

The NSW Government considers and plans for future hydrogen storage needs, starting with setting out a research project for geoscience experts to advise on the matter.

Replacing diesel in remote applications

Diesel is currently used extensively in mining and agriculture, and to power remote communities. Developing hydrogen remote area power systems (RAPS) can reduce Australia's reliance on imported diesel and support decarbonisation in these sectors and communities. The development of hydrogen remote applications would also generate jobs in the design, construction and operation of hydrogen systems and provide a much-needed training ground to develop local knowledge and experience in the industry.

From a cost comparison perspective, hydrogen can replace diesel as a fuel right now. However, the issue remains how to replace existing infrastructure (including vehicles, which we return to below) and how to produce the hydrogen at scale in a pre-commercial environment.

Recommendation 7

The NSW Government considers a new direct compensation measure to replace diesel standalone power systems.

Replacing natural gas

The decarbonisation benefits to NSW of replacing natural gas with clean hydrogen are obvious – hydrogen can be combusted in much the same way as natural gas, but without the associated emissions. Decarbonising gas use would seem to be fundamental for NSW to get to net zero by 2050. It is not – and cannot – be all about electrification; not only would the electricity generation and infrastructure requirements be onerous, but not all processes can be electrified. And not all consumers would or could shift their use (with the associated changes to premises) in any event.

Besides the obvious benefits of decarbonising Australia's gas use, the use of hydrogen in the natural gas networks can provide important domestic offtake support to the emerging hydrogen export industry. This can also occur without significant additional investment in infrastructure.

However, explicit government policy support is required, as the gas networks cannot effectively make rate cases to their regulator without policy endorsement for expenditure. The most valuable support at this stage is for the NSW Government to put its previously announced 10% blending target into legislation. Also, the current national regulatory framework does not account for hydrogen, which has created uncertainty for gas networks seeking to pursue hydrogen blending.

It is also important to plan for natural gas substitution over time, to ensure that the mix of hydrogen and natural gas produced matches the capabilities of the end user and end user. We note that Victoria's recent *Renewable Hydrogen Industry Development Plan* states that there will be a gas substitution roadmap, which will "establish a strategic framework for the transition of gas to meet

Victoria's emission reduction targets through support for more efficient use of natural gas, reduced fugitive emissions, increased use of hydrogen and biogas and increased electrification of Victorian homes and businesses".[23]

Funding support at the supply is also required to justify replacing natural gas with hydrogen, because hydrogen is currently much more expensive to produce than natural gas. We have covered this in the earlier section about project funding.

Recommendation 8

The NSW Government legislates its 10% (by volume) natural gas blending target as soon as possible and sets a clear policy pathway to get there.

Recommendation 9

The NSW Government coordinates with DISER and the Australian Energy Market Commission to investigate possible rule changes to allow for and value hydrogen blending into natural gas networks.

Transport applications

Decarbonisation of Australia's transport sector is becoming increasingly urgent. Transport is Australia's second largest emitter, making up 19% of current greenhouse emissions.

Decarbonising transport in NSW is essential to bringing the state's carbon footprint down to meet the anticipated 2030 interim emissions reduction target of 35% fewer emissions than in 2005, and to be net zero by 2050.

Decarbonising transport will only occur with a mix of batteries and hydrogen fuel cells. While both can be used for light vehicles, hydrogen has particular value in the heavy transport sector. As noted in the NHS, hydrogen fuel carries significantly more energy than the equivalent weight of batteries. This is particularly useful for buses, trucks and ships that carry heavy loads and can travel long distances. Even with improvements in battery efficiency the heavy transport sector remains very hard to decarbonise without clean molecules like hydrogen.

As with gas blending opportunities, transport also provides significant hydrogen offtake potential. Transport uses are more piecemeal than gas blending but have the advantage of having a public profile and can also replace diesel now.

Hydrogen can also bring new design and manufacturing opportunities to Australia in fuel cell technologies, to be used in the automotive, mining, aviation and marine industries.

Governments can provide the right signals by setting targets and reducing unnecessary barriers to uptake for vehicles. They can help create the demand that will draw through private investment in vehicles and infrastructure. This will give certainty to manufacturers and investors in the early

[23] Victorian Government (2021) Renewable Hydrogen Industry Development Plan, p. 40. See https://www.energy.vic.gov.au/__data/assets/pdf_file/0021/513345/Victorian-Renewable-Hydrogen-Industry-Development-Plan.pdf?mc_cid=f09fe1345e&mc_eid=39bc23f085

stages. As the NSW Chief Scientist and Engineer has noted,[24] the NSW Government can also leverage its own significant procurement power to support EVs. Government fleets and back-to-base vehicles are clear opportunities in these early stages.

It would also make sense for the NSW Government to directly fund a basic refuelling network, whether to work with Government fleets or as a separate entity. The case to bring FCEVs to the country improves significantly if there is infrastructure to support them.

The government should actively support the development of refuelling infrastructure so that the market can then develop around vehicles and hydrogen provision. We have covered this in the earlier section about project funding.

At a national level we need to see the following:

- Light vehicle CO2 emissions standard suitable for the Australian new vehicle market.
- CO2 emissions standard for new heavy vehicles (buses, trucks) to bring vehicles to Australia.
- Euro 6 noxious emissions standards for light and heavy vehicles.

Recommendation 10

The NSW Government advocates at a national level for emissions standards for vehicles.

Recommendation 11

The NSW Government develops a grant programme to directly support the installation of hydrogen refuelling infrastructure for FCEVs.

Recommendation 12

The NSW Government sets a 50% zero emissions vehicle targets for fleets of cars, buses and ancillary vehicles by 2030. This would include privately operated public transport fleets and government owned logistics providers.

[24] NSW Chief Scientist and Engineer (2020) Opportunities for prosperity in a decarbonised and resilient NSW: Decarbonisation Innovation Study, August, p. 22. See https://www.chiefscientist.nsw.gov.au/independent-reports/decarbonisation