2025 consultation

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11th July 2025

Net Zero Commission
4 Parramatta Square
12 Darcy Street
Parramatta, New South Wales 2150

To the Net Zero Commission,

Re: **Net Zero Commission 2025 consultation**

The Australian Hydrogen Council (AHC) welcomes the opportunity to engage with the Net Zero Commission as it develops strategies to support decarbonisation in New South Wales (NSW).

The AHC is the peak body for the hydrogen industry and our membership includes companies from across the value chain. Our members are at the forefront of Australia's hydrogen industry, developing the technology, skills and partnerships necessary to ensure that hydrogen and its derivatives play a meaningful role in decarbonising and strengthening Australian industry.

We are pleased to see the Net Zero Commission looking to accelerate climate action in NSW and aligning with federal processes to achieve this.

Electrification is an integral element of Australia's decarbonisation, and we support the logic of electrifying where this is possible and economic. While many applications for molecules will shift to electrons as electrification emerges as the most efficient option for continued operations, there is still a significant portion of industrial activity that will not be covered. And hydrogen is the only large-scale option for decarbonising energy that requires molecules. That is, Australia will not get to net zero without hydrogen.

We take this opportunity to ensure that hydrogen and its derivatives are adequately considered within this strategy. Hydrogen will be critical to decarbonise the hard to electrify and difficult to abate sectors of the economy, whether in its ability to decarbonise steelmaking (at least the iron ore reduction phase), provide heat for high temperature processes (such as processing bauxite into alumina to make aluminium), for heavy transport (including as a feedstock for future marine and aviation fuels), or to support food security via low carbon ammonia fertilisers.

In NSW, there are Safeguard facilities that are already or may in future be looking to hydrogen to assist in their decarbonisation, such as Orica's ammonia production facility on Kooragang Island, BlueScope's iron production in Port Kembla, and Boral's cement facility. In 2022-23, these three facilities were in the top seven highest emitters in the state, collectively producing over eight million tonnes of carbon dioxide emissions.[1] In 2023-24, each of these facilities has reported lower net emissions and represents some of the few Safeguard covered industries in NSW not explicitly in coal mining.[2] Especially as the Net Zero Commission looks to accelerate decarbonisation, each of these unique industries will need to be

[1] CER (2025) *Safeguard facility covered emissions data 2022–23*, Australian Government, https://cer.gov.au/markets/reports-and-data/safeguard-facility-covered-emissions-data-2022-23.
[2] CER (2025) *2023–24 baselines and emissions data*, Australian Government, https://cer.gov.au/markets/reports-and-data/safeguard-data/2023-24-baselines-and-emissions-data.

wrapped around to support the state's economic diversity and facilitate a just transition, working alongside federal initiatives such as the Net Zero Economy Authority.

There is also significant ambition federally and in NSW to grow a hydrogen and derivatives industry, such as through the Future Made in Australia agenda, NSW Hydrogen Hubs in the Hunter, Port Kembla and Moree, and this signal flows through to the ports that have molecules as part of their strategies.[3] This ambition will need to be recognised and supported through the Net Zero Commission strategies.

Therefore, through this process, the Net Zero Commission must also consider how to facilitate this long term hydrogen and derivatives industry, incentivising deployment of relevant technologies, driving demand through policy and procurement levers, building the necessary infrastructure, and developing modelling to best sequence the transition and decarbonisation of industry to ensure that the hydrogen is available (and in the quantities required) when NSW industry demands it.

The AHC has been very engaged in the role of the states and territories in critical sectors to achieve net zero. We have worked closely with the NSW government as it has progressed policy and research, such as through the Renewable Fuel Scheme, strategies to develop a renewable fuels industry, joint work on the green ammonia opportunity, and by providing connections to international industry and investment perspectives.

We would be delighted to be involved in the development of the Net Zero Commission's strategies. In the first instance, please see some of our relevant policy responses, in-depth positions and recent recommendations that can assist the Net Zero Commission in its remit.[4]

We look forward to engaging with you further through this process.

If you wish to discuss any element of this submission, please contact me at ncerexhe@h2council.com.au.

Kind Regards,

Natasha Cerexhe
Policy Manager
Australian Hydrogen Council

[3] For example: Port of Newcastle (2025) *Minister for Climate Change and Energy unveils final master plan design for nation's most advanced Clean Energy Precinct*, 4 July, https://pon.com.au/news/minister-for-climate-change-and-energy-unveils-final-master-plan-design-for-nations-most-advanced-clean-energy-precinct/.

[4] AHC (2025) *2025-26 Pre-budget submission*, submission, January, https://h2council.com.au/wp-content/uploads/2025/02/25-26-AHC-Pre-budget-submission.pdf ;
AHC (2024) *Re: Opportunities for a renewable fuel industry in NSW*, submission, 30 August, https://h2council.com.au/wp-content/uploads/2024/09/240830-NSW-renewable-fuels-AHC-submission.pdf ;
AHC (2024) *AHC submission to transport sector plan and LCLF*, submission, 26 July, https://h2council.com.au/wp-content/uploads/2024/07/240726-AHC-submission-to-transport-sector-plan-and-LCLF-1.pdf ;
AHC (2024) *Climate Change Authority 2024 issues paper: targets, pathways and progress*, submission, 21 May, https://h2council.com.au/wp-content/uploads/2024/05/240521-AHC-submission-CCA-issues-paper.pdf ;
AHC (2024) *Electricity and Energy Sector Plan – Discussion Paper*, submission 26 April, https://h2council.com.au/wp-content/uploads/2024/04/240426-AHC-submission_Electricity-and-Energy-Sector-Plan.pdf.

2025-26 Pre-budget submission

Australian Hydrogen Council
January 2025
Submission to Treasury

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AUSTRALIAN HYDROGEN COUNCIL

Contents

Acronyms and abbreviations

Acronym/abbreviation	Definition
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
ARENA	Australian Renewable Energy Agency
ASFI	Australian Sustainable Finance Institute
CEFC	Clean Energy Finance Corporation
CIS	Capacity Investment Scheme
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DRI	Direct reduced iron
FCEV	Fuel cell electric vehicle
FMIA	Future Made in Australia
GO	Guarantee of Origin
GW	Gigawatt
HPTI	Hydrogen Production Tax Incentive
IEA	International Energy Agency
ISP	Integrated System Plan
IRENA	International Renewable Energy Agency
ktpa	kilotonnes per annum
LNG	Liquified natural gas
MJ	Megajoule (10^6 Joules, or 1,000,000 Joules)
Mt	Millions of tonnes
MW	Megawatt
NHIA	National Hydrogen Infrastructure Assessment
NHS	National Hydrogen Strategy
PJ	Petajoule (10^{15} Joules, or 1,000,000,000,000,000)
TCO	Total cost of ownership
TRL	Technological readiness level
TUoS	Transmission use of system charges
ZLEV	Zero and low emissions vehicle

Executive summary

The Australian Hydrogen Council (AHC) is extremely supportive of the Australian Government's policy developments in support of the hydrogen industry and the energy transition as a whole.

We now urge the government to consider further initiatives in this Budget to fill some of the remaining commercial and policy gaps.

The demand side of the cost gap must now be better addressed, and in line with the direction set to date on priority use cases. The infrastructure requirements to move and store hydrogen have also been a lower priority until now, which needs to be rectified.

Recommendation 1: Policy to kickstart key markets

Consistent with its FMIA and NHS agenda, the Australian Government should prioritise and fund the following demand side policies for the 2025-26 Budget:

- Contracts for difference or production tax credits for future green metals supply and use, leading from DISR's recent consultation.

- Public procurement of green metals; at least an initial assessment of options and mapping major opportunities against timelines for construction, facility development, and procurement.

- A mandate for low to zero carbon ammonia for miners to use in explosives (budget impacts here will be minimal because it will be borne by miners).

- A mandate or demand mechanism for low carbon liquid fuels, especially SAF (including blends), that is tailored to Australia's market and national security interests.

Recommendation 2: Direct support for cornerstone industrial use and early adopters

To encourage domestic decarbonisation and support existing industry, in 2025-26 the Australian Government should:

- Assess the age and decarbonisation options for key Safeguard assets that overlap with FMIA and NHS criteria, and fund natural gas cost support mechanisms as required (or effect other gas industry policy) to keep manufacturing in the country.

- Target and fund direct government support packages for early adopters of hydrogen for industrial purposes who cannot reasonably access other support. This could be delivered via ARENA or another government funding and investment body.

Recommendation 3: Funding support for key infrastructure

To lay the groundwork for hydrogen in future road transport and shipping, the Australian Government should:

- Fund an assessment of key shipping corridors and Australian bunkering options for ammonia and methanol for 2025-26, and earmark longer term funds to support prospective common user infrastructure based on the assessment.

- Revise and progress the Hydrogen Highways initiative or reallocate funds to refuelling for other heavy transport applications for 2025-26.

Ideally, funding provided could be layered with other funding, such as for hubs, Hydrogen Headstart, and likely future HPTI recipients.

1 Introduction

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.

The AHC is the peak body for the hydrogen industry and our membership includes companies 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 ensure that hydrogen and its derivatives (such as ammonia and methanol) play a meaningful role in decarbonising Australian industry.

We are extremely supportive of the Australian Government's policy developments related to the hydrogen industry. These include the Future Made in Australia package, the Hydrogen Production Tax Incentive, Hydrogen Headstart, and the revised National Hydrogen Strategy. Other enabling initiatives relate to electricity investment (the Capacity Investment Scheme, Rewiring the Nation, Powering the Regions), the National Reconstruction Fund, progress on supporting sustainable finance, and the carbon leakage review. These are also fundamental to creating the right investment environment for Australian hydrogen projects.

Figure 1 below provides an overview of key policy from our perspective. We discuss most elements in some detail in the Appendix to this submission.

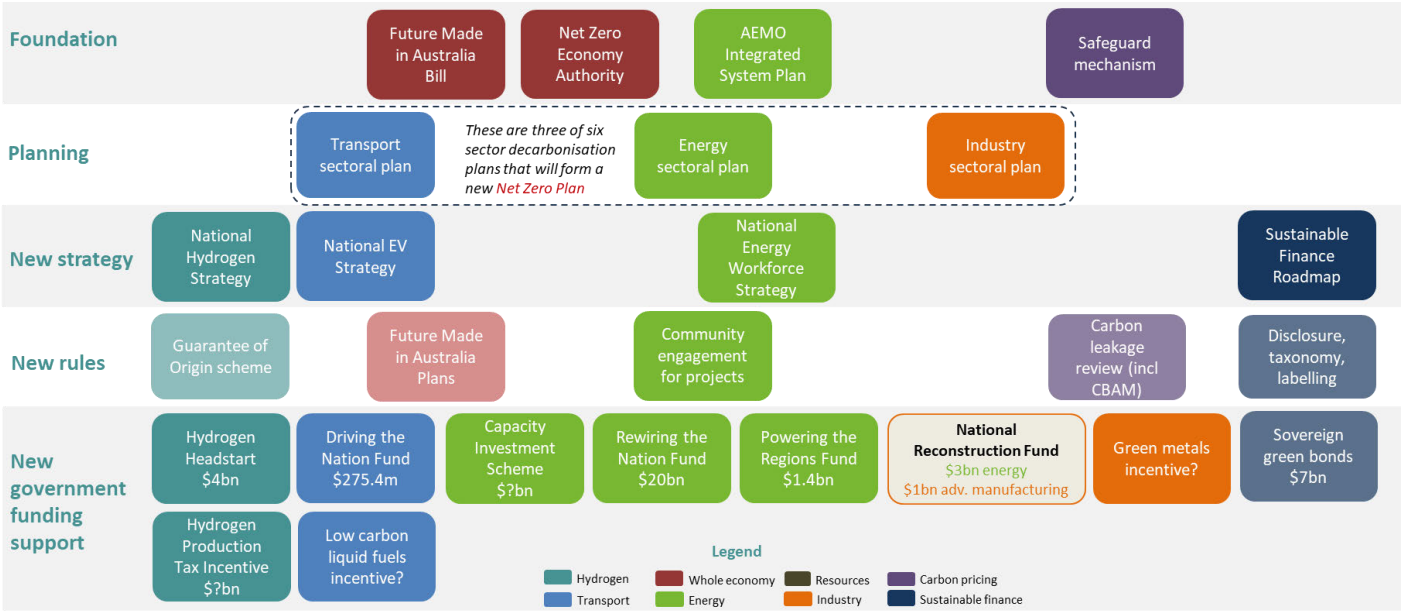

Figure 1: Australian federal policy environment – key elements for hydrogen

The work to this point across this complex array of issues has been comprehensive, and most welcome. However, more needs to be done to connect the different policy pieces and fill policy gaps if we are to gain and maintain our momentum in effecting the energy transition and support the Australian economy.

Further, the Hydrogen Production Tax Incentive (HPTI) is proposed to be AU$2/kg hydrogen, but this alone will not be enough to close the commercial gap for hydrogen projects. Hydrogen Headstart will help several projects reach commerciality, but it will still be difficult to close the gap entirely given rising input costs and a low customer willingness to pay a green premium.

We urge the government to consider further initiatives in this Budget to fill both the commercial and policy gaps.

2 The role for hydrogen

Globally, hydrogen is widely seen as an important means to reduce carbon emissions, with IRENA advising that as of May 2024, 46 national (and supra-national) strategies and 8 roadmaps on hydrogen had been drafted and published, and at least 20 more countries were in the process of producing such documents.[1]

Australia was one of the first countries to see the hydrogen opportunity, and we have developed an enviable pipeline of projects.

In the process of developing these projects and in working through the options, governments and industry have learned a great deal. Collectively, we are increasingly moving away from talking about hydrogen in the abstract – the thing we could make and should make – to its purpose to decarbonise specific sectors of the economy.

Views are converging on the role for hydrogen in the future, as follows:

1. We will need hydrogen in the energy transition for its chemical uses:
    - Clean and green hydrogen is required because we already need it to make ammonia for the nitrogen fertilisers that keep half the world alive, and for the ammonium nitrate that our miners require. Our existing ammonia industry needs to be decarbonised.
    - Hydrogen will have a role to decarbonise steel – producing Direct Reduced Iron (DRI) with hydrogen will be a necessary means to decarbonise at least the first part of the steelmaking process.
2. Hydrogen is required as a chemical feedstock for future fuels:
    - Feedstock for future shipping fuels – hydrogen is needed for both the ammonia and methanol pathways.
    - Feedstock for the aviation fuels of the future – the e-SAF when we need to scale beyond biogenic feedstocks, and right now as a supporting act to process biogenic feedstocks.
3. Hydrogen as a direct fuel (essentially as a carrier for energy for long term/heavy uses that are challenging to electrify) is most likely for:
    - Replacing diesel for remote power needs, which is particularly relevant for a large and less populated country like Australia, where connection to electricity grids can be infeasible.
    - Decarbonising heavy road transport and smaller aircraft. Matters of efficiency, infrastructure needs, and viable alternatives are being worked through, as well as hybrids between batteries and hydrogen, and blended products.
    - High temperature industrial heating, including a strong possibility it could be the best fuel for decarbonising the calcining process in producing alumina from bauxite.

[1] IRENA (2024) *Green hydrogen strategy: A guide to design*, International Renewable Energy Agency, Abu Dhabi, see https://www.irena.org/Publications/2024/Jul/Green-hydrogen-strategy-A-guide-to-design.

- Electricity production, in place of natural gas in peaking generation facilities to support grid stability in the event of long-term renewable energy 'drought'.

Producing the volumes of hydrogen required for these uses will need terawatts of new power and further hundreds of billions of dollars of investment in production capabilities, industrial facilities and associated infrastructure. These uses alone will require close attention to priorities, efficiencies, and sequencing to be feasible, and scaling up will take years.

Figure 2 shows the ecosystem that needs to be in place to get to commerciality in hydrogen. This submission addresses only some of these aspects, but we have provided extensive commentary on all of them in the past[2] and would be happy to have further conversations as might be useful to the Australian Government and the broader policy community.

Figure 2: Areas for government policy and support for the emerging hydrogen industry.

[2] AHC (2023) *A fit-for-purpose refreshed NHS: next steps for building Australia's hydrogen industry*, August, https://h2council.com.au/ahc-publications/.

3 The current state of the emerging Australian hydrogen industry

Electrification is an integral element of Australia's decarbonisation, and we support the logic of electrifying wherever this is possible and economic. However, this is already not an easy task, with almost 80 per cent of Australia's domestic energy consumption in FY2022-2023 in the form of molecules rather than electrons.[3]

While many applications for molecules will shift to electrons as electrification emerges as the most efficient option for continued operations, there is still a significant portion of industrial activity that will not be covered. And hydrogen is the only large-scale option for decarbonising energy that requires molecules.

Further, Australia is a trusted energy partner across Asia and the export of molecules is critical to Australia's prosperity. Our trade partners are confronting their own decarbonisation challenges within their national context, and Australia has an important role in remaining a source of clean energy, in whatever form is required.

The growth of Australia's hydrogen industry therefore not only supports domestic decarbonisation but also provides Australia with an opportunity to add value to existing raw exports and create new export opportunities. This will improve Australia's slide down Harvard's globally recognised Atlas of Economic Complexity, where Australia was at 93rd place in 2021 (from 60th in 2000) with Uganda, Armenia and Honduras ranked directly ahead of us.[4]

It will also require a level of Australian local industry participation all along the value chain to support the production, storage, movement and use of hydrogen. The ambition of the AHC is to see the Australian industry become a global leader in aspects of the hydrogen supply chain through our universities, start-ups, and SMEs developing and commercialising innovative technologies.

However, this will all take time. Unlike the global LNG market, or the early solar industry – two often used examples of how new industries can develop over time – we need to create an entirely new market for clean and green hydrogen, with new forms of production, new ways to use hydrogen, and a new end-to-end supply chain that is supported with an appropriately resourced ecosystem. To compare, it took LNG and solar PV years to get to scale *even though* each produced energy that society could immediately use and value.

And while we build hydrogen capabilities, we must also enable the transition within the electricity system: we need to build out renewables capacity at an unprecedented rate for the sake of the electricity system, as well as for hydrogen, and in doing this costly exercise also bring prices *down* for renewable or green hydrogen to be competitive.

The complexity of the energy transition, and hydrogen's role with it for decarbonise the hardest sectors to abate, can be overwhelming. We at the AHC have engaged with this complexity for some

[3] Calculated based on data found in Table H and Table R of Department of Climate Change, Energy, the Environment and Water (2024) *Australian Energy Update,* Australian Government, August, https://www.energy.gov.au/publications/australian-energy-update-2024.

[4] Harvard Growth Lab (n.d.) *Atlas of Economic Complexity*, 2021 data (current), Harvard Kennedy School, see https://atlas.cid.harvard.edu/countries/14.

time and written about the many issues that need to be resolved. We have shared our writing through the Appendix to this submission and the various references. However, for the purpose of the 2025-26 Budget, there are three matters that are inhibiting hydrogen developments and must be addressed:

- Hydrogen demand signals are lacking
- Electricity prices are prohibitive
- Today's high gas prices reduce future hydrogen users.

We discuss these matters below.

3.1 Hydrogen demand signals are lacking

IRENA has recently referred to the 'green hydrogen deadlock' where potential off-takers (consumers) and suppliers are unable to move forward without further information – such as about prices and commitments.[5] And potential suppliers are hesitant to build and deploy without firm offtake agreements. This seems an apt characterisation of much of the hydrogen conversation these days. First-of-a-kind projects are uncertain and risky, with a strong need for information for both supply and demand sides.

It is unhelpful that many places, including Australia, lack meaningful (economy-wide) carbon pricing. This is the key solution for a society that needs to transition and runs a market economy – price is the signal of value for all things. However, cost of living pressures make regulatory 'sticks' like broad carbon pricing unattractive politically.

To date, Australian Government support for the hydrogen industry has been in the form of project-specific grants and concessions, and has been weighted to the supply side. This appeared logical in the context of a pre-commercial – that is, pre-market – environment with a dynamic and flexible view on potential uses, but it was perhaps too optimistic given demand pressures are not present.

The proposed HPTI takes a different approach; while it is supply focussed, it is market wide. Now we need to pair this with market demand signals and infrastructure measures, and support early users to see their path forward in the meantime. The AHC's proposals on these matters are outlined in section 4 of this paper.

3.2 Electricity prices are prohibitive

Electricity prices (hydrogen input costs) have also been a significant roadblock to progress. In 2019-2020 the common understanding was that electricity would need to be around AU$20MWh to get the cost of hydrogen production low enough to develop commercial renewable hydrogen projects. At the time, electricity prices were closer to AU$40MWh, with many assuming they would fall to the right level in the coming years.

However, with COVID affecting supply chains, the war in Ukraine affecting gas prices, and with pressure on renewables from coal generation plant retiring, we have seen electricity prices go the

[5] IRENA (2004) *Green hydrogen strategy: A guide to design*, International Renewable Energy Agency, Abu Dhabi, see https://www.irena.org/Publications/2024/Jul/Green-hydrogen-strategy-A-guide-to-design.

wrong way, with the gap to $20MWh now two to three times greater. And the inflationary pressures that affected renewable projects have similarly blown out construction costs for hydrogen projects.

We have not made electricity policy recommendations in this submission, because this is a well-known issue for Australia and we are not the lead association on this matter. We strongly endorse the ongoing programme to develop renewables and transmission infrastructure in Australia and the Australian Government's steps to date.

3.3 Today's high gas prices reduce future hydrogen users

Gas prices and access to gas are negatively affecting Australia's heavy industry, threatening the viability of feedstock-reliant domestic manufacturers and are indirectly impeding Australia's nascent hydrogen industry.

The experiences of ammonia producer Incitec Pivot must be viewed with some concern given that ammonia is the industry most favoured for nearer-term hydrogen domestic value and export growth potential. The company announced in November 2024 that it was selling its fertiliser business after it bore "big impairments" from "uncertainty about east coast gas prices",[6] and it closed its facilities in Gibson Island[7] and Geelong.

In work for the CEFC in 2021, Advisian advised: "A large portion of Australia's ammonia manufacturing capacity is beyond the initial design life of the facility and survives through judicious asset management and favourable domestic gas pricing".[8]

From a pro-hydrogen economic competitiveness perspective, higher natural gas prices would usually be viewed favourably because this closes the competitive gap with hydrogen. However, by driving future hydrogen anchor industries away, very high gas prices will instead have strong chilling effects on Australia's hydrogen prospects.

Further, steelmaker BlueScope has recently stated that in its shift from using coal in the ironmaking process the company "believes that the eventual end state will be DRI manufactured using green hydrogen" but its analysis indicates green hydrogen is not likely to be economically viable for some time. Instead, natural gas-based DRI will be an intermediate step. The good news is that even with natural gas, the emissions reduction potential of the DRI process is significant:

> BlueScope would be able to reduce its Scope 1 emissions intensity by up to 60% using natural gas and, assuming a green hydrogen pathway, 85% using green hydrogen (relative to FY23 levels). This would be equivalent to a reduction of more than 3.6Mtpa and 5.2Mtpa of CO2-e respectively.[9]

[6] Evans, E. (2024) 'Incitec Pivot unwinds fertiliser business as write-offs spike to $1b', *Australian Financial Review*, 11 November, see https://www.afr.com/companies/manufacturing/incitec-pivot-unwinds-fertiliser-business-as-write-offs-spike-to-1b-20241111-p5kphl.

[7] This was closed in 2022 but hydrogen proponents had hoped to establish Gibson Island as a hydrogen opportunity, with government support.

[8] Advisian (2021), page 77.

[9] BlueScope (2024) *Submission re. Federal Government's Electricity and Energy Sector Plan Discussion Paper*, 26 April, see https://consult.dcceew.gov.au/electricity-and-energy-sector-plan-discussion-paper/new-survey-7563fd36/view/74.

However, accessing this gas at a competitive price is a problem. In October last year, BlueScope's head of climate change was reported as saying that switching to DRI with natural gas would require 30 to 40 petajoules each year. She was reported as saying it was "hard to see where that volume of gas would come from without new east coast gas fields or the implementation of a domestic gas reservation policy by the federal government". She also noted that "The other really important elements here are not just about volumes, it's about pricing," citing the Middle East and the United States where gas prices and energy prices "generally are very, very low".[10]

Although we make the argument in Australia that future steelmakers will want to import iron from Australia because this will be cheaper for them than importing ore and processing it themselves, Australia may well be approaching the opposite situation – where we send ore overseas for others' gas-driven DRI process – because our gas prices are too high. This seems an extraordinary situation given our gas production capacity and our plans to produce green iron here using the DRI process.

Finally, methanol is also a viable future market for hydrogen, but opportunities in this market have dwindled due to gas prices. Australia used to produce methanol at a site in Victoria, but the plant was "placed in care and maintenance mode" in March 2016 because of an inability to secure competitively priced natural gas at the time.[11] Methanol can also be used to produce ethylene and propylene, which in turn are processed into most plastics and synthetic polymers. This pathway has been in development in China for some time. Qenos, Australia's major ethylene producer, might have used methanol to decarbonise in the future, but it went into administration this year, reportedly because of high natural gas prices.[12]

Again, the issue of the loss of industry is a much larger matter than hydrogen, but it is important to see the connection between these current gas users and achieving the goals of the Australian Government as set out in the FMIA package and revised National Hydrogen Strategy.

3.4 Conclusion

It appears that that the development of the hydrogen industry will happen in phases, over a longer period than initially expected, and with ongoing risk to be managed in new ways.

In the meantime, it is vital that we hold the line to keep our gas-dependent heavy industry afloat, and get the hard work done now so we are ready for scale later.

The energy transition is also about hybrid solutions, with pathways to 'better', so we do not let perfect get in the way of progress. The initiatives discussed in the next section support this approach, while working with and supporting existing government policy.

[10] Mizern, R. (2024) 'Bank ban on gas at odds with net zero transition: energy CEOs', *Australian Financial Review*, 21 October, see https://www.afr.com/politics/federal/why-more-cheaper-gas-is-crucial-to-bluescope-s-greener-future-20241021-p5kjvi.

[11] Coogee (n.d.) 'Manufacturing and supply', business website accessed November 2024, https://www.coogee.com.au/capabilities/manufacturing-supply/.

[12] Potter, B. (2024) 'Gas costs could sink more manufacturers after Qenos: AIG', *Australian Financial Review*, 18 April , https://www.afr.com/policy/energy-and-climate/gas-costs-could-sink-more-manufacturers-after-qenos-aig-20240418-p5fl03.

4 New initiatives to be supported through the next Budget

Clearly the 2024-25 Budget was supportive of hydrogen, and we welcomed the announcement of the AU$2/kg$H_2$ HPTI, Hydrogen Headstart 2.0, and other associated initiatives. This has put Australia back in the running to attract international capital and build the industry.

The 2024 National Hydrogen Strategy (NHS) was also released in September 2024, where this was an important update to Australia's ambition and priorities (see pages 266 to 35) in the Appendix for more information).

However, as discussed earlier in this submission, there is more to be done and significant detail yet to be fleshed out, and the annual Budget process provides an important opportunity to take the next steps.

The demand side of the cost gap must now be better addressed, and in line with the direction set to date on priority use cases. The infrastructure requirements to move and store hydrogen have also been a lower priority to date, which needs to be rectified.

4.1 The hydrogen demand side

At the time of the original NHS (in 2019) the hydrogen industry opportunity was seen as primarily about exporting hydrogen as an energy carrier. We have since seen a stronger focus on domestic use, whether for ultimate domestic purposes (such as high temperature industrial heating) or as a means to add value to export commodities (such as producing green iron from ore).

As noted by the Treasury:

> It is in Australia's interests to position adaptively for a range of hydrogen-adjacent opportunities besides hydrogen export – for example, using hydrogen as a feedstock in clean-energy embodied goods, such as green iron, as a practical way to embed hydrogen in energy-intensive goods. [13]

In line with this sentiment, the FMIA policy package proposes a new National Interest Framework for sectors to receive Australian Government support through its specialist investment groups, such as ARENA.

Five sectors have been stated to already fit within the framework: renewable hydrogen, critical minerals processing, green metals, low carbon liquid fuels, and clean energy manufacturing, including battery and solar panel supply chains.[14] Hydrogen plays a role in most of these sectors; obviously as renewable hydrogen itself, but also as a feedstock for green metals and low carbon liquid fuels. Clean energy manufacturing can also encompass the technology and equipment to make, store and use hydrogen.

[13] Treasury (2024) *Future Made in Australia National Interest Framework: Supporting paper*, 14 May, see https://treasury.gov.au/sites/default/files/2024-05/p2024-526942-fmia-nif.pdf, page 16.
[14] Ibid.

The FMIA framing of priorities is then reinforced by Action 15 of the 2024 NHS, which is to "prioritise support for the development of Australian hydrogen for use in prospective export-facing industries, particularly green ammonia, iron and alumina".[15]

Our recommendations below view further Budget support for hydrogen through this lens – we focus on the demand side of the emerging hydrogen market, and the already stated end use priorities for government policy on hydrogen. There are more policy and budget needs than this, but these are particularly relevant to the government achieving its stated ambitions.

Demand side measures are the missing pieces for the industry, and especially when we have not internalised the cost of carbon in the economy and fossil fuel prices remain the ones to beat. In the absence of an external force, such as a mandate to buy greener products, it is difficult for even the most climate-aware business to always choose a less known technology or more expensive product. Boards need to demonstrate their fiduciary duty to maximise profits has been met, within the law, and business decision-making is often risk averse.

It is therefore in the public interest for governments to depend less on soft ESG measures to see corporate change and to instead mandate the outcomes they want to see, or at least phased pathways to get there. Additional financial support can always be provided through policy measures to support businesses through the transition.

Market support

Using the priority areas of the FMIA and the NHS, the 2025-26 Budget should include measures for demand side market mechanisms for:

- **Green metals**, as discussed in a recent Australian Government consultation, and in more detail in page 44 of this document. In combination with HPTI, demand side support – such as public procurement of green metals, production incentives, and contracts for difference – will vastly improve the business case for decarbonising iron and alumina production. These are fundamental measures to pave the way for a new and lucrative export market for Australia.

  Climate Energy Finance (CEF) recently undertook extensive analysis of the green iron and steel opportunity for Australia, recommending that, among other things, there should be a clear focus on demand-side policies and incentives including the fundamental measures above.[16] CEF also proposes a new Trilateral Clean Commodities Trading Company (Australia, South Korea and Japan), as well as an Australasian Green Iron Corporation JV between Australia and key trade partners. We note that implementing these initiatives would require the Australian Government to be far more proactive than it has been to date, and we strongly agree that these measures are worth pursuing.

[15] Department of Climate Change, Energy, the Environment and Water (2024) *National Hydrogen Strategy 2024*, Australian Government, September, see https://www.dcceew.gov.au/sites/default/files/documents/national-hydrogen-strategy-2024.pdf, page 62.
[16] Pollard and Buckley (2024) *Green Metal Statecraft: Forging Australia's Green Iron Industry,* Climate Energy Finance, 15 November, see https://climateenergyfinance.org/wp-content/uploads/2024/11/CEF_Green-Metal-Statecraft_FINAL.pdf.

- **Ammonia**, which could cover all uses of ammonia, or only some uses. For example, we note that IEEFA has suggested that mining companies could shift to green explosives (which are made with ammonia) with the right incentives.[17] With miners consuming about half of Australia's ammonia through explosives, they could be a driver for cleaner ammonia (and hydrogen as the input to ammonia), at minimal incremental cost: IEEFA found that a switch to 20 per cent green ammonia by 2025 would increase mining operating costs by less than 0.1 per cent, and a full switch to 100 per cent green ammonia would increase mining operating costs by up to 0.4 per cent.

  This change is likely to require a government mandate, and we support further Australian Government consideration of the possibility, noting it would have little to no effect on the 2025-26 Budget.

- **Low carbon liquid fuels**, also as discussed in recent Australian Government consultation, and in more detail on page 411 of this document. The government focus to date has been on renewable diesel and sustainable aviation fuel (SAF), with biogenic feedstock the clear preference. We are concerned that multiple transport modes have counted the same biogenic feedstock as being available and recommend more comprehensive planning to avoid unwelcome surprises. It seems likely that e-SAF will be required in the future.

  In our view, the best approach for aviation would be mandates for future long-term use of SAF (such as in the EU), and incentives to help producers and users close the commercial gap. Incentives are best targeted where first-of-a-kind projects carry higher risk and cost, and can reduce as technology advances and efficiency improvements are made.

  A mandate will need a grace period to enable capability so that Australian producers are not disadvantaged while industry scales up; we note that even using biogenic feedstock for SAF at scale requires new refineries to be developed. In the meantime, the Australian Government should work closely with international standard-setting entities to develop and expedite international standards.

  We also recommend further exploration of government procurement policy targets to stimulate more local SAF production. Given its consumption of aviation fuels, the Australian Department of Defence would seem an obvious lead, as well as government travel.

Recommendation 1: Policy to kickstart key markets

Consistent with its FMIA and NHS agenda, the Australian Government should prioritise and fund the following demand side policies for the 2025-26 Budget:

- Contracts for difference or production tax credits for future green metals supply and use, leading from DISR's recent consultation.

- Public procurement of green metals; at least an initial assessment of options and mapping major opportunities against timelines for construction, facility development, and procurement.

[17] Butler and Denis-Ryan (2024) *How mining could ignite Australia's green hydrogen boom: The financial case for shifting to green explosives*, Institute for Energy Economics and Financial Analysis, February, see https://ieefa.org/sites/default/files/2024-02/How%20mining%20could%20ignite%20Australia%27s%20green%20hydrogen%20boom_Feb24_0.pdf.

- A mandate for low to zero carbon ammonia for miners to use in explosives (budget impacts here will be minimal because it will be borne by miners).

- A mandate or demand mechanism for low carbon liquid fuels, especially SAF (including blends), that is tailored to Australia's market and national security interests.

Direct support

Prior to the announcement of the HPTI, all hydrogen related government funding has been via grants or loans provided directly to project proponents.

This model of direct support will continue to play a vital role, and we note that the 2024-25 Budget provides significant funding to ARENA to continue its grants programme. Further, the FMIA states the priorities for Australian Government spending, which we assume will impact ARENA's business-as-usual grants programme as well as more specialised initiatives.

The existing guidance may suffice in other sectors, but we recommend more support for early adopters of hydrogen. Beyond price, the barriers faced by parties seeking to integrate hydrogen into their operations include the significant cost required to convert assets, and the uncertainty about the total asset life costs of doing so given lack of current experience. With hydrogen industry development still in a nascent stage, end users are understandably cautious and need support to develop business cases for change and manage financial and/or technology risks.

The NHS was essentially silent on how existing businesses might take steps to use hydrogen to decarbonise, which we believe could be rectified through the 2025-26 Budget. These industrial purposes may coincide or be bolstered with transport use cases or broader precinct needs.

Given the issue with high domestic gas prices driving away the very industries the FMIA seeks to enable, there is an urgent need for government response. We note that this is better managed via market reform as a whole, so that natural gas prices are lower for everyone, but in the absence of this the Australian Government needs to provide reasonable direct support to affected facilities. This could commence with an assessment of key Safeguard assets that overlap with FMIA and NHS criteria and are at risk, and this analysis would have significant analysis in common with the recent carbon leakage review.

Recommendation 2: Direct support for cornerstone industrial use and early adopters

To encourage domestic decarbonisation and support existing industry, in 2025-26 the Australian Government should:

- Assess the age and decarbonisation options for key Safeguard assets that overlap with FMIA and NHS criteria, and fund natural gas cost support mechanisms as required (or effect other gas industry policy) to keep manufacturing in the country.

- Target and fund direct government support packages for early adopters of hydrogen for industrial purposes who cannot reasonably access other support. This could be delivered via ARENA or another government funding and investment body.

4.2 Common user hydrogen infrastructure

Government support is required for financing and constructing common user infrastructure, such as ports and pipelines. This need is significant; for example, last year the US stated that even after its production tax credit has been accounted for, US$85-$215 billion in cumulative investment is required to scale the domestic hydrogen economy through to 2030 (10 MMT pa), with *as much as half* of this funding required to develop the midstream or end-use infrastructure.[18]

The NHS has a clear infrastructure focus, with future work for the National Hydrogen Infrastructure Assessment featuring prominently. We also welcome the recognition in the NHS of hydrogen hubs and their integration into industrial precincts (Action 4).

Ports, corridors and bunkering opportunities

Action 19 of the NHS commits governments to "Consider the readiness and prospects of ports to store and export hydrogen, import renewable energy components, and to provide safe marine refuelling using low-carbon liquid fuels such as hydrogen, ammonia and methanol". Each element of this rather crowded action item is important and requires further work, but a more immediate step would be to consider Australia's appetite and capacity for bunkering future fuels; that is, providing refuelling for ships.

There is a global push to decarbonise the maritime sector, with the EU agreeing a mandate of at least 1 per cent of green hydrogen-based fuels in shipping by 2031. Methanol is technically a low carbon liquid fuel when made with low carbon inputs, such as clean and green hydrogen. It is the more advanced alternative to bunker fuel for shipping, with the other option being ammonia. Obviously, hydrogen is the key feedstock for both pathways.

The Australian Government has begun to explore green shipping corridors with some of our trading partners, most notably Singapore[19] and New Zealand, but also with the Netherlands and Port of Rotterdam. To date, these agreements have largely focused on the trade and movement of molecules or in the management of shipping traffic.

The establishment of shipping corridors for green products has not been as developed in Australia. While Australia is not a major hub or bunker port for our region given the size of our markets, there may be future opportunities for bunkering where these can be combined with regular and stable offtake, such as iron ore transportation (and ultimately iron ore processing and iron transportation). Green corridors, operating alongside other policies such as domestic production incentives for hydrogen and metals, carbon border adjustment mechanism and demand incentives, would act to establish a robust domestic hydrogen production industry that can supply the feedstock required for metals processing.

[18] US Department of Energy (2023) *Pathways to Commercial Liftoff: Clean Hydrogen*, March, page 42, see https://liftoff.energy.gov/wp-content/uploads/2023/05/20230523-Pathways-to-Commercial-Liftoff-Clean-Hydrogen.pdf.

[19] Singapore and Australia have signed a Memorandum of Understanding (MoU) to formally collaborate on establishing the Singapore-Australia Green and Digital Shipping Corridor (GDSC). See https://www.dfat.gov.au/trade-and-investment/singapore-and-australia-green-and-digital-shipping-corridor. Further, under Australia-Singapore Initiative on Low Emissions Technologies (ASLET), both Singapore and Australia will commit up to $10 million each in their respective currencies to deliver projects under the initiative.

Examples of corridors and green products include:

- aluminium from Gladstone to the markets in North Asia
- zinc from Townsville to the markets in North Asia
- iron or steel from Port Kembla to the markets in North Asia
- methanol from Bell Bay to Singapore
- iron from Port Bonython to the markets in North Asia
- iron from Geraldton to the markets in North Asia.

One example of a green shipping corridor that explores the feasibility of both molecules and products is the work of the Chilean Green Corridors Network.[20] The Maersk Mc-Kinney Moller Centre for Zero Carbon Shipping is leading the work across a number of phases, in collaboration with the Chilean Ministries of Energy, Transportation & Foreign Affairs.

The first phase of the project considered map routes, vessel types, fuels, operators and cargo owners to determine potential domestic and international green corridors. Half of the corridors are related to shipping activities in Chile whereas the other half is related to activities internationally.

We recommend the Australian Government assess Australian bunkering options and shipping corridors, to then prioritise funding for port and related common user infrastructure developments that can layer with other funding, such as for hubs, Hydrogen Headstart, and likely future HPTI recipients. The Chilean Green Corridors Network is a good template for consideration.

Road transport refuelling

NHS Action 17 is for governments to "Support the targeted use of hydrogen for transport, either through direct use in hydrogen fuel cell vehicles or as a low-carbon feedstock for the production of low carbon liquid fuels, alongside support for other pathways like electrification and alternative fuels". Similar to the port action, this is a crowded action that is reasonable but needs some unpacking. This need is reinforced when we look at Action 6, which is that the Australian Government "will work with the states and territories and other experts to improve understanding of future hydrogen transport needs to inform the next iteration of the National Hydrogen Infrastructure Assessment".

There is a hydrogen road transport project with funding: the Hydrogen Highways initiative, which has been delayed, apparently indefinitely. We note that the 2024-25 federal budget allocated $75 million over four years to the Hydrogen Highways initiative;[21] however, the original application results were expected in early 2023, and the industry has no greater clarity on the proposed process. As discussed in the Appendix, we have argued for the need for pilots and trials of vehicles on Australian roads to be able to inform freight and logistics firms' assessments of total cost of ownership, or TCO. The Hydrogen Highways project was supposed to provide this information.

[20] Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (2022) *Chilean Green Corridors Network Project,* 29 August, https://www.zerocarbonshipping.com/projects/chilean-green-corridors-network-project-2/.
[21] Treasury (2024) *Budget 2024-25, Federal financial relations: budget paper no. 3*, Australian Government, 14 May, see https://budget.gov.au/content/bp3/download/bp3_2024-25.pdf.

We would like to see the project progress, and we seek clarity on next steps. If this needs more funding, then this is a better option than keeping the existing funding in limbo. We would welcome further engagement on options for progressing this matter, including any revision of the criteria.

If this project is to not go ahead at all, we ask that the money remains allocated to hydrogen refuelling station support in another form. This may be for more remote, precinct-based or logistics hub-based activities, or back-to-base operations. As with the port recommendation, this support could be layered with other funding, such as for hubs, Hydrogen Headstart, and likely future HPTI recipients.

Recommendation 3: Funding support for key infrastructure

To lay the groundwork for hydrogen in future road transport and shipping, the Australian Government should:

- Fund an assessment of key shipping corridors and Australian bunkering options for ammonia and methanol for 2025-26, and earmark longer term funds to support prospective common user infrastructure based on the assessment.

- Revise and progress the Hydrogen Highways initiative or reallocate funds to refuelling for other heavy transport applications for 2025-26.

Ideally, funding provided could be layered with other funding, such as for hubs, Hydrogen Headstart, and likely future HPTI recipients.

Appendix: The hydrogen policy environment

The Australian Government is undertaking a programme of systemic reform, including creating a Net Zero Plan, enabling regional development through a new Net Zero Economic Agency, funding infrastructure and technology through enhanced industry policy, and attracting private investment through large scale tax credits and other subsidies through the new Future Made in Australia policy package.

Figure 3 on page 3 shows the current array of Australian Government policy measures that are relevant to hydrogen. This is not an exhaustive list and is provided for illustrative purposes. This Appendix discusses the most important measures from this list for the development of the clean and green hydrogen industry, as shown in Table 1.

Measure	Policy intent
The Safeguard Mechanism	Pricing carbon emissions from heavy industry
National Hydrogen Strategy	Setting the strategic intent for the emerging hydrogen industry
The Guarantee of Origin Scheme	Certifying carbon emissions
Sector decarbonisation plans, leading to a Net Zero Plan	National planning to get to net zero
Future Made in Australia Bill	Ensuring major funding support is in the national interest
Hydrogen Production Tax Credit and Hydrogen Headstart expansion	Providing hydrogen-specific financial support
Carbon Leakage Review	Exploring the need for a Carbon Border Adjustment Mechanism
AEMO's Integrated System Plan (ISP)	Planning for renewable electricity infrastructure needs
Capacity Investment Scheme	To promote certainty in renewables and storage capacity investments through revenue underwriting
Sustainable Finance Roadmap, taxonomy and green bonds	Sustainable finance reform to mobilise private capital and provide transparency
The National Energy Workforce Strategy	Planning a workforce to meet the energy transition challenge
National Electric Vehicle Strategy	To support uptake of electric passenger vehicles

Table 1: Key policy measures for the emerging hydrogen industry

We address the current state of play as well as the AHC's policy positions, which are in turn discussed in greater detail across a range of submissions made to recent government consultations. We note also that in August 2023 the AHC provided a comprehensive submission to the Australian Government's National Hydrogen Strategy review consultation, with 53 recommendations.[22]

[22] AHC (2023) *A fit-for-purpose refreshed NHS: next steps for building Australia's hydrogen industry*, August, https://h2council.com.au/ahc-publications/.

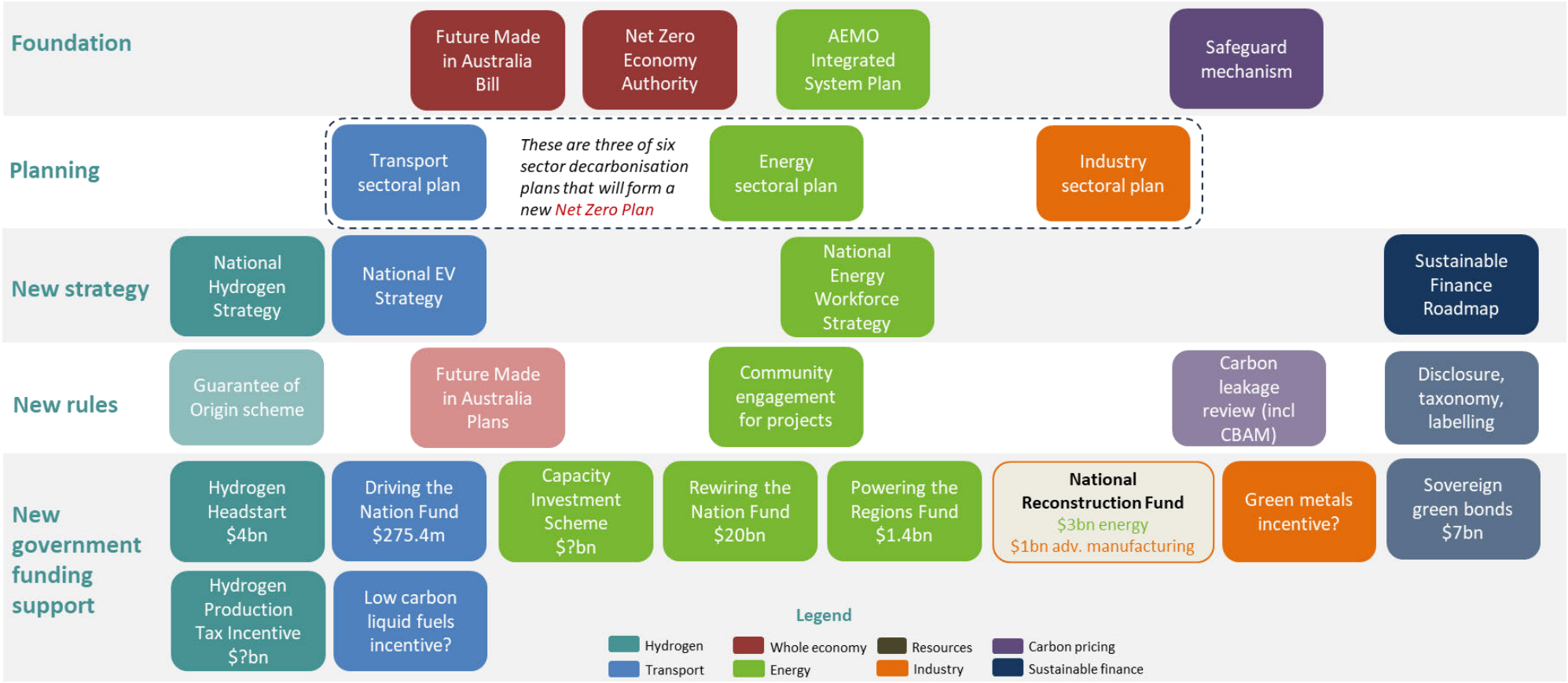

Figure 3: Australian federal policy environment – key elements for hydrogen

1. The Safeguard Mechanism

FOUNDATION POLICY – CARBON PRICING

Description and status

The Safeguard Mechanism[23] is the Australian Government's policy for reducing emissions at Australia's largest industrial facilities. The policy sets legislated limits on the greenhouse gas emissions per facility. These limits ('baselines') decline over time, requiring the facility owners to plan for, and invest in, decarbonisation initiatives. While the original Safeguard Mechanism commenced in 2016, it was reformed in 2023 to tighten the baselines and better ensure emissions reductions.

The Safeguard Mechanism applies to industrial facilities emitting more than 100,000 tonnes of carbon dioxide equivalent (CO_2-e) per year. There were 219 safeguard facilities in the 2022-23 reporting year.[24]

As part of the Safeguard Mechanism reforms in 2023, the Department of Climate Change, Energy, the Environment and Water (DCCEEW) reviewed production variables[25] to ensure they remained appropriate and effective in meeting the emissions reduction objective. A new hydrogen emissions intensity target was introduced (for new facilities), at 7.13 t CO2-e/t of gaseous or liquefied hydrogen. This target is to inform a facility's baseline under the Safeguard Mechanism.

The government intends to review the Safeguard Mechanism policy settings in 2026-27.

AHC position

The amended Safeguard Mechanism is the key government policy to ensure industry decarbonisation aligns with legislated net zero targets and is Australia's core replacement for a carbon price.

It is positive that the Safeguard Mechanism exists, but it does not go far enough.

The legislation only covers the emissions of the nation's highest emitters. It also does not go far enough to incentivise covered organisations to commit stronger or faster action. While there have been promising trials announced, the Safeguard Mechanism – in its role as a pseudo carbon price – will need to be bolstered to accelerate uptake of decarbonisation solutions and increase investment in production facilities for clean and green hydrogen and derivatives.[26]

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[23] DCCEEW (n.d.) 'Safeguard Mechanism', updated 7 June, accessed 5 September 2024, https://www.dcceew.gov.au/climate-change/emissions-reporting/national-greenhouse-energy-reporting-scheme/safeguard-mechanism

[24] Clean Energy Regulator (n.d.) 'Safeguard Mechanism', updated 8 July, accessed 5 September 2024, https://cer.gov.au/schemes/safeguard-mechanism.

[25] DCCEEW (2024) *Safeguard Mechanism: Prescribed production variables and default emissions intensities*, see https://www.dcceew.gov.au/sites/default/files/documents/safeguard-mechanism-document-production-variable-definitions-2024.pdf.

[26] AHC (2023) *A fit-for-purpose refreshed National Hydrogen Strategy: next steps for building Australia's hydrogen industry*, August, https://h2council.com.au/ahc-publications/.

Overall, whilst significant export of hydrogen and its derivatives is not anticipated until the 2030s, planning and environmental approvals for the development and construction of supply chains and supporting infrastructure need to begin now. Private sector actors will not make the required investment decisions until there is policy certainty and stability, alongside dedicated and long-term financial incentive or subsidy announced by the Australian Government.

Regarding the production variable emissions intensity target of 7.13 t CO_2-e/t of gaseous or liquefied hydrogen, it is unclear how this number was calculated.

Furthermore, under the production variable, hydrogen is considered trade exposed. This refers to the risk of incurring a green premium and how this domestic decarbonisation can be potentially undercut and undermined by imported, emissions-intensive alternatives. Under the Safeguard Mechanism, this vulnerability is recognised and combatted with access to additional support and a potentially lower annual reduction in baseline for trade-exposed industries rather than the standard 4.9 per cent. Provided that Australia is trying to establish hydrogen and its derivatives at scale to address our hard to abate sectors and support our green advanced manufacturing ambitions, we need to protect our domestic production.

2. The National Hydrogen Strategy

NEW STRATEGY – HYDROGEN

Description and status

The original Australian National Hydrogen Strategy (NHS) was released in November 2019.[27]

A revision to the strategy was announced in 2023, with consultation starting mid that year.

In September 2024 the Australian Government released the final NHS,[28] which was also agreed with all states and territories. The 2024 NHS:

- Sets a 2050 renewable hydrogen production target of 15 million tonnes per year, and 30 million tonnes as a stretch target. There are 5-yearly volume milestones set from 2030.

- Sets a base export amount of 0.2 million tonnes, with a stretch potential of 1.2 million tonnes of renewable hydrogen (or equivalent in hydrogen embodied products) per year by 2030.

- Lists 34 actions, spread across all relevant sectors.

The NHS sets the context for further reports, such as the annual State of Hydrogen report, and 5-yearly National Hydrogen Infrastructure Assessments (from the next iteration, planned for 2025-26).

The NHS is also to be reviewed every five years.

AHC position

The AHC developed a paper as an input to the Australian Government's process to refresh the NHS.[29] In this paper, we covered all the system elements that need to be in place to have the hydrogen industry develop in the Australian public interest and developed 53 recommendations to guide the thinking and policy making of the Australian and jurisdictional governments.

We were closely involved with the Australian Government's consultation process, with our CEO on the formal advisory group.

The 2024 NHS is very high level, which we understand is a result of it needing to stay relevant in a highly dynamic environment, including the fact of the six sectoral decarbonisation plans and other key policy still being in development. The general approach of the NHS and the major commitments surrounding it – such as the 2024-25 Budget announcements of the HPTI and Hydrogen Headstart

[27] COAG Energy Council (2019) *Australia's national hydrogen strategy*, November, https://www.dcceew.gov.au/energy/publications/australias-national-hydrogen-strategy.

[28] DCCEEW (2024) *National Hydrogen Strategy 2024*, Department of Climate Change, Energy, the Environment and Water, Canberra, September, https://www.dcceew.gov.au/energy/publications/australias-national-hydrogen-strategy.

[29] AHC (2023) *A fit-for-purpose refreshed NHS: next steps for building Australia's hydrogen industry*, August, https://h2council.com.au/ahc-publications/.

2.0 – reflect the positions we have put forward, but we seek clarity on a number of elements. We have mapped all recommendations across to our own and can provide this document on request.

The tables below provide a summarised version of our views and past recommendations. We have taken the NHS actions and allocated them to the following categories:

- Foundational matters
- Demand
- Funding and investment
- Infrastructure
- Industry capability.

Foundational matters

We have grouped the 2024 NHS targets and actions together in Table 2, which shows the foundational policy put forward in the NHS, and the AHC's brief commentary.

Overall, the targets appear reasonable, but the NHS does not provide a clear map about they were arrived at, or how the actions explicitly support the targets. We are seeking the NHS to be supplemented by further actions to meet targets and milestones, with responsibility clearly allocated.

Topic	2024 NHS	AHC comments
Targets	Australia will produce at least 15 million tonnes of renewable hydrogen per year, with a stretch potential of 30 million tonnes by 2050. In addition to the 2050 hydrogen production target, Australia's progress will be measured against the following annual hydrogen base and stretch production milestones: • 2030: 0.5 - 1.5 million tonnes • 2035: 3 – 5 million tonnes • 2040: 5 – 12 million tonnes • 2045: 9 – 20 million tonnes Australia will export a base amount of 0.2 million tonnes, with a stretch potential of 1.2 million tonnes of renewable hydrogen (or equivalent in hydrogen embodied products) per year by 2030.	The base level of the targets is consistent with mid cases of previous research. The NHS does not articulate how the targets might be met through the actions, and no modelling is publicly available. We have previously argued for more explicit modelling connected to the broader Net Zero sectoral plans. These targets should be able to track back to the government's Net Zero Plan as a whole.
Green credentials	**Action 1**: Focus government support on renewable hydrogen, complemented by suitable emissions intensity thresholds and other requirements for government-supported hydrogen projects, with GO certificates to form the basis of verification.	Policy is as expected. Note we have previously argued that the Australian Government should remain open to blue hydrogen projects for regions that can support it without unnecessarily delaying renewable/green hydrogen developments.
GO Scheme	**Action 30**: Implement the Guarantee of Origin scheme in 2025, and progressively increase the scope of the scheme to support the expansion of the hydrogen industry.	Agree

Topic	2024 NHS	AHC comments
Community engagement and benefit sharing	**Action 19**: Support the coordinated production and dissemination of culturally appropriate and accessible education materials that provide factual information about hydrogen production, and the obligations of project proponents. **Action 20**: Support the inclusion of specific criteria in funding program guidance and obligations in funding agreements with Australian governments that require proponents to adopt best practice when engaging with First Nations communities including benefit sharing. **Action 21**: The Australian Government will encourage the hydrogen industry to adopt best practice stakeholder engagement, including through the development of a voluntary code of conduct, to maintain positive interactions with communities and industry.	The AHC has developed HyFAQ (hosted by CSIRO). This resource and the work underpinning it should be used as a reference. We are progressing the code of conduct work (Action 5.3 under the 2019 NHS). We developed principles in recent years but found this was a complex space and we preferred to partner with others, particularly in renewables.
Planning and implementation	**Action 28**: Monitor emerging risks to domestic hydrogen supply as part of the independent assessment undertaken for the annual State of Hydrogen report, and the 5-yearly review of the National Hydrogen Strategy. **Action 34:** Publish an annual State of Hydrogen report centred around an independent assessment of progress. This will highlight emerging trends that may necessitate minor or urgent policy measures ahead of the next 5-yearly review. **Action 32:** Complete a full review of the National Hydrogen Strategy every 5 years, with the review to include a focus on progress against the targets and milestones detailed in the strategy, and consideration of the need for additional policy measures.	Agree, and we welcome working with the Australian Government on these reports. In the meantime, we are seeking the NHS to be supplemented by further actions to meet targets and milestones, with responsibility clearly allocated. Detailed implementation plans may need to be by sector or ecosystem element.

Table 2: Foundation matters addressed in the 2024 NHS and AHC comments on the actions set out

Demand

Table 3 shows the NHS actions relevant to hydrogen demand. As noted in the table, the AHC position is largely supportive, but we seek greater clarity on the work outlined in Actions 17 and 18, relating to transport and electricity grid support respectively. There is much more to be done across all areas in this table, and the work should be a priority for the 2025-26 Budget, as discussed in the body of this submission.

Topic	2024 NHS	AHC comments
Demand priorities	**Action 15**: Prioritise support for the development of Australian hydrogen for use in prospective export-facing industries, particularly green ammonia, iron and alumina.	Mostly agree – the AHC has argued for some time that it would be wise to prioritise the hard-to-abate sectors of the economy, and we have identified green chemicals and metals as particularly prospective. However, this action is silent on methanol, which can be produced as a low carbon liquid fuel and could be used in future shipping. The Australian Government has clearly set its priority as domestic use but for export purposes – the action here can be mapped to the FMIA and national interest categories for government financial support. We discuss green metals and chemicals throughout the body of this submission, and via the range of related policies in this Appendix.
Transport sector	**Action 17**: Support the targeted use of hydrogen for transport, either through direct use in hydrogen fuel cell vehicles or as a low-carbon feedstock for the production of low carbon liquid fuels, alongside support for other pathways like electrification and alternative fuels.	In principle this action is sensible but it is very high level and so it is not clear what the Australian Government sees as the problem to be solved or how this work will be led. This also merges all forms of transport, which complicates matters. We address road transport, aviation and shipping separately in this document. We have previously argued for a national ZLEV strategy for heavy vehicles with both financial and non-financial incentives, as well as a range of analyses.[30] This is also where methanol could be addressed through policy.
Electricity grid support	**Action 18**: Support analysis on how hydrogen can optimally support Australia's transition to renewables, including for energy storage, grid firming and via the flexible use of electrolysers.	As above, in principle this action is sensible but it is very high level and so it is not clear what the government sees as the problem to be solved or how this work will be led. We have previously argued that the Australian Government should task AEMO and AEMC with undertaking a full energy market and grid impact analysis for wide scale adoption of electrolysers as flexible load in the electricity grid. This work can then inform more comprehensive net zero modelling.[31]

Table 3: Demand side matters addressed in the 2024 NHS, and AHC comments on the actions set out

Funding and investment

We have grouped several of the NHS actions into the topic of funding and investment, as shown in Table 4. This also connects to relationships with international partners.

[30] Ibid.; pp. 123-126.
[31] Ibid.; pp. 69 -71.

These provide a direction rather than detail, which makes sense for an industry that will take time to develop, and for a strategy that ideally stands the test of time and does not need frequent modification. Some of the actions are already in the process of implementation from past Budgets, such as Action 2, which can be seen as a description of the HPTI.

Overall, we support the approach set out and look forward to further developments. The 2025-26 Budget also provides a good opportunity to build on the previous Budget's big announcements with more targeted support, as set out in this submission.

Topic	2024 NHS	AHC comments
Finance reform	**Action 3**: Consider reforms that may further enable specialist investment groups to play a bigger role in supporting the hydrogen industry to mature and secure further finance through traditional capital markets.	Agree, but we seek clarity on process. This matter is urgent.
Funding the cost gap	**Action 2:** Provide early policy support to enable the scaling up of the hydrogen industry to achieve production costs that are competitive with incumbent fossil fuels and to secure early offtake agreements. **Action 33:** Monitor the value of direct revenue support in the hydrogen sector and anticipate shifts that allow returns to taxpayers in the future. This will include considering trends in technology costs, international market developments (including policy support in competitor countries) and the pace at which the costs of carbon emissions are internalised within the most prospective hydrogen using sectors.	The NHS actions are high level but work with the FMIA, including the HPTI and Headstart. We have addressed other means of closing the financial gap in the body of this submission. We note that discussions on royalties are a long way away.
International partnerships	**Action 29**: Pursue opportunities to leverage investment from other countries who are willing to provide co-funding and make other efforts to build end-to-end global supply chains. **Action 31**: Existing partnerships will be prioritised as vehicles for furthering our international hydrogen objectives. Australia will look for opportunities to grow global markets and build end-to-end supply chains.	Agree with the principle but we note that there have been some problems with our international engagement to date that need to be addressed.[32] We have previously argued for the Australian Government to create an investment proposition to take to international markets. This work will need to be sufficiently funded and requires clear coordination across posts. The Australian Government should develop bespoke joint support packages between Australia and its trading partners that underwrite trade and support necessary infrastructure.
Investment attraction	**Action 22**: Continue efforts across all levels of government to improve the efficiency and effectiveness of regulatory approval processes for safety and environmental protection.	Agree, and we note the FMIA 'front door for investors', which is what we have recommended in the past. This needs to be part of the investment proposition mentioned above.

Table 4: Funding and investment matters addressed in the 2024 NHS, and AHC comments on the actions set out

[32] Ibid.; pp. 51-58.

Infrastructure

The 2024 NHS has a strong infrastructure focus, with many of the actions relating to further analysis and required collaboration with the states and territories. We support the actions as set out and now encourage further Australian Government engagement on the detail. Table 5 provides the relevant NHS actions and our brief responses.

Topic	2024 NHS	AHC comments
Hubs and precincts	**Action 4**: Support the integration of hydrogen hubs into the broader scoping, planning and development by Australian governments of industrial precincts.	Agree, this aligns with our recommendation to create Hydrogen Economic Zones to support regional hydrogen initiatives and connect the relevant supply, demand, infrastructure and workforce.[33] We recommend more Australian Government leadership to support regional development in the national interest and welcome the involvement of the Net Zero Economy Authority.
NHIA	**Action 5**: Deliver the next iteration of the National Hydrogen Infrastructure Assessment over 2025 and 2026 in consultation with key infrastructure planning agencies, with subsequent analysis conducted at least every 5 years.	Agree. We note page 50 of the NHS says that consideration will be given to the need for additional analysis to inform the NHIA, which could include: • hydrogen storage needs for different purposes, timeframes and locations • hydrogen pipeline corridors, easements and route alignment • water infrastructure needs, underpinned by the best available science • port capability and capacity, shipping routes and refuelling requirements heavy transport infrastructure needs. We have previously discussed each of these matters in some detail[34] and strongly agree these should be addressed in further analysis, both to support the NHIA and for other policy and planning.
Pipelines	**Action 6**: The Australian Government will work with the states and territories and other experts to improve understanding of future hydrogen transport needs to inform the next iteration of the National Hydrogen Infrastructure Assessment.	Agree. We previously recommended that the government should develop a national assessment of hydrogen pipeline corridors, easements and route alignment.[35] This work would then inform further policy on necessary coordination, co-funding and regulation.
Ports	**Action 9**: Consider the readiness and prospects of ports to store and export hydrogen, import renewable energy components, and to provide	Agree, but this action is very high level. We have previously recommended[36] that the Australian Government also:

[33] Ibid.; pp. 63-65.
[34] Ibid.; pp. 61-87.
[35] Ibid.; pp. 75-78.
[36] Ibid.; pp. 79-80.

Topic	2024 NHS	AHC comments

	safe marine refuelling using low-carbon liquid fuels such as hydrogen, ammonia and methanol.	• Undertake to support port redevelopments to 2045. The national assessment will clarify what is required, but this is expected to be around A$20-$30 billion
		• Engage with shipping companies operating in Australia and peak bodies to analyse and report back on:
		  • Current shipping routes.
		  • Fuels in which they are investing, the relative energy densities of options, and requirements to refuel.
		  • Bunkering in Australia, to understand if products (including fuels) are to be transported from southern Australia, what the impact is on key matters such as the total journey length and requirement to refuel.
		  • Opportunities for demonstration projects at suitable ports.
		We discuss ports in the main body of this submission.

Storage	**Action 7**: Support Geoscience Australia's precompetitive data program to identify suitable sites for hydrogen storage opportunities. **Action 8**: Support the establishment of fit-for-purpose and nationally consistent regulatory arrangements for the geological storage of hydrogen.	Agree, but these actions appear unnecessarily limited in scope by focussing only on salt caverns and the remit of Geoscience Australia. We have previously recommended[37] that the Australian Government should assess: • The economic benefit of hydrogen storage, including in supporting the electricity system. • The need for different types of storage for hydrogen, at what scale/volume and in what timeframe. • The fitness for purpose of existing storage measures, including current and new salt caverns, depleted gas reservoirs, line packing in pipes, and above-ground solutions. • If more storage is required, the next steps to develop this as needed, including cost recovery mechanisms as required for users. We have also recommended that Australian Government support common user storage developments to 2045. There is a particular need to fund demonstration and pilot projects for large-scale underground hydrogen storage.
Water	**Action 25**: Report annual project water consumption by the hydrogen industry through the annual State of Hydrogen report.	Agree. There is perhaps a stronger role here for the Australian Government though – we

[37] Ibid.; pp. 80-84.

Topic	2024 NHS	AHC comments
	Action 26: To support infrastructure planning by companies and water-planning agencies, future National Hydrogen Infrastructure Assessments will include a focus on water demand and availability for hydrogen production. **Action 27**: Support the consideration of water demand associated with hydrogen production in the development of a new National Water Initiative as a complement to water management policy and frameworks in operation at a state/ territory level.	previously argued[38] it should engage across the hydrogen and water divisions and with water utilities and state/territory jurisdictions to analyse and report back on: • Total water availability, mapping across Hydrogen Economic Zones. • The role of the hydrogen industry in maintaining Australia's water balance. • A national plan with water utilities that specifically addresses likely needs and timeframes for manufactured water and water infrastructure for hydrogen. Hydrogen policy settings should be explicitly incorporated into the revised National Water Initiative.

Table 5: Infrastructure matters addressed in the 2024 NHS, and AHC comments on the actions set out.

Industry capability

Table 6 shows a group of NHS actions that relate to industry capability and how it can be enabled and supported through government policy, planning, and regulation. The topics include RD&D, regulation (primarily safety), workforce and skills development, and manufacturing. We have also included a topic we called demand support, which relates to supporting hydrogen users adopt hydrogen (NHS Action 16).

The topics in the industry capability category are the least developed in the NHS, which leads to important knowledge and operational gaps in the enabling environment for the nascent hydrogen industry.

Whether this relates to under-funded RD&D, gaps in the regulatory framework that lead to uncertainty, a lack of skilled people for the future workforce. We are interested to work with governments to unpack the issues and assist with further policy recommendations and design.

[38] Ibid.; pp. 73-75.

Topic	2024 NHS	AHC comments
RD&D	**Action 11**: Identify opportunities that leverage Australia's research, development and demonstration (RD&D) capabilities to advance hydrogen technology manufacturing in Australia. **Action 13**: Australia will seek opportunities to increase RD&D investment in the TRL 4-6 range through programs and grants, including through ARENA. **Action 14**: Identify opportunities to work with partners on RD&D and position Australia at the forefront of international hydrogen-related research collaboration.	Agree, but these actions could be more specific given what we know already. We have previously suggested the priority topics and next steps.[39] We welcome the focus on TRL 4-6, but the appetite for further policy support is not clear. (Note RD&D on storage is covered with Geoscience Australia action on salt caverns). Overall, the RD&D environment in Australia is concerning, with funding that is fundamentally misaligned with Australia's ambitions to be a leader in innovation and technology. Future limits to international students, with the associated reduction in tertiary funding, will radically increase the existing gap between capacity and ambition.
Regulation	**Action 23**: Support the development and adoption of the National Hydrogen Codes of Best Practice in relation to hydrogen and ammonia. **Action 24**: Consider the need for expert forums or bodies to advise governments on safety and environmental protection issues to ensure that best practice approaches are being employed.	Agree, but we note that the Codes still lack context, and there are regulatory gaps not addressed to this point. We have previously suggested that the Australian Government identify regulatory gaps and reform opportunities and lead a programme of reform to meet the refreshed NHS targets and milestones.[40] Further engagement with international jurisdictions is encouraged.
Workforce	**Action 12**: Support workforce development initiatives at all levels of government in line with responsibilities, with reference to analysis and guidance from key institutions including the Department of Employment and Workplace Relations, Jobs and Skills Australia, and the Jobs and Skills Councils.	Agree, but this action could be more specific and we have previously sought clearer leadership on this matter and workforce modelling (see item 12 in this Appendix). We aware of work at the jurisdictional level that we hope will be inform national policymaking.
Manufacturing	**Action 10**: Support the development of sovereign clean technology and emissions-reduction manufacturing industries.	Agree, and we have previously outlined steps to take.[41] Ideally this is managed through DISR as well. See also RD&D above.
Demand support	**Action 16**: Work with industry to understand barriers and challenges to hydrogen adoption in prospective domestic sectors, including in the context of developing sectoral decarbonisation plans for energy, industry and transport.	Agree, noting that that the understanding should then lead to measures to prevent or avoid unreasonable barriers.

Table 6: Industry capability-related matters addressed in the 2024 NHS, and AHC comments on the actions set out

[39] Ibid.; pp. 109-115.
[40] Ibid.; pp. 115-120.
[41] Ibid.; pp. 67-69, 105-108.

3. The Guarantee of Origin

NEW RULES - HYDROGEN

Description and status

The Guarantee of Origin scheme (GO scheme) is an emissions accounting framework that allows buyers of hydrogen to have confidence in the low emissions claims of producers.

Intended to align with international methodologies, this is Australia's primary means of certifying the emissions intensity not only of hydrogen, but an increasing portfolio of products.

The GO scheme will be run by the Clean Energy Regulator (CER) and will allow for a range of variables to be measured, tracked and reported on, and discussions are in progress to extend the coverage of the scheme to a range of other products, such as biogas and green metals.

The GO scheme does not set a policy view on what is an acceptable level of emissions intensity; rather, it provides the means by which covered products can demonstrate compliance with any external emissions requirement.

The GO scheme is voluntary, but compliance is/will be mandated through key Australian Government funding mechanisms, such as Hydrogen Headstart and the Hydrogen Production Tax Incentive.

In September 2024, the Future Made in Australia (Guarantee of Origin) Bill 2024 was introduced to federal Parliament and referred to the Senate Environment and Communications for inquiry and report before being legislated in November 2024.[42] This Bill is the enabling infrastructure for subordinate legislation and rules which will determine the details of the scheme. These details are anticipated to be designed and consulted on before the intended commencement of the GO scheme in the second half of 2025.

AHC position

There is a clear need for a robust and trusted means of certifying emissions claims for hydrogen, and this has been raised as the industry's primary issue for some years. The AHC has been driving progress on this issue since 2018 and has engaged closely with DCCEEW and the CER. We support their development of a robust and versatile scheme that will meet the needs of a broad range of stakeholders.

The concept of a certification scheme for hydrogen has evolved considerably since the release of the initial discussion paper on the development of a Hydrogen Guarantee of Origin in mid-2021. The mechanism now being referred to as the GO scheme provides an architecture for tracking emissions

[42] Parliament of the Commonwealth of Australia (2024) 'Future Made in Australia (Guarantee of Origin) Bill 2024 [Provisions] and related bills', Parliamentary business, accessed 20 November 2024, https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/GuaranteeofOrigin.

well beyond the 'rubber stamping' concept envisaged by some when the need for a certification scheme was initially raised. By remaining agnostic to production pathway and emissions intensity DCCEEW is establishing a scheme which can adapt to the needs of industry and consumers beyond merely the production and use of hydrogen.

We are aware of Australian Government efforts, both bilaterally with trading partners and through the International Partnership on Hydrogen and Fuel Cells in the Economy (IPHE) to push for a globally recognised methodology for accounting for emissions and we consider that the GO approach can serve to underpin efforts to ensure that global reporting of emissions related to traded commodities is robust.

There is a range of other national and jurisdictional schemes that relate to emissions reporting, such as a GreenPower Renewable Gas Certification Pilot and the NSW Renewable Fuel Scheme (RFS). These often apply to the same producer of hydrogen and are governed and administered by different bodies; we seek information about how these may overlap with the GO scheme, as well as how the GO scheme will operate alongside initiatives such as the proposed Australian border carbon adjustment and the sector decarbonisation plans currently in development.

There is also a need for interoperability – many of the large-scale hydrogen and derivatives projects proposed for Australia have export ambitions and are keen to ensure consistency across international jurisdictions. In addition, AHC members are calling for multilateral interoperability rather than point to point (e.g. Australia-EU, Australia-Japan) interoperability.

4. Sector decarbonisation plans

PLANNING – TRANSPORT, ENERGY AND INDUSTRY (FOR NET ZERO PLAN)

Description and status

The Australian Government is working on a Net Zero Plan to reach the legislated target of net zero greenhouse gas emissions by 2050.

Led by DCCEEW, and in coordination with other departments, six sectoral emissions reduction plans are being developed to support the Net Zero Plan. These are electricity and energy; transport; industry;[43] agriculture and land; resources; and the built environment.

The six sectoral plans are supported by modelling and advice from the Climate Change Authority on targets and pathways, which was released in a major report.[44]

Of the six plans, energy, transport and industry directly relate to hydrogen, and resources is adjacent.[45] Public and targeted consultation was undertaken from late 2023 and throughout 2024, including discussion papers on electricity and energy,[46] transport,[47] agriculture, and green metals.[48]

Current timeframes for completion are unclear, but the Climate Change Authority's 2035 targets advice (which will be incorporated into the Net Zero Plan) has been delayed from Q4 2024 to 2025.

AHC position

We support the development of the Net Zero Plan (and the six sectoral decarbonisation plans) and have engaged with the relevant departments.

Overall, a common theme for AHC across hydrogen use cases is that planning and environmental approvals for the development and construction of supply chains and supporting infrastructure need to begin now. Significant investment decisions will not be taken by private sector actors until there is

[43] DISR (2024) 'Net zero sector plans for industry, resources and the built environment', 17 June, News, https://www.industry.gov.au/news/net-zero-sector-plans-industry-resources-and-built-environment#:~:text=The%20Australian%20Government%20is%20developing%20a

[44] Climate Change Authority (2024) *Sector Pathways Review*, released 5 September 2024, see https://www.climatechangeauthority.gov.au/sites/default/files/documents/2024-09/2024SectorPathwaysReview.pdf.

[45] Note that ammonia to make fertiliser is not under the agriculture sector plan but the industry sector plan.

[46] DCCEEW (n.d.) 'Electricity and Energy Sector Plan, updated 14 May 2024, accessed 5 September 2024, https://www.dcceew.gov.au/climate-change/emissions-reduction/net-zero/electricity-and-energy-sector-plan#:~:text=The%20Electricity%20and%20Energy%20Sector%20Plan.

[47] DITRCA (2024) *Transport and Infrastructure Net Zero Consultation Roadmap,* https://consult.dcceew.gov.au/transport-and-infrastructure-net-zero-consultation-roadmap.

[48] See Department of Industry, Science and Resources (2024) *Green Metals, A Future Made in Australia: Unlocking Australia's Green Iron, Steel, Alumina and Aluminium Opportunity*, Consultation paper, May, see https://consult.industry.gov.au/unlocking-green-metals.

policy certainty and stability, alongside dedicated and long-term financial incentives or subsidies announced by the Australian Government.

Australian policy and decision makers are creating the economic conditions for the emergence of entire new industries in Australia. The products that could be manufactured, produced, and traded are central to the energy and economic security of our trading and security partners across the region. If we are to be successful in the efforts to decarbonise not only Australia but the region, Australian governments must be willing to increase their risk appetite – to expand the suite of investment options to include equity stakes, large debt financing and expanded contracts for difference to incentivise the uptake of clean molecules in place of those derived from fossil fuels. We commend the Australian Government for its investment in the National Reconstruction Fund (Australia's manufacturing bank) to supplement the important work of the CEFC (Australia's green bank). But funding provided to these two agencies should be an order of magnitude higher if Australia's industrial and decarbonisation aims are to be met.

Our regional partners – in Japan, Korea, Taiwan, and Singapore as well as across ASEAN – are ready to co-invest and co-design the early mover Australia projects, but not at any price and not without Australia demonstrating willingness to carry some of the cost burden and investment risk. The AHC contends that in the absence of very significant and rapid reallocation of Australian private capital, the scale of the investments required for hydrogen production (power, transmission, storage of electrons, electrolysers, storage of hydrogen as well as downstream uses of the hydrogen such as production of ammonia or reduction of iron ore) necessitate international investment. We are hopeful that the regional and national investment priorities arising from the sector decarbonisation strategies will consider the role of hydrogen investment.

Electricity and energy

The AHC submission to the Electricity and Energy Sector Plan addressed planning, grid capabilities and the role of molecules,[49] and key arguments have been repeated elsewhere in this document.

The AHC supports electrifying where this makes sense, and following the research and data when it comes to the hard to abate areas. Comprehensive and published planning information – defined here as projections and assessments of future energy supply and demand pathways – would assist governments, the private sector and the public to make informed decisions about their options and actions for broader net zero planning.

No planning and reporting information of this type is currently being produced. AEMO's ISP is the nearest example of a comparable product, but it does not cover oil, energy exports, the consumption of electricity and gas off main grids, or the achievement of policy and programmatic goals. So while the ISP is an important input to a national energy planning document, it serves a different, more specific, and limited purpose. We are pleased with the recent review and increase to

[49] AHC (2024) *Electricity & Energy Sector Plan – Discussion Paper*, 26 April, see https://h2council.com.au/wp-content/uploads/2024/04/240426-AHC-submission_Electricity-and-Energy-Sector-Plan.pdf.

the scope of the ISP,[50] however, this needs to be expanded if we are to capture comprehensive net zero modelling. We discuss this further in section 9 of this Appendix.

The challenge for Australia is that we still need to build the renewables capacity that we are relying on to power our future renewable superpower ambition. This is on top of what is required to decarbonise the grid and provide system reliability. The need to build renewables to produce hydrogen is one of the most significant matters for consideration, where governments will be confronted with – and will need to explicitly manage, if not accommodate – competing priorities.

This also relates to electricity prices, where electricity pricing is a key driver of hydrogen costs. Australia is not on track so far, with electricity prices much higher than they need to be for the hydrogen industry to develop as required. Given that Australia's potential renewable superpower status is founded on anticipated future cheap electricity prices, this is also a matter of importance for the Net Zero Plan. Policy initiatives that support hydrogen projects include concessions or exemptions on Transmission Use of System (TUoS) charges, as previously suggested by AHC in various fora. We are also supportive of the Capacity Investment Scheme, as covered under section 10 of this Appendix.

When considering next steps, as we have previously advocated,[51] the REZ and industry hubs model of funding and coordination should be extended to cover so-called Hydrogen Economic Zones (or Low Carbon Precincts) to facilitate planning across industries and with some degree of central (that is, government led) funding and coordination. We believe that the focused parameters of industrial decarbonisation within key regions will assist in identifying and addressing the challenges that arise within the net zero transition. Crucially, this concentrated precinct would supply the data required to inform and sequence wider Australian decarbonisation decisions, as well as provide central locations to develop R&D, explore international partnerships (such as through green shipping corridors) and address barriers (such as common user infrastructure investment).

We must also build Australia's clean energy workforce, as discussed in section 12 of this Appendix.

Transport

Our submission to the Transport and Infrastructure Net Zero Consultation Roadmap reiterated our recommendation to the Australian Government on its revised National Hydrogen Strategy,[52] where we ask for Australian Government support for hydrogen in heavy road transport with a national ZLEV strategy, fleet trials, transition funds, and either a heavy vehicle fuel efficiency standard or sales target.

[50] Energy and Climate Change Ministerial Council (2024) *Response to the Review of the Integrated System Plan*, Australian Government, see https://www.energy.gov.au/sites/default/files/2024-04/ecmc-response-to-isp-review.pdf.
[51] AHC (2023) *A fit-for-purpose refreshed National Hydrogen Strategy: next steps for building Australia's hydrogen industry*, August, https://h2council.com.au/ahc-publications/.
[52] Ibid.

Our current view is that these positions are still reasonable,[53] and that a desirable policy instrument for road transport could be a supply chain emissions target that addresses scope 3 emissions for major retailers that use heavy road transport. We expect this would mean minor cost pass through when spread across all consumers (assuming retailers sought to pass costs on).

We suggest that the Australian Government should assess how quickly road vehicle fleets might need to turn over to reasonably meet emissions objectives and consider the demand side mechanisms to encourage this. Incentives need to encourage consumer technology shifts to the longer term low and zero emissions technologies. This seems most promising for battery and fuel cell electric road and rail transport. Government-funded renewable diesel incentives would then be suitable for a specific transition period while it may be needed.

For maritime, we will need to prepare for the planning and infrastructure requirements across Australian ports. Considering the lack of availability of space at existing Australian ports, and that Australia will generally be the taker of shipping company appetites for fuels, the Australian Government may need to nominate the best locations for specific segments of the maritime transition. Timely analysis and decision making must be undertaken to determine the target ports if we are to meet the ambitious whole of economy decarbonisation targets under the Paris agreements, International Maritime Organisation, and national legislation.

Hydrogen as a direct road transport fuel

Australia has ten hydrogen refuelling stations open and another three under construction.[54] This is not sufficient to support transport uses of hydrogen, and the significant Australian Government trial that the industry has been calling for to derisk investment, the Hydrogen Highways initiative, continues to be pushed back and delayed. (We note that the 2024-25 federal budget allocated $75 million over four years to the Hydrogen Highways initiative;[55] however, the original application results were expected in early 2023, and the industry has no greater clarity on the proposed process.)

We have argued for some time that there needs to be pilots and trials of vehicles on Australian roads to be able to inform freight and logistics firms' assessments of total cost of ownership, or TCO. The Hydrogen Highways project was supposed to provide this information. The ongoing delay just furthers the problem that offtake cannot be agreed when the total cost of a fleet replacement to hydrogen fuel cell heavy vehicles remains so uncertain.

There is urgency to test the technology in use in Australia so that there is total cost of ownership assurance, the OEMs have the time and confidence to manufacture or retrofit fuel cell heavy vehicles at scale, and Australia can progress beyond trials. This is a multi-year endeavour, and the

[53] AHC (2024) *Submission to the low carbon liquid fuels and transport sector plan*, 18 July, https://h2council.com.au/wp-content/uploads/2024/07/240718-AHC-submission-to-LCLF-and-transport-sector-plan.pdf.

[54] HyResource (2024) *Hydrogen Refuelling Stations spreadsheet*, CSIRO, accessed 20 November 2024, updated 25 October 2024, see https://research.csiro.au/hyresource/projects/hydrogen-refuelling-stations/

[55] Treasury (2024) *Budget 2024-25, Federal financial relations: budget paper no. 3*, Australian Government, 14 May, see https://budget.gov.au/content/bp3/download/bp3_2024-25.pdf.

Australian Government has a necessary role here to prioritise establishing the hydrogen refuelling infrastructure, helping to accelerate the timeline and derisk fleet transition.

We note that the Hydrogen Production Tax Incentive is currently proposed to only apply to production facilities that have a minimum capacity on 10MW, which would not cover most hydrogen refuelling stations currently in development, therefore making them ineligible.[56] Furthermore, this credit is only expected to apply from 2027-28, which does not incentivise the immediate scale up of hydrogen refuelling stations that will be required to derisk range anxiety and encourage vehicle supply in Australia.

Low carbon liquid fuels (hydrogen as potential feedstock)

We agree that there is an opportunity for Australia to establish a low carbon fuels (LCLF) industry. This supports fuel security, recognises the lower energy density of green fuels, and incentivises decarbonisation through supply. Separate modes of transport and industries are working to unpack the research, trajectory, and timelines of different low carbon fuel options, but there is significant overlap, especially regarding biofuels and hydrogen.

The Australian Government consultation papers on low carbon liquid fuels[57] and the transport roadmap[58] (for the sectoral plan) have clearly shown a preference for using biogenic feedstock to make future fuels for road and air transport. As we have noted in our responses,[59] prioritising biofuels for near term use is a reasonable perspective. However, we caution the Australian Government to not put off harder work to develop at-scale solutions. Biofuels are the transitionary step for most liquid fuel uses while electrification and hydrogen capabilities are scaled up, and they will continue to play a vital long-term role for smaller scale use. In our view biofuels must be enabled but cannot *deprioritise* Australian Government efforts to develop policy to electrify, use batteries, and have the hydrogen infrastructure and supply for when the demand requires it. This obviously varies by transport mode – where hydrogen is used it could be for hydrogen as a fuel (such as for heavy road freight) or hydrogen as feedstock (for future maritime or aviation fuels). In any event, building out hydrogen capability and infrastructure will take time and needs to start now to be ready for when it is required.

Renewable diesel and SAF (whether biofuel or hydrogen-based) have been merged in recent government consultations, but it is important to note that these are not equivalent in terms of their long-term value to Australia's transport decarbonisation efforts. Renewable diesel is expected to have a shorter-term role, such as in heavy road transport and will be used more in regional and rural areas, for vehicles that are not yet ready for retirement, and while the technology and

[56] Treasury (2024) *Hydrogen production tax incentive*, Australian Government, https://treasury.gov.au/consultation/c2024-541265.
[57] DITRCA and DCCEEW (2024) *Low Carbon Liquid Fuels A Future Made in Australia: Unlocking Australia's low carbon liquid fuel opportunity*, Consultation Paper, see https://www.infrastructure.gov.au/sites/default/files/documents/low-carbon-liquid-fuels-consultation-paper.pdf.
[58] DITRCA (2024) *Transport and Infrastructure Net Zero Consultation Roadmap,* https://consult.dcceew.gov.au/transport-and-infrastructure-net-zero-consultation-roadmap.
[59] AHC (2024) *Submission to the low carbon liquid fuels and transport sector plan*, 18 July, https://h2council.com.au/wp-content/uploads/2024/07/240718-AHC-submission-to-LCLF-and-transport-sector-plan.pdf.

refuelling/recharging networks are being rolled out. Furthermore, incentivising renewable diesel could lead to the perverse outcome of delaying or undermining the transition to electrification, which is already a commercially available and governmentally subsidised technology in some transport modes. In contrast, SAF is a genuinely long-term play.

On the matter of biogenic feedstock, biofuels are of course not all the same; this is a diverse family of feedstocks with their own different emissions characteristics. One thing all biofuels have in common, besides drop-in capabilities, is natural constraints on production. Waste streams are certainly constrained, and crop requirements for land and water can reach the point where biofuel production starts to compete with food.[60] Additionally, there are implications for biodiversity and fertility of land where rising impacts of climate change are expected to already be impacting crop yield. These are finite and vital resources that need to be managed carefully and responsibly.

To add complexity, there will be competition for biofuels for the hard to abate transport modes, particularly in aviation and maritime, where the demand will outweigh the possible supply of biofuels. These modes of transport must strategically sequence their decarbonisation and the feedstocks each can potentially use. We need greater clarity on the natural constraints of biofuels; this is a matter not only of fuel security but also food security.

We are supportive of an LCLF industry in Australia and welcome demand side incentives and policy mandates. These then need to sit alongside investment and infrastructure in the long-term net zero fuel solutions, such as hydrogen. The best approach for aviation would be mandates for future long-term use of SAF, and incentives to help producers and users close the commercial gap.

We also support the Australian Government's commitment to funding to develop a certification scheme for LCLF through an expansion of the Guarantee of Origin scheme, and its plan to build on ARENA's SAF Funding Initiative.

Industry

The Australian Government has advised that the industrial sectoral plan will cover:[61]

- alumina and aluminium;
- waste and resource recovery;
- chemicals and plastics;
- iron and steel;
- cement and concrete;
- food and beverages;
- pulp and paper;
- manufacturing;
- metals refining and smelting; and
- synthetic greenhouse gases.

[60] CSIRO (2023) *Sustainable Aviation Fuel Roadmap*, see https://www.csiro.au/en/research/technology-space/energy/sustainable-aviation-fuel.

[61] DISR (2024) 'Net zero sector plans for industry, resources and the built environment', News, 17 June, https://www.industry.gov.au/news/net-zero-sector-plans-industry-resources-and-built-environment#:~:text=Industrial%20sector%20plan%20The%20industrial%20sector%20plan%20is,impacted%20by%20the%20economy%E2%80%99s%20transition%20to%20net%20zero.

The consultation for the industry sectoral plan has generally not been public, with targeted discussions held to date. A paper on potential incentives for building the green metals sector was released in May 2024.[62] The discussion below reflects the AHC's submission to that process. We write more comprehensively about industrial hydrogen uses in our August 2023 position paper, and we also completed a report with Australian Alliance for Energy Productivity (A2EP) on decarbonisation options for different high temperature heating applications.[63]

Iron

The AHC strongly supports work to develop the role for hydrogen in steel making.

Hydrogen can support the production of green iron in steelmaking by removing oxygen from the iron ore. Direct reduced iron (DRI) is currently produced at scale with natural gas; however, steelmakers are considering the use of hydrogen for DRI manufacturing to make the steelmaking process CO_2-free, and several projects are in train. This could be a significant export opportunity for Australia, as countries seek to reduce their energy consumption and shift to importing iron from countries like Australia rather than importing iron ore and using energy domestically for processing. (The iron-to-steel stage is likely to remain in countries using the steel because steel is a relatively complex and bespoke product.)

While Australia is not a first mover on DRI with hydrogen, we are the largest exporter of iron ore, and so there is a market opportunity. This is particularly as decarbonisation policies start to bite and we can produce hydrogen cleanly. Given that the technologies currently being piloted and trialled (direct reduction furnace technology, electric arc furnace) are not expected to be deployed at scale until the late 2030s/early 2040s, Australian governments and corporates have significant motivation and lead time to ensure investment in the secure supply of hydrogen feedstock for DRI.

However, Australia could still be left behind in the global move to green steel. The bulk of the iron ore currently mined for export in Australia is incompatible for use in the production of DRI as the ore contains too many impurities. Australian iron ore is predominantly hematite-goethite, which, while a higher-grade ore, is not ideal for the DRI process because processing it to the required standard is currently difficult. Magnetite is a lower grade ore but can be processed (a process called beneficiation) for use in DRI processes.

As noted by the Australian Industry Energy Transitions Initiative:

> Developing new methods of processing hematite-goethite for its use in green steelmaking (especially DRI-EAF) could allow continued use of existing mines and infrastructure and preserve Australia's current iron ore markets. The processing of hematite-goethite for use in DRI-EAF technologies is poorly understood and will require R&D to enable commercially

[62] See Department of Industry, Science and Resources (2024) *Green Metals, A Future Made in Australia: Unlocking Australia's Green Iron, Steel, Alumina and Aluminium Opportunity*, Consultation paper, May, see https://consult.industry.gov.au/unlocking-green-metals.

[63] Australian Alliance for Energy Productivity (2023) *Bringing the heat: Hydrogen's role in decarbonising Australian industrial process heat*, August, see https://h2council.com.au/wp-content/uploads/2023/08/Bringing-the-heat-report-for-AHC-25-August-2023.pdf.

viable methods. Furthermore, yield losses during beneficiation will need to be addressed so as to not decrease the economic viability of this route.[64]

There is therefore a fundamental need to develop and demonstrate means of producing DRI from both magnetite *and* hematite-goethite if Australia is to reach its potential in iron exports.

Alumina

Hydrogen can also support green alumina production. Australia is the second largest producer of alumina in the world, and the largest exporter. Primary aluminium is made from bauxite, which is refined to make alumina before being smelted to make aluminium. Refining bauxite to produce alumina has four stages: digestion, clarification, precipitation, and calcination. Digestion takes place at 150-270°C and calcination at temperatures above 1000°C. Hydrogen can substitute for natural gas in calcination and is considered a strong alternative to electrification.

The pathway for green metals is still nascent as the technologies are being developed. We know that there will be requirements for low-cost renewable electricity and hydrogen (as metals processing is energy intensive), and in some cases, the ongoing technology will not be determined until the results of trials and demonstrations have been finalised. Therefore, multiple streams of investment will continue to be required to investigate each technology until there is a clear, proven pathway. For example, ARENA has backed both the electrification and hydrogen studies in the alumina calcination process with the outcomes expected in 2030. The outcomes of studies such as these, alongside industry-led pilot studies and the sustainable finance taxonomies, will assist investors in their long-term investment strategies.

We are pleased to see the dedication to developing the technology pipeline for the processing of green metals under the FMIA agenda, including through the ARENA-administered Innovation Fund (to facilitate commercial scale up) and the Green Metals Innovation Network (to plan for and train the future workforce). It is Australia's opportunity to focus this support and investment on the information gaps and prove up prospective technologies through long term, robust studies and analysis.

Supply side support for green metals end users

The Australian Government's rollout or development of the demand side support models for green metals should where possible be matched with the Hydrogen Production Tax Incentive (HPTI) to simultaneously support demand and supply for priority industries.

The focus on green metals is a comparative advantage for Australia to reconsider the flow of trade of our most valuable resources. This investment into decarbonising and maintaining existing Australian metals processing facilities can contribute to the expansion and diversification of Australian exports and increase Australia's sovereign manufacturing capability, for example in the development of the offshore wind industry. One of the key concerns surrounding this policy is timeliness – Australia's

[64] Climateworks Centre and Climate-KIC Australia (2023) *Pathways to industrial decarbonisation: Positioning Australian industry to prosper in a net zero global economy*, Australian Industry Energy Transitions Initiative, Phase 3, February, see https://www.energy-transitions.org/publications/pathways-to-industrial-decarbonisation/.

metal processing facilities are aging and need to strategically plan and reinvest in technology that will allow them to trade in an increasingly decarbonised world.

Significant consideration will also need to be given to the downstream costs on construction. Construction already has long lead times and inflated costs due to supply chain challenges, and the green metals industry will inherently have a green premium, which will result in a flow down impact onto the consumer. The challenge requires strategic planning and could benefit from mechanisms that directly support consumer uptake.

One of the greatest opportunities to boost demand is the utilisation of government procurement levers, especially in the use of decarbonised materials in government supported or funded projects, similar to the United States' *Buy Clean Initiative:*[65]

> Through Buy Clean, the Federal Government is for the first time prioritizing the use of American-made, lower-carbon construction materials in Federal procurement and Federally-funded projects. This is advancing America's industrial capacity to supply the goods and materials of the future while growing good jobs for American workers.

A similar Australian demand side initiative could mandate, where possible, that projects supported under FMIA and other investment vehicles source green cement and metals (as well as the technologies developed and manufactured in Australia) in the construction of any buildings or projects backed by public investment. By committing to being the first customer for green metals and other decarbonised products, the Australian Government creates demand, supports the order book of nascent Australian companies, and reduces risk and uncertainty for subsequent buyers and investors.

This type of initiative would ideally be supported by a strong and rigorous Australian carbon border adjustment mechanism (CBAM) to avoid the perverse outcome of parallel imports of cheaper, more emissions intensive materials undercutting Australia's decarbonisation investment and efforts. The Australian Government should also consider an ASEAN level CBAM, both to strengthen regional investment partnerships and initiatives aimed at increasing friendshoring in critical sectors and to increase the likelihood of successful industrial decarbonisation.

We also support the Australian Government's commitment to funding the development of a certification scheme for green metals through an expansion of the Guarantee of Origin scheme. Given that the nascent green metals industry will require significant investment and attract a green premium, it is vital that there is robust certification of the emissions intensity across the product lifecycle. There is not yet a globally agreed definition of 'green' or 'clean' for metals, and there is significant work to be done in designing adequate emissions recording; however, this work will safeguard against greenwashing and facilitate investor confidence.

We recommend that the expansion of the Guarantee of Origin Scheme covers green metals to align with international best practice for the measurement and certification of scope 1, 2, and 3 emissions for the production of DRI and green steel.

[65] Office of the Federal Chief Sustainability Officer (2023) *Federal Buy Clean Initiative,* Council on Environmental Quality, USA Government, see https://www.sustainability.gov/buyclean/.

5. The Future Made in Australia Bill

FOUNDATION – WHOLE ECONOMY

Description and status

The Future Made in Australia (FMIA) package was first raised in the 2024–25 Budget, and a Future Made in Australia Bill[66] was referred to the Senate Economics Legislation Committee for inquiry[67] before passing through Parliament in September 2024.

The FMIA is essentially Australia's answer to the US Inflation Reduction Act. It sets out a process to identify sectors of national interest which might then receive government financial support through key agencies, such as ARENA.

It also sets out that an applicant for, or recipient of, FMIA support must have a Future Made in Australia Plan, which demonstrates community benefits, defined by compliance with principles set out in the Bill and in subsequent rules.

Five sectors have been stated to already be aligned with a new National Interest Framework[68] under the Future Made in Australia policy package: renewable hydrogen, critical minerals processing, green metals, low carbon liquid fuels, and clean energy manufacturing, including battery and solar panel supply chains.[69]

The final coverage of funding/financial support bodies is not yet clear, but the FMIA provisions may ultimately reset how the Australian Government provides a range of funding to key industries, including all business-as-usual activities of ARENA and Export Finance Australia. There is also necessary overlap between topics covered through the FMIA and the sectoral plans, with the key examples being green metals and low carbon liquid fuels (each recently a topic of consultation as discussed above).

While the FMIA Bill has been passed, the subordinate mechanisms are still being developed, including the front door for investors (consultation September 2024), hydrogen production tax

[66] Parliament of the Commonwealth of Australia (2024) *Future Made in Australia Bill 2024*, 'A Bill for an Act to unlock investment in a Future Made in Australia, and for related purposes', see https://parlinfo.aph.gov.au/parlInfo/download/legislation/bills/r7219_first-reps/toc_pdf/24084b01.PDF;fileType=application%2Fpdf#search=%22legislation/bills/r7219_first-reps/0000%22.

[67] Parliament of the Commonwealth of Australia (n.d,) 'Future Made in Australia Bill 2024 [Provisions] and the Future Made in Australia (Omnibus Amendments No. 1) Bill 2024 [Provisions]', Parliamentary business, accessed 5 September 2024, https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/FutureMadeinAustralia#:~:text=On%204%20July%202024,%20the%20Senate.

[68] Treasury (2024) *Future Made in Australia National Interest Framework: Supporting paper*, 14 May, see https://treasury.gov.au/sites/default/files/2024-05/p2024-526942-fmia-nif.pdf

[69] Australian Government (2024) *Budget 2024-25 A Future Made in Australia*, see https://budget.gov.au/content/factsheets/download/factsheet-fmia.pdf.

incentive (Bill entered Parliament in November 2024) and community benefits principles (general consultation within FMIA Bill and another anticipated).

AHC position

The FMIA is a vital Australian Government response to changes in global supply chains and energy security, as well as a necessary step to reinvigorate Australian capabilities and grow economic complexity.[70] The energy transition is hugely challenging, but it also presents an important opportunity for Australia to develop competitive advantage in renewable energy production, technology and use within the global marketplace, as well as ensuring ongoing prosperity in our region.

Notably, of the five industries aligned with the National Interest Framework, hydrogen plays a vital role in most, including green metals, low carbon liquid fuels, clean energy manufacturing (such as electrolysers), and renewable hydrogen itself. There has already been progress in the demand side mechanisms of green metals and low carbon liquid fuels, and, coupled with the FMIA Innovation Fund and Hydrogen Headstart, the overall policy framework should help derisk investment into the hydrogen value chain.

A front door for investors

The FMIA Bill seeks to create a front door for investors, to "provide a single point of contact for investors and companies with major, transformational investment proposals, delivering a coordinated approach to investment attraction and facilitation for these projects".

We welcome the announcement of this intent, and note it is aligned with our own advocacy. For some time now, the AHC has observed that the complexity and uncertainty of the investment environment and the overall ecosystem (multiple states, regulatory differences, permitting within states) is making hydrogen project proponents' decisions unnecessarily difficult. There is a need for investors and other decision makers to recognise meaningful investments in new infrastructure and technology, and the current environment is not conducive to this. Government thus has a role to direct investors' attention to the opportunities; to help create value propositions that investors recognise.

Community benefits

The FMIA Bill seeks to hold recipients of significant funding accountable to the community by aligning corporate activity with government expectations on community benefits. The community benefit principles set out in the FMIA Bill are:

> *(a) that Future Made in Australia support should provide community benefits, in particular by:*
>
> *(i) promoting safe and secure jobs that are well paid and have good conditions; and*
>
> *(ii) developing more skilled and inclusive workforces, including by investing in training and skills development and broadening opportunities for workforce participation; and*

[70] AHC (2024) *The Future Made in Australia Bill*, 26 July, https://h2council.com.au/wp-content/uploads/2024/07/240726-AHC-FMIA-submission.pdf.

(iii) engaging collaboratively with and achieving positive outcomes for local communities, such as First Nations communities and communities directly affected by the transition to net zero; and

(iiia) supporting First Nations communities and traditional owners to participate in, and share in the benefits of, the transition to net zero; and

(iv) strengthening domestic industrial capabilities, including through stronger local supply chains; and

(v) demonstrating transparency and compliance in relation to the management of tax affairs, including benefits received under Future Made in Australia supports; and

(b) any other principles specified in the rules for the purposes of this paragraph.

We are supportive of the principles and their role to guide decision makers on how FMIA outcomes would benefit the community.

We note that delivery on the intent is likely to differ across Australia given the diversity of communities that will benefit, differences in opinion about how communities would like to benefit, and the maturity of different sectors covered by the FMIA. There will be a balance required so that processes for demonstrating benefit do not stifle the innovation the funding was intended to support.

Project proponents are often already reporting to government on how they meet objectives outlined in the community benefit principles, and these existing approaches can readily be reviewed and used. We urge an assessment and consolidation of existing obligations to ensure they align with the FMIA, rather than the imposition of a requirement for a new set of plans to be developed which may just add administrative burden without necessarily providing additional benefits. Key examples include the Australian Industry Participation (AIP) Plans required when participants receive Australian Government funding,[71] alongside Environmental Management Plans, Stakeholder Management Plans and Cultural Heritage Management Plans.

[71] See Department of Industry, Science and Resource (n.d.) *Australian Government funded projects*, Australian Government, https://www.industry.gov.au/major-projects-and-procurement/australian-industry-participation/australian-government-funded-projects.

6. The Hydrogen Production Tax Incentive

NEW GOVERNMENT FUNDING SUPPORT – HYDROGEN

Description and status

The Hydrogen Production Tax Incentive (HPTI) is a tax credit aimed at addressing the cost of hydrogen production to support the Australian industry getting to scale.

The HPTI has been proposed as AU$2 per kg of hydrogen, for facilities larger than 10MW per facility, and for production at under or equal to a 0.6kg CO2e/kgH_2 threshold.

The HPTI is available for hydrogen produced from eligible facilities for up to 10 years between 1 July 2027 and 30 June 2040.

While the HPTI is committed in the 2024-25 federal budget as AU$6.7 billion over 10 years, in practice this is an uncapped incentive.

The HPTI connects with (and sits under) the FMIA, and any money provided will be subject to the community benefits principles being met, through the recipient submitting a compliant Future Made in Australia Plan.

The Future Made in Australia (Production Tax Credits and Other Measures) Bill 2024 was introduced into Parliament in November 2024 and referred to the Senate Economic Legislation Committee for inquiry and report by 31 January 2025.

AHC position

Within the overall FMIA approach, the HPTI is a most welcome hydrogen initiative that signals to Australian investors and the rest of the world that Australia is back in the game for attracting project investment, and the technology, capability and workforce opportunities that come with it.[72]

The announcement and funding of the HPTI signals the confidence of the Australian Government in the hydrogen and derivatives industries and provides a recognition that clean molecules and fuels will be needed if Australia is to achieve whole-of-economy decarbonisation.

We are pleased to note that the Australian Government is considering support models for particular end uses, such as for green metals and low carbon liquid fuels. We support these demand side initiatives and see them as being matched with the HPTI to simultaneously support demand and supply for priority industries. It is vital that the different initiatives are able to work together for those projects that are eligible.

[72] AHC (2024) *The Hydrogen Production Tax Incentive*, 12 July, https://h2council.com.au/wp-content/uploads/2024/07/240712-AHC-HPTI-submission_final.pdf.

There is a diversity of views within the AHC membership on some of the details of the HPTI as currently set out in the draft Bill, but overall we think that the design strikes the right balance to drive sustainable industry growth.

We note that at $2/kg the HPTI is less than other schemes; particularly the IRA, against which it will be most compared. Ideally the HPTI would be twice as much at least to close the commercial gap. However, we note that this was an unlikely outcome for this policy at this time. We also note that the Australian Government has recognised that more is required, and that Hydrogen Headstart is intended to support a small number of first movers in the years prior to the HPTI taking effect. The announcement of the second round of Hydrogen Headstart in the May budget is very welcome.

We also note that the IRA is becoming encumbered with additional criteria for eligibility that are commonly considered to stifle the growth of the hydrogen industry. With the HPTI the Australian Government can reclaim some of the attention and investment dollars that shifted from here to the US.

The HPTI is an uncapped incentive, meaning that any and all projects that meet the eligibility criteria will receive the $2/kg of hydrogen over the specified timeframes, and any one project can receive as much or as little as the hydrogen it produces. This design feature has been welcomed by both industry and the AHC.

Regarding the eligibility criteria, we understand the Australian Government's desire to focus on large scale projects, and to tighten project delivery as much as possible. We suggest that lessons already learned in hydrogen have shown that greater flexibility is required at this stage, such as for:

- **Timing**: We note that the proposed subsidy is proposed for only ten years, rather than for fifteen, which would be in line with the support provided by other nations as well as the expectations of industry and lenders.

  The AHC strongly urges an extension of the end date for the HPTI to 30 June 2045, in order to enable the long lead times required by projects and in recognition of the difficulties in securing workforce for project delivery.

- **Size**: We believe that the HPTI should in principle be available to all projects – that is, not limited to use or size. There will be a need to demonstrate capacity and seriousness of intent of course, so as to maintain legitimacy of the initiative and not reflect an unnecessary administrative burden for the government. This may mean a minimum size is required; we have suggested 1 MW rather than the 10MW proposed.

  A 1 MW size limit may, in fact, be necessary to incentivise investment in domestic decarbonisation opportunities. If these smaller projects are excluded, it is likely they will be considered less attractive as investment propositions and will find it increasingly difficult to attract private capital, with the flow on impact on regional and domestic decarbonisation efforts.

  Similarly for site coverage, we suggest that there will be a need to address multiple sites within a specified region, and the AHC supports the definition utilised in the Hydrogen Headstart process to date. This will provide for facilities that have had to spread beyond one

specific site due to land use constraints but are demonstrably within the same industrial or operational zone.

- **Commercial structures**: The eligibility criteria related to eligible entities requires clarification. The commercial structures for project delivery are quite varied, with a range of domestic and international investors often included in joint venture or SPV arrangements. In some instances, government-owned or backed entities are also equity holders (domestic Australian government as well as international). We would suggest that this definition be entity-agnostic, thereby extending eligibility to companies, trusts, and partnerships. Such an inclusive approach will significantly enhance the effectiveness of the incentive by ensuring that the type of holding vehicle does not impede the achievement of the HPTI's objectives.

  The complexity of structuring should be reflected in the eligibility criteria, with members also seeking clarification around the transferability of the tax incentive benefits within and between the commercial partners. This is important to clarify as it will have implications for investors into Australian backed projects.

- **Carbon emissions maximum**: The AU$2/kg of hydrogen under the HPTI equates (approximately) to the US$1/kg subsidy proposed under the IRA for emissions between 0.45 and 1.45kg of CO2e. Given currency exchange, the Australian figure is slightly more generous than the US for projects above 0.45kg CO2e (to the 0.6kg CO2e threshold). The Australian figure is then less competitive for very low emissions hydrogen and obviously there is no support at all where emissions are higher than 0.6kg CO2e.

  We recognise that this is a renewable hydrogen initiative and a higher emissions intensity to account for non-renewable hydrogen is not contemplated in the policy. We note that this may limit Australia's competitive value in importing markets which are currently open to higher emissions hydrogen.

  Even for hydrogen projects using electrolysis, there may be benefit in starting with a slightly higher carbon emissions level so that grid-connected projects can get up in the medium term and progress the industry to scale.

Finally, the proposed incentive has not been indexed for inflation, and we strongly recommend that the Australian Government reconsiders this decision. It is the industry standard for electricity power purchase agreements (PPAs) to be indexed to inflation or CPI; not indexing the HPTI would be inconsistent with industry standards and expectations. A lack of inflation adjustment for the HPTI means the real value of the tax offset will have declined more than 10 per cent by the time the HPTI comes into effect, and by around a third by the time it expires (based on Commonwealth Budget 2024-25 CPI inflation forecasts).

7. Hydrogen Headstart

NEW GOVERNMENT FUNDING SUPPORT – HYDROGEN

Description and status

Hydrogen Headstart is a grant programme, first announced in the May 2023 federal Budget. The initial value was AU$2 billion, to be shared between two or three Australian projects.

A process was undertaken by the Australian Government to consult on design principles. First round submissions were received, with a shortlist of six projects publicly announced in December 2023. Shortlisted parties submitted their more detailed submissions in July 2024. Final announcements for the AU$2 billion are expected in early 2025.

In the May 2024 federal Budget a second round of Hydrogen Headstart was announced, with a further AU$2 billion announced. The process of delivering this second round is not yet public.

AHC position

The Hydrogen Headstart is a welcome initiative for the hydrogen industry, and we have been pleased to see the Australian Government fast track the process to date.

Hydrogen Headstart is intended for the first-of-a-kind projects to reduce the commercial gap ahead of the HPTI coming into effect. We remain hopeful that the funding will *sufficiently* close what we know is a widening commercial gap, as a result of inflationary pressures and higher than expected electricity prices. Many of our members have advised us that Hydrogen Headstart still needs to be stacked with other price and non-price benefits to make a difference, including support mechanisms from overseas.

There are now questions as to whether money received through Hydrogen Headstart can be stacked with the HPTI – on the one hand, receiving Headstart funding should not mean access to the HPTI is impeded, but on the other hand we can understand a desire for the government to not allow what may essentially be double-dipping from public funds.

We know the government is aware of these matters, and we await further announcements.

8. The Carbon Leakage Review

NEW RULES – CARBON PRICING

Description and status

In March 2023 the Australian Government announced a review of carbon leakage[73] as part of its reform of the Safeguard Mechanism.

Lead by Professor Jotzo from the Australian National University, the overarching intention of the review is to assess the impact of carbon mitigation policies on the viability of existing industries, as well as on investment attraction.

The Review has been asked to focus on an assessment of carbon leakage risks, the development of policy options to address carbon leakage, and an assessment of the feasibility of a carbon border adjustment mechanism (CBAM), particularly in relation to steel and cement.[74]

A second round of consultation was opened in November 2024 which provided an overview of the review's modelling and analysis. Initial results have identified commodities for the material carbon leakage list over time: cement, clinker and lime; ammonia and derivatives; steel; and glass. There is additional support for clinker and cement which are expected to have more pronounced risks, and therefore, are likely to be recommended for the first tranche of support mechanisms, including potentially a border carbon adjustment (BCA).

The final review report and recommendations were to be submitted to government before the end of 2024.

AHC position

We support the Carbon Leakage Review. In an increasingly carbon constrained world, many nations are exploring carbon border leakage mechanisms, so as to prevent unfair dumping of products produced in countries without significant decarbonisation policies and intentions. The most prominent mechanism is the CBAM in the European Union.[75]

An Australian CBAM (or BCA as the Review is calling it) would increase the volumes of green energy/products domestically produced, as it would aim to avoid parallel imports of grey products, such as cement and steel (but ideally also hydrogen, ammonia and urea), which otherwise would undermine Australia's decarbonisation efforts and investment.

[73] Carbon leakage occurs where companies move their facilities to jurisdictions with weaker emission constraints. This is bad for the original host industry because it loses a source of GDP and it is bad for the planet because it results in higher global emissions.
[74] DCCEEW (2023) *Public consultation on the proposed approach to assess and address carbon leakage risk, as part of the Carbon Leakage Review*, see https://consult.dcceew.gov.au/consultation-proposed-approach-carbon-leakagerisk-as-part-of-the-carbon-leakage-review.
[75] European Commission (2024) *Carbon Border Adjustment Mechanism*, see https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en.

We have argued that it makes sense that we need to protect emerging, domestic production, and so hydrogen, ammonia and urea should be included on the carbon leakage list.[76] Hydrogen is feedstock for ammonia, which is feedstock for urea.

Including hydrogen, ammonia and urea (or the best combination) on the Australian carbon leakage list would:

- **Align with other jurisdictions:** Global policy and legislative trends indicate that the remit of carbon border adjustment schemes will increase to cover a range of products beyond fossil fuels or their replacements such as hydrogen, ammonia and methanol.
- **Align with the Safeguard Mechanism:** The Safeguard Mechanism (a major consideration of the Carbon Leakage Review) now has a hydrogen production variable, which is considered trade-exposed. Additionally, ammonia production is already covered under the Safeguard Mechanism, with the ammonia industry one of Australia's most emissions intensive. In fact, ammonia and derivatives production is completely covered under the Safeguard Mechanism, which makes it ideal for inclusion in an Australian BCA.
- **Make room for future new industries by defraying the green premium:** Australia will need to develop a hydrogen supply chain to realise our energy transition. This includes decarbonising our existing industries, such as ammonia. Across seven sites, Australia currently supplies over 2Mtpa of ammonia and imports the remaining demand. As we look to transition and expand our green ammonia production, this will naturally be delivered at a green premium, leaving Australia's ammonia producers at risk to traditional fossil fuel ammonia being imported at a lower cost. A BCA can help defray the green premium.

  We also note that Australia currently imports over 80 per cent of its urea, mostly from the Middle East. A BCA on urea (or hydrogen or ammonia, its precursors) will provide a means to reduce Australia's reliance on imports by incentivising domestic supply.

In the context of hydrogen, the considerations of the Guarantee of Origin scheme should be incorporated into the operations of the BCA.

In our view it is vital that policy seeks to not only find the balance between the direct costs to reach industrial decarbonisation objectives and the costs of keeping strategically viable industries in Australia, but also includes the major indirect costs. This then requires an assessment of the industries in question to not only consider economic criteria, but also address:

- each industry's role in the economy, including contribution to GDP, regional prosperity and quality jobs;
- relative timeframes for likely pathways to decarbonisation both in Australia and potentially competing countries, and effects on the above; and

[76] AHC (2023) *Re: Public consultation on the proposed approach to assess and address carbon leakage risk, as part of the Carbon Leakage Review*, 15 December, see https://h2council.com.au/wp-content/uploads/2023/12/231215- Carbon-Leakage-Review-AHC-SUB_for-submission.pdf.

- the relative mobility of each industry (that is, the necessary investment and threshold for moving investment away from Australia).

Assessment and analysis of the impacts of high energy prices in the EU (for example, the impact on the petrochemical industries), alongside the carbon pricing and CBAM measures, would be illustrative as a counterfactual for proposed Australian reforms. These experiences may illustrate the types of policies that would need to be in place in Australia to prevent capital flight as well as (hopefully) incentivise investment.

Whilst the Review notes that the purpose of a BCA is not to protect domestic industry and output, the AHC position is that Australia's suite of policies for addressing whole of economy decarbonisation should, where possible, be aligned with and work to enhance public investment strategies. For example, the Future Made in Australia Act (FMIA) and National Hydrogen Strategy signal Australia's ambition to be a market creator for the commercial scale hydrogen industry, with the intention of encouraging private capital to invest in sectors identified as critical to Australia's future economic prosperity. The proposed hydrogen production tax incentive is currently intended to commence in 2027, and inclusion of hydrogen in the BCA would provide additional investment certainty for projects currently under development and seeking offtake as they approach FID in line with these dates.

The issue of carbon leakage goes beyond the movement of carbon, it also captures the movement of industries. In the absence of a carbon tax and without inclusion of hydrogen and its derivatives in carbon leakage mitigation policies, we risk parallel imports of not just grey commodities, but blue and green commodities that will force out domestic investment and innovation. In our view, hydrogen must be included on the first tranche of the BCA carbon leakage commodity list, which will provide the necessary investment and legislative certainty to companies investing across the hydrogen value chain.

9. AEMO's Integrated System Plan

FOUNDATION - ENERGY

Description and status

The Australian Energy Market Operator's (AEMO) Integrated System Plan (ISP) is a scenarios-based roadmap for the National Electricity Market to transition to net zero by 2050. It sets out the required generation, storage and network investments. In the absence of an alternative, the ISP is used by many in the energy industry as the primary modelling for the future energy system.

AEMO also develops an Inputs, Assumptions and Scenarios Report (IASR) relates to the inputs, assumptions and scenarios it proposes to use in its next year's forecasting and planning activities, including the ISP.

The 2024 ISP and associated material was released in June 2024.[77] AEMO is currently developing the 2026 ISP and is working to include recommendations from the Energy and Climate Change Ministerial Council such as better integration of gas.[78] The 2026 ISP is scheduled to be published on 24 June 2026, with multiple opportunities to engage throughout the process.

AHC position

AEMO's modelling is key to how Australian stakeholders, especially governments, view and make decisions regarding the future energy portfolio, including the infrastructure, planning and policy required. AEMO recognises the necessary role of hydrogen in Australia for tackling the hard to electrify sectors and achieving net zero, and we are pleased to see that this is touched on in each of the current IASR scenarios set out by AEMO.

However, AEMO has recently proposed that the 2025 IASR scenarios will be largely similar to the previous 2023 versions.[79] We do not agree with this approach. There has been significant policy progressed since 2023 which impacts hydrogen, and this ambition and strategic direction should be reflected in the development of AEMO scenarios and forecasting. Even in its 'niche' uses (such as green iron and ammonia/methanol production), hydrogen will require a significant and long-term boost to Australia's electricity system – both on and off grid – as well as in other infrastructure such as pipelines.

[77] See AEMO (n.d) *2024 Integrated System Plan*, accessed 4 September 2024, see https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp.
[78] Energy and Climate Change Ministerial Council (2024) *Response to the Review of the Integrated System Plan*, Australian Government, see https://www.energy.gov.au/sites/default/files/2024-04/ecmc-response-to-isp-review.pdf.
[79] AEMO (2024) *2025 IASR Scenarios*, Consultation Paper, 17 July, see https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/consultation-paper.pdf?la=en.

In our view, the material that should be accounted for includes:

- all modelling and work undertaken for the revised National Hydrogen Strategy;
- the modelling undertaken by the Climate Change Authority for the Net Zero Plan (the Sector Pathways Review);
- other government work on the sectoral decarbonisation plans;
- the findings relating to business cases from Hydrogen Headstart; and
- Treasury modelling and consultation on the HPTI.

Further, we would expect the policy intent of the above and the broader FMIA to also inform AEMO's understanding of scenarios, given that industrial policy and funding initiatives will likely affect energy use by type and location. While much of the analysis and data will not be public, it should be shareable within the Australian Government to support planning.

The above data would support the current ISP, but we note that the natural parameters of the ISP means that some important analysis is still currently out of scope. For Australia to appropriately sequence the complex energy transition, we need advanced planning and regular reassessment across the wider net zero undertaking. Modelling could identify efficiencies and opportunities such as for developing common user infrastructure. It could also clarify understanding and assist policy development on the role for hydrogen in supporting the electricity grid, whether as a means of storage to be then fed back into the grid when needed, or where electrolysers act as a flexible load.

We need additional, interconnected data that interrogates the intricacies of the complete system. This level of planning is a significant task but would provide the required confidence to invest, navigate risk and identify opportunities. We note that enhanced whole of system modelling is currently underway through the recent methodology consultation, which includes infrastructure investment mapping, better integration of gas in the ISP and improvements to the hydrogen electrolyser load modelling.[80]

We encourage the Australian Government to consider the scale of modelling and forecasting required to decarbonise effectively and sequence efficiently, and fund publicly available and granular modelling across the entire net zero system.

[80] AEMO (2024) *ISP Methodology Consultation*, October, https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

10. The Capacity Investment Scheme

NEW GOVERNMENT FUNDING SUPPORT - ENERGY

Description and status

In late 2023, the Australian Government announced the expansion of the Capacity Investment Scheme (CIS, previously a pilot only) to target a total of 32 GW of new capacity nationally, made up of 23 GW of renewable capacity and 9 GW of clean dispatchable capacity (primarily for batteries but potentially including hydrogen for long duration storage).

The Australian Government will provide revenue underwriting for successful CIS tender projects, with an agreed revenue 'floor' and 'ceiling'. This in intended to decrease financial risks for investors.

The Australian Government is negotiating Renewable Energy Transformation Agreements with states and territories, which includes delivering around half of the capacity (18 of 32 GW) of the expanded CIS.

The expanded CIS will be rolled out from 2024 to 2027. There will be regular competitive tenders held approximately every 6 months, with the first pilot tender having launched in May 2024. Auction results for this tender were announced on 4 September 2024, supporting six large scale battery projects.[81] Subsequently, the CIS Tender 1 - NEM Generation announced nineteen projects representing 6.4GW.

There are three more CIS tenders currently in progress for: WEM Clean Dispatchable (successful bids to be announced March 2025), NEM Dispatchable (successful bids to be announced in Q3 2025) and NEM Generation (registration open until February 2025 with successful bids to be announced in October 2025).

The expected costs of CIS contracts are confidential.

AHC position

The AHC has not formally provided a public position on the CIS. However, we support all efforts from the government to encourage investment in renewable energy and storage developments. This is for the sake of the energy transition as a whole, as well as greater availability of renewable electricity for hydrogen developments.

We note with interest the findings of the Climate Change Authority[82] that the design of the CIS is unlikely to attract tenders from necessary long duration storage options such as pumped hydro

[81] DCCEEW (2024) 'Capacity Investment Scheme supports 6 new projects in Vic and SA', website, accessed 4 September 2024, see https://www.dcceew.gov.au/about/news/capacity-investment-scheme-supports-6-new-projects-vic-sa.

[82] Climate Change Authority (2024) *Sector Pathways Review*, 5 September, page 32, see https://www.climatechangeauthority.gov.au/sites/default/files/documents/2024-09/2024SectorPathwaysReview.pdf.

storage, which has lead times of over eight years and relatively high upfront costs. It is also considered unlikely to support more nascent technology or provide the longer-term signals needed for investment in the electricity sector beyond 2030.

11. The Sustainable Finance Roadmap, taxonomy and green bonds

NEW STRATEGY, NEW GOVERNMENT FUNDING SUPPORT – SUSTAINABLE FINANCE

Description and status

Following consultation in 2023, the Australian Government released a Sustainable Finance Roadmap[83] in June 2024.

The Roadmap sets out a range of actions to reduce barriers to investment into sustainable activities, explicitly addressing improved transparency on climate and sustainability, financial system capabilities, and Australian Government leadership and engagement.

Important elements include:

- Mandatory climate-related financial disclosure requirements for large businesses and financial institutions, to take effect from 1 January 2025. The bill on this matter passed the Senate in late August 2024.
- The government's partnership with the Australian Sustainable Finance Institute (ASFI) to develop an Australian sustainable finance taxonomy. ASFI will finalise development of the initial Australian Sustainable Finance Taxonomy by the end of 2024. This will cover 'green' and 'transition' activities that contribute to climate change mitigation, in six priority sectors, as well as 'do no significant harm' and 'minimum social safeguard' criteria.
- The release of green bonds with the first green bond issued on 4 June 2024. The bond line is AU$7 billion in size and will mature in June 2034. The Government will provide green bond investors with regular and transparent allocation and impact reporting. Annual reporting will commence in 2025 will be published on the AOFM website.

AHC position

There is an apparent consensus on the need for increased policy and regulatory action to increase the rate of capital reallocation away from fossil fuels and activities incompatible with net zero. However, despite this consensus, the rate of capital flows to new energy projects (relative to capital flows in traditional extractive industries or technology investments) remains too low and too slow.

Feedback from AHC members indicates that it is not a shortage of capital that has prevented projects from progressing to FID and construction. Rather, lenders have proven to be risk averse, unwilling to finance projects developing clean molecule supply chains.

The AHC welcomes the roadmap and the range of actions it puts into place.[84]

[83] The Australian Government the Treasury (2024) Sustainable Finance Roadmap, June, see https://treasury.gov.au/sites/default/files/2024-06/p2024-536290.pdf

[84] AHC (2023) *Re: Sustainable Finance Strategy*, 1 December, see https://h2council.com.au/wp-content/uploads/2023/12/231201-Sustainable-Finance-Strategy_AHC-submission.pdf.

We also seek for the various initiatives within the roadmap to explicitly account for clean and green hydrogen. Australia has existing and emerging capabilities in producing, moving, storing, and using hydrogen and its derivatives. For these capacities to increase, the requirements for the supply chains need to be explicitly considered and modelled, rather than emerge as implied within the taxonomies.[85]

We also note that the initial taxonomy will be available for use on a voluntary basis by both the private and public sectors. In our view, the sustainable finance taxonomy is a significant policy to assist investor due diligence, and we prefer this is mandated rather than voluntary.

[85] AHC (2024) *Australian Sustainable Finance Taxonomy V0.1 consultation*, 7 July, see https://h2council.com.au/wp-content/uploads/2024/07/240707-AHC-submission-to-ASFI.pdf.

12. The National Energy Workforce Strategy

NEW STRATEGY - ENERGY

Description and status

The National Energy Workforce Strategy[86] will seek to ensure Australia has the workforce it needs to meet its net zero ambitions.

The stated aims of the strategy are to:

- Build on existing workforce resources to identify current and future skills gaps in the energy sector and help plan for energy workforce needs.
- Provide a national framework for coordinating existing and planned workforce-initiatives from the Australian, state and territory governments.
- Foster an environment that enables the clean energy workforce to grow, adapt and build the skills and capability we need to reach net zero emissions by 2050.
- Build on the work of Jobs and Skills Australia through the Clean Energy Capacity Study while not undertaking additional workforce projections.

A consultation paper was released in August 2024, where this described the need to address shortages in the clean energy workforce. The strategy was anticipated to be considered by Energy Ministers in December 2024, with publication likely in 2025.

AHC position

Clean energy projects are experiencing current skill shortages in critical occupations. For example, the 2023 Skills Priority List (SPL) found that 73 per cent of Electrotechnology and Telecommunications Trades and 100 per cent of Construction and Trades Worker occupations are in shortage nationally.[87]

Skill shortages will be exacerbated in the coming years as renewable energy projects of growing scale are deployed at a more rapid rate. Jobs and Skills Australia (JSA) found that Australia needs an additional 32,000 electricians and 450,000 construction jobs to 2030 to meet legislated 2030 decarbonisation targets.[88] It concluded that current policy settings will not deliver the workforce needed to meet existing targets. It also found that while clean energy will provide a pathway for

[86] DCCEEW (2024) *National Energy Workforce Strategy*, accessed 4 September 2024, last updated 1 August 2024, see https://www.dcceew.gov.au/energy/workforce#:~:text=The%20Australian%20Government%20is%20developing%20a.

[87] Jobs and Skills Australia (2023) *2023 Skills Priority List: Key Findings Report,* Canberra, Australia, see https://www.jobsandskills.gov.au/sites/default/files/2023-10/2023%20SPL%20Key%20Findings%20Report.pdf.

[88] Jobs and Skills Australia (2023) *The Clean Energy Generation*, Canberra, Australia, see https://www.jobsandskills.gov.au/sites/default/files/2023-10/The%20Clean%20Energy%20Generation_0.pdf.

some transitioning workers, this workforce is too small to supply the rapidly growing needs of industry.

The need for a workforce skilled in handling hydrogen will add to these current requirements. While there is an existing workforce in hydrogen, the roles are largely in-house for major chemical producers and refiners, and the workforce is relatively small scale.

As shown in , the future clean and green hydrogen industry will be much more complex, with a diverse range of newer roles in addition to a need for more traditional electrical trades, construction workers and process engineers. These newer roles to make hydrogen include handling feedstocks of various types, electrolyser manufacturing and maintenance, and handling liquid hydrogen. Further jobs are then created to use hydrogen and hydrogen products in a range of ways, such as in maintaining vehicles, exporting ammonia, producing green metals, and producing low carbon liquid fuels such as sustainable aviation fuel.

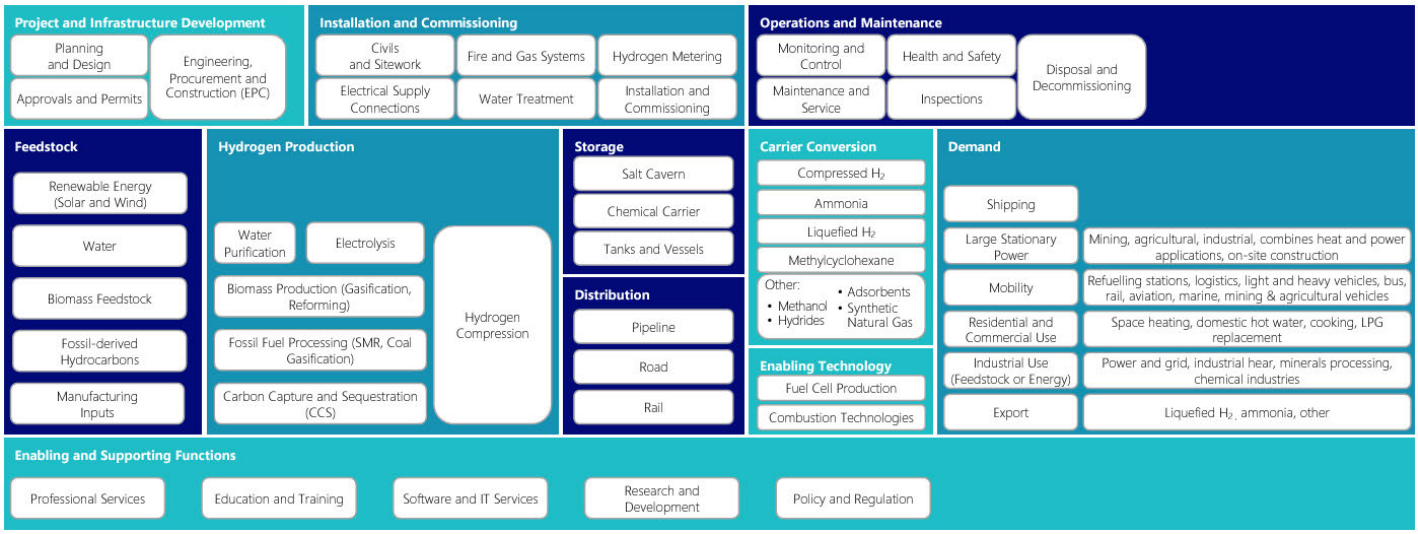

Figure 4: Hydrogen supply chain framework. Source: ARUP 2023.[89]

The diverse array of what is considered a hydrogen job in the emerging industry has, unfortunately, led to the workforce being insufficiently understood and modelled, and has left data gaps. There is still very little clarity and publicly available modelling on the scale, composition, location and pace of the emerging clean and green hydrogen workforce, let alone how this will be affected by the new ambition and investment of the FMIA.

There needs to be better assessment of the current and forecast hydrogen workforce. This modelling needs to comprehensively cover the full hydrogen value chain within Australia, either in a single or series of work packages. This would need consistent methodologies and inputs, as well as a degree of flexibility for key policy changes. The Australian Government is the natural owner of this undertaking; it already holds the strategic direction and action plan for Australia's policy framework,

[89] Arup (2023) *Powering Up: Seizing Australia's Hydrogen Opportunity by 2040*, National Energy Resources Australia, see https://h2council.com.au/wp-content/uploads/2023/04/230331-NERA-Powering-Up-HETS-Study.pdf.

as well as the most extensive knowledge bank of Australian hydrogen projects through the Hydrogen Hubs, Hydrogen Headstart, and ARENA and CEFC processes.

The HPTI is proposed to start providing $2/kg for hydrogen produced from 1 July 2027, which means that projects will be racing and competing to ensure that they are producing from the start date, maximising their incentive. It is therefore vital that we collectively understand, model, communicate and begin addressing any issues in preparation for this date.

13. The National Electric Vehicle Strategy

NEW STRATEGY - TRANSPORT

Description and status

Released by the Australian Government in 2023, the National Electric Vehicle Strategy[90] sets out to get more EVs on the road and support EV charging infrastructure. FCEVs was covered in the basic definition of EVs.

A light vehicle Fuel Efficiency Standard was announced in the strategy, and this measure came into effect on 1 July 24.

Primarily battery-focussed, the strategy only addresses hydrogen in a brief discussion about the establishment of hydrogen highways; that is, refuelling networks for key freight routes. Other than this there is no substantive discussion about hydrogen.

A comprehensive and in-depth review of the strategy will be undertaken in 2026.

AHC position

We raise only for completeness: the AHC does not have a position on the National EV Strategy other than to note it is disappointingly silent on what is needed for hydrogen in transport, and also does not meaningfully address heavy vehicles. As discussed above in section 3 of this Appendix, we have advocated for some time for heavy vehicle policy, and for hydrogen infrastructure and demand support within this. The transport sectoral plan will hopefully add some substance to the policy environment.

[90] DCCEEW (2023) *National Electric Vehicle Strategy*, see https://www.dcceew.gov.au/sites/default/files/documents/national-electric-vehicle-strategy.pdf.