HIRINGA ENERGY SUBMISSION

INTERIM HYDROGEN ROADMAP

October 2023

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Executive summary

We congratulate the MBIE team for the release of the Interim Hydrogen Roadmap which is a great summary of New Zealand's collective effort to date, provides a range of possible futures and what might be required to manifest these scenarios.

We applaud and align with the Government's overarching aim being to "optimise the potential for hydrogen to contribute to New Zealand's emissions reductions, economic development, and energy sector to the extent compatible with broader electrification goals".

If this overarching aim is to be achieved, the Final Hydrogen Roadmap needs to go a step further beyond this Interim Roadmap and outline a clear short, medium and long term role for hydrogen within New Zealand's energy system, backed up with a favourable regulatory framework and enabling policy mechanisms, culminating in an attractive investment case for green hydrogen.

We support the National Party's intention to reduce gross emissions as opposed to buying international carbon credits to meet our international climate obligations.[1] Decarbonising New Zealand's heavy freight sector has a compelling return on investment from a CO_2e abatement cost perspective.

With >90% of New Zealand's total freight task now moved by road[2] and freight movements expected to increase 33% by 2050,[3] it is essential to decouple the sector's environmental impact from the economic growth it supports.

New Zealand's export commodities (and their supply chains) are coming under an increasing amount of pressure to decarbonise under global emission reporting and management frameworks such as Carbon Border Adjustment Mechanisms (CBAM), which some of our largest trading partners have either launched or are currently evaluating.

A variety of hydrogen powered trucks are now available in New Zealand and a nationwide hydrogen refuelling network is currently being built. Decarbonising road based linehaul freight within New Zealand is now a low hanging fruit. It is logical to focus our collective efforts on the successful deployment of this hydrogen subsector given it is market ready and able to underpin other hydrogen use cases such as industrial feedstocks, seaports, forestry operations and the production of low emission derivatives such as aviation and shipping fuels.

A key message that would be helpful for the Final Hydrogen Roadmap to articulate is that green hydrogen does not detract from the electrification of our economy, instead it enhances it by helping establish better renewable generation project economics (resulting in more construction) as well as enabling renewable electricity to reach parts of our economy that would otherwise have no choice but to use liquid fossil fuels.

[1] https://www.rnz.co.nz/news/election-2023/499299/climate-debate-puts-parties-emissions-policies-under-scrutiny
[2] Freight and logistics | Ministry of Business, Innovation & Employment (mbie.govt.nz)
[3] https://www.sbc.org.nz/insights/2021/low-carbon-freight-pathway

Feedback on questions

Section 1: Hydrogen is emerging as an important part of the future global (and domestic) energy system

Question 1: Are there other issues we should be considering in our assessment of the strategic landscape for hydrogen in New Zealand?

Hiringa concurs with the commentary around the significant role that green hydrogen can play in decarbonising hard-to-electrify parts of the global economy and the challenges that the burgeoning industry faces.

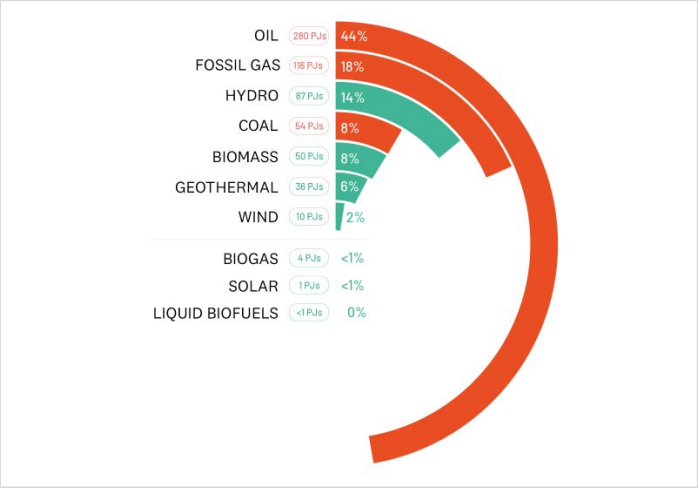

Figure 1 Primary energy consumption in New Zealand (Source: EECA)

Renewable sources accounted for 30% of New Zealand's primary energy consumption in 2022[4] as demonstrated in Figure 1. The Government has a target to increase primary energy consumption from renewable sources to 50% by 2035. Figure 2 communicates the various ways in which green hydrogen compliments our energy mix and how it can enable New Zealand to meet our overall renewable primary energy consumption targets.

Figure 2 Green hydrogen compliments New Zealand's energy mix

[4] https://www.mbie.govt.nz/about/news/energy-in-new-zealand-2023-shows-renewable-electricity-generation-increased-to-87-percent/

Green hydrogen is well suited to decarbonise the parts of the New Zealand economy that require significant emission reductions over the coming emission budget periods, as outlined in Figure 3. Therefore, it's in our best interests to support the Government's overarching aim being to "optimise the potential for hydrogen to contribute to New Zealand's emissions reductions …" if we are to reach our net zero 2050 target.

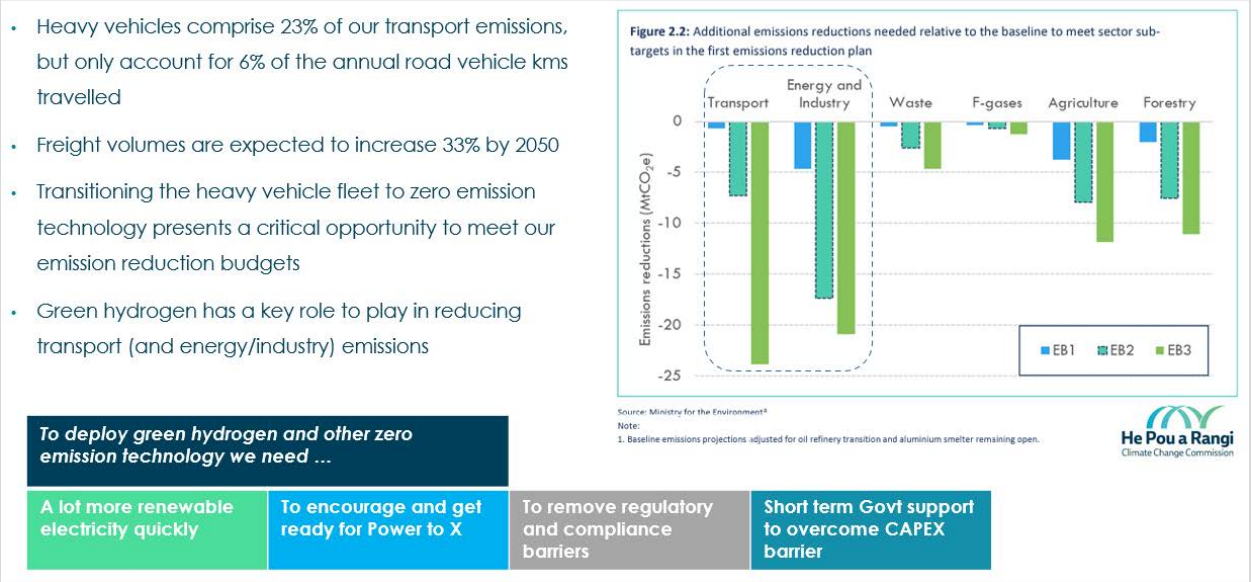

Figure 3 Green hydrogen will help New Zealand meet our emission budgets

It is becoming increasingly important for New Zealand's export commodities to have well documented low emission supply chains when entering markets such as the European Union, United Kingdom and Australia which are either in the process of, or considering, the roll out carbon tariffs on the goods they import. Green hydrogen's role in decarbonising domestic heavy freight in addition to meeting the low emission fuel demands of international air freight and global shipping lines is pivotal.

The Aotearoa Freight and Supply Chain Strategy sets a target of a 35% reduction in freight emissions by 2035 (based on 2019 levels). Projecting forward based on New Zealand's current policies we are not on track to meet this target as outlined by the Ministry of Transport in Figure 4. The Strategy goes on to say that "We will need to develop new policies that accelerate our emissions reduction … reducing heavy truck emissions will be an important focus."[5]

[5] New Zealand freight and supply chain strategy | Ministry of Transport

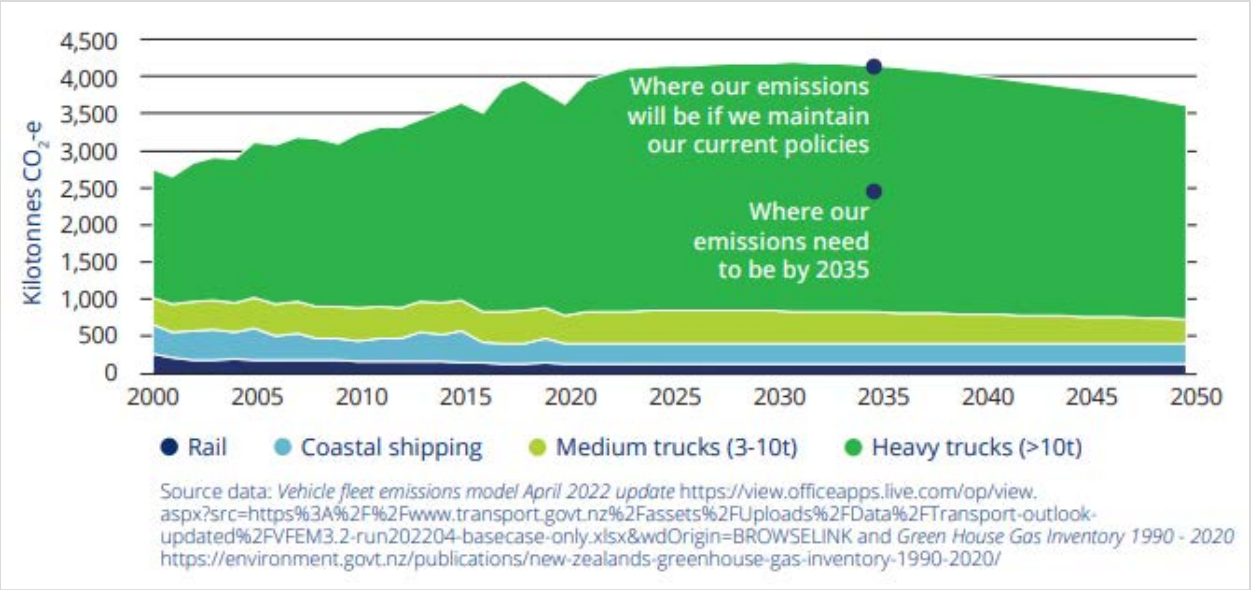

Figure 4 Freight emissions by transport mode from 2000 to 2050 (Source: MoT)

The Interim Hydrogen Roadmap states that *"We have received strong support from the sector to develop a clear strategy to guide the development of the sector and outline what contribution it makes to our national goals".* We strongly agree with this sentiment and suggest that the Interim Hydrogen Roadmap falls short of this. We would like to continue to work with Government to ensure that the Final Hydrogen Roadmap and associated Energy Strategy paint a clear, bold, and investible pathway so that green hydrogen can add as much value as possible to New Zealand's energy system and economy, underpinned by enduring supportive policies and regulatory frameworks.

Section 2: The role for hydrogen in New Zealand's energy transition

Question 2: Do you agree with our assessment of the most viable use cases of hydrogen in New Zealand's energy transition?

Question 3: Do you support some of these uses more than others?

Question 4: What other factors should we be considering when assessing the right roles for hydrogen in New Zealand's energy transition?

Replacing diesel with green hydrogen has one of the strongest commercial carbon abatement cases today and is therefore most likely to be New Zealand's earliest hydrogen growth market. As a result, we recommend that this is a collective focus of Government and industry in order to get this use case established so that it can underpin and stimulate other less commercially mature use cases.

With the right Government support, around 35 hydrogen powered (fuel cell and diesel-hydrogen dual fuel) trucks could be operating on New Zealand roads by the end of 2024. Dual fuel truck technology will have a significant role to play in decarbonising legacy fleets and heavy duty offroad truck use cases. Hydrogen fuel cell and dual fuel truck technologies will emerge concurrently depending on the nature of fleet operations and the pace of fleet decarbonisation sought by operators. Refer to Figure 5 for the variety of heavy fuel cell truck platforms available today.

Figure 5 Heavy fuel cell truck platforms available in New Zealand

Using green hydrogen as an industrial feedstock stacks up best commercially when renewables are coupled with electrolysis and the project has the flexibility to supply electricity to the grid or to hydrogen production, depending on electricity cost curves. The Kapuni Green Hydrogen Project[6] is an example of this.

[6] Hiringa Energy & Ballance Agri-Nutrients | Green Hydrogen Project (greenhydrogennz.com)

Large scale hydrogen combustion for electricity generation is a less efficient and therefore higher cost use of the molecule (when compared to use in fuel cells or as an industrial feedstock) and therefore unlikely to be deployed in the near to medium term unless the price differential between green hydrogen and natural gas closes completely. There is however a dispatchable thermal power generation project underway in South Australia fueled by green hydrogen, with the commercial viability of the project yet to be determined.[7] It is generally accepted that hydrogen is a poor electricity firming technology as a generator fuel, but an excellent firming technology as flexible demand to make the most of larger variable renewable wind and solar capacity.

Green hydrogen derivatives such as ammonia, e-methanol and e-sustainable aviation fuel have more complicated and energy intensive manufacturing processes above and beyond green hydrogen production. As a result, hydrogen derivatives are more costly and will be deployed in hard-to-abate sectors such as aviation, international shipping and the substitution of current high-carbon hydrogen feedstock in refining and chemical manufacturing, as early adopters demand them, or emission reductions are enforced. Some global stakeholders in these sectors view New Zealand as a good testbed to pilot low emission fuels, but an enabling regulatory environment and foundation hydrogen economy is required in order for them to invest.

Feedback on heavy transport

Hiringa holds a different set of assumptions around anticipated hydrogen powered truck uptake based on customer feedback and fleet deployment projects under development.

A key observation is that while the EY-modelled heavy transport hydrogen offtake in 2050 is similar to Hiringa's house view, it is the short to medium term where there is material under estimation of the required hydrogen volumes for servicing the heavy transport sector's needed emission reductions.

Hiringa's modelling is based on a higher expected penetration and more rapid uptake of hydrogen within a narrower subsegment of heavy trucks where the advantages of hydrogen as the decarbonisation vector, both operationally and in terms of implied abatement cost, are very clear.

Accurately modelling heavy truck hydrogen consumption as best we can is not only important to the hydrogen industry but also the wider energy sector for a number of reasons:

1. The discrepancy of around 95,000 tonnes of heavy truck hydrogen consumption in 2035 equates to approximately 600MW of additional renewable electricity being required. In order to generate this additional electricity approximately 1,400MW of installed wind capacity would need to be built over the next 11 years. A supportive policy framework and significant infrastructure investment are therefore required in order for green hydrogen to decarbonise the biggest emitting (per VKT) transport subsegment by the end of Emission Budget Three.[8] We need to be signalling the critical nature of this supportive policy framework and infrastructure investment in the Final Hydrogen Roadmap.

[7] Hydrogen Jobs Plan | Office of Hydrogen Power South Australia
[8] https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-budgets-and-the-emissions-reduction-plan/

2. Global hydrogen technology suppliers and potential investors look to Government projections such as this modelling as reference points for commercial viability and potential market size. Articulating a steadfast decarbonisation pathway for heavy transport sends the right message internationally if we want to be able to import the hydrogen technology and attract the investment we need to realise the decarbonisation potential of green hydrogen.

It appears that the EY model includes all trucks over 12t doing about 45,000km per annum with a gradual ramp up towards 2050. The reality is that heavier linehaul trucks are the most commercially viable segment of the transport sector and are therefore going to ramp up earlier than modelled. Lighter hydrogen powered trucks are not likely to ramp up until later with battery electric technology more likely to be fit-for-purpose for the lightest duty truck segment in the short to medium term. A more accurate model reflecting a faster uptake of linehaul trucks comes with the upside of greater emissions reductions earlier given the bigger emissions profile of heavy diesel trucks.

Ultimately the model would benefit from breaking down the average truck used into more specific weight classes which will likely reflect a more meaningful reduction in transport emissions. Hiringa would welcome the opportunity to continue to work with MBIE to refine the modelling feeding into the Final Hydrogen Roadmap.

Feedback on aviation

The New Zealand Hydrogen Aviation Consortium estimates an earlier ramp up of hydrogen offtake for aviation in addition to a much higher hydrogen offtake in 2050 as demonstrated below. Please refer to Launching Green Hydrogen Powered Aviation in Aotearoa[9] for more information, with an excerpt shown in Figure 6.

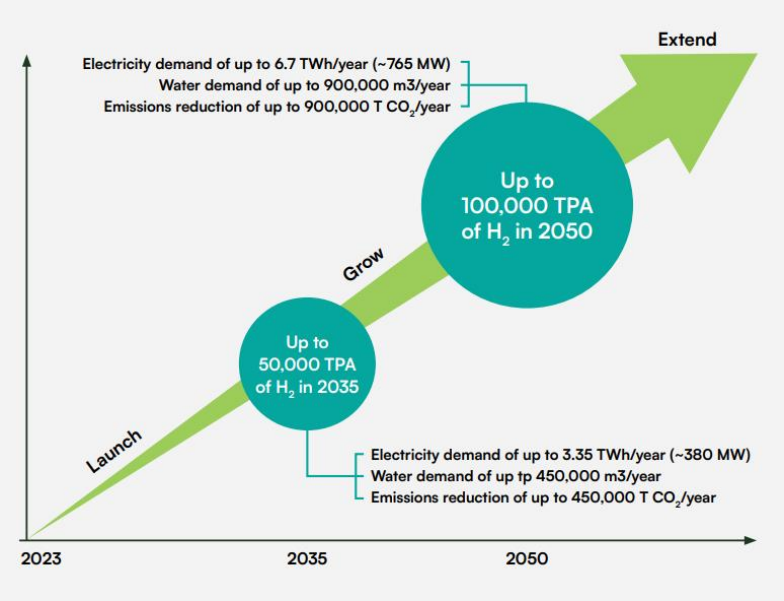

Figure 6 Potential hydrogen demand and impact (Source: H2 Aviation Consortium Report)

[9] https://www.h2aviationconsortium.co.nz/

Pathway to 2050

Question 5: Do you agree with this assessment of the potential for hydrogen supply and demand in New Zealand?

Question 6: Do you agree with the key factors we have set out that are likely to determine how hydrogen deployment could play out?

Question 7: What do you think needs to happen to address these factors? Do you have any evidence to help us build a clearer picture?

The report outlines the following key factors that will determine whether the five scenarios are achievable commercially. We provide feedback under each key factor:

- ***Electricity prices**: Electricity prices are estimated to comprise around half of the production costs for a hydrogen plant in 2022, increasing to around 80 per cent over time as other costs (such as capital costs) reduce. To reach a production price of $2NZD per kilogram of hydrogen in 2050, these estimates found an electricity price of $55NZD/MWh would be needed.*

  We concur that electricity prices are a fundamental determining factor of green hydrogen prices. Hydrogen production aside, in order to achieve the required increase in electricity generation between now and 2050 and achieve a reduction in electricity prices over time, New Zealand is going to have to accelerate the construction of renewable electricity generation. This will require a fit-for-purpose resource consenting programme (fast and certain) and larger number of electricity purchases willing to commit to long term offtake from renewable generators to enable funding and construction. In the absence of a competitive offtake market for large renewable generation projects, the Government may need to lean in with incentives or price guarantees to enable low-cost renewable generation into the New Zealand electricity market.

- ***Capital costs**: Capital costs were estimated to comprise around 24 per cent of the levelised cost of green hydrogen in 2022. These are assumed in our modelling to drop over time from $1,000USD per kilowatt of electrolyser capacity in 2022 to $200USD per kilowatt in 2050.*

  We are already seeing significant cost downs in electrolyser capex costs as well as other ancillary hydrogen equipment as production lines are ramped up and more suppliers enter the global hydrogen market.

- ***Optimising production, transport, storage, and conversion costs**: Optimisation of transport, storage, and conversion costs is essential for viability and energy efficiency. Conversion and transport costs are estimated to add between 30 to 80 per cent to the cost of green hydrogen in 2035, and 16 to 80 per cent in 2050, depending on the method used and level of transformation required.*

  Optimisation of hydrogen production and getting it to customers efficiently will be key to getting hydrogen to market at a price that is cost competitive with fossil fuels. New Zealand's future hydrogen market is likely to be a combination of distributed and centralised hydrogen production

driven by locating hydrogen production close to renewable electricity generation as well as customers.

Optimisation, transport, and storage of hydrogen enables time shifting of renewable generation and can smooth the overall New Zealand generation profile while increasing the penetration of low-cost intermittent renewable electricity. Reducing electrolyser load during periods of peak demand will also enable better utilisation of existing and new transmission and distribution grid infrastructure.

- ***Available workforce:*** *Hydrogen deployment will require skilled workers to construct, operate and maintain infrastructure and equipment.*

  We agree that a hydrogen industry will only be sustainable if there are enough skilled workers underpinning it. Refer to Section 3 for more information.

- ***Demand:*** *Producers need a clear demand trajectory and established market mechanisms for delivering their products to market. This could include links to export markets.*

  Activating hydrogen demand has been a strong focus of Hiringa to date. Customers demanding hydrogen is a critical enabler for establishing a hydrogen industry. Refer to Section 3 for more information.

- ***Value stacking****: Developers to date have expressed interest in building renewable electricity generation alongside hydrogen production or securing long-term offtake agreements from electricity suppliers who commit to building additional generation to meet this demand.*

  Hiringa is constructing new electricity generation assets in conjunction with industrial hydrogen supply and hydrogen refuelling network projects, bringing better project economics, and therefore delivering competitively priced hydrogen to market, while contributing to New Zealand's renewable electricity build out.

  The Interim Hydrogen Roadmap refers to electrolyser capacity factors of 80%-90% being required. This is higher than where Hiringa electrolysers will be optimised and projects commerciality achieved. In our view, optimised utilisation rates at somewhat lower average levels better balance electricity input costs in response to real time supply and demand and price signals. In doing so this ensures electrolyser demand supports the overall high-Variable Renewable Energy (VRE) system, rather than competing with less flexible electricity demand.

How hydrogen could contribute to our (MBIE) objectives

Question 8: Do you agree with our findings on the potential for hydrogen to contribute to New Zealand's emissions reduction, energy security and resilience and economic outcomes?

Question 9: Do you have any insights we should consider on what is needed to make hydrogen commercially viable?

Question 10: Is there any further evidence you think we should be considering?

Refer to Sections 1 and 2 regarding hydrogen making a more significant and earlier contribution to the decarbonisation of heavy transport and aviation. Refer to Sections 2 and 3 regarding what is needed to make hydrogen commercially viable in a timely manner.

Section 3: Government position and actions

Question 11: Do you agree with our policy objectives?

Question 12: Do you agree with our positioning on hydrogen's renewable electricity impacts and export sector?

Question 13: Do you agree with the proposed actions and considerations we have made under each focus area?

Question 14: Is there any evidence we should be considering to better target actions in the final Hydrogen Roadmap?

Policy objectives

The Government's overarching aim is to optimise the potential for hydrogen to contribute to New Zealand's emissions reductions, economic development, and energy sector to the extent compatible with broader electrification goals.

We fully endorse the Government's overarching aim. However, the final Energy Strategy that integrates this Final Hydrogen Roadmap with other aspects of New Zealand's energy system will need to be clearer and stronger around hydrogen's contribution if its potential is to be optimised and realised within the New Zealand economy.

In relation to "the extent compatible with broader electrification goals" within the overarching aim we make the following comment. The premise held by some that hydrogen production competes for scarce green electrons is false. The flexible nature of electrolyser demand allows for greater utilisation of variable renewables (otherwise spilled, or constrained off, or sold at zero or negative prices), with less overbuild of transmission, storage and firming infrastructure that would need to be built in a 'no-hydrogen' scenario.

We provide feedback under each of the Government's supporting policy objectives below.

Policy objective 1: Ensure supply can scale up, including hydrogen production that is matched to electricity and other inputs.

We recommend that policy objective 3 below should be the primary focus of the Government to achieve its overarching aim above. If New Zealand's hydrogen industry cannot achieve a strong foothold early on there will be no need to plan for the industry scaling up.

Refer to Section 2 for more prerequisites to hydrogen scale up in New Zealand. In summary, a clear, investable hydrogen blueprint for action (part of the wider Energy Strategy); a conducive consenting and regulatory framework (including standards); and an electricity market that enables a diverse range of parties to build large scale renewable assets is needed.

Policy objective 2: Enable the safe use of hydrogen and facilitate early projects that enable the sector to develop.

We agree that enabling safe operation with appropriate safeguards is a top priority for the hydrogen sector and we acknowledge some of the great progress made in this space. Aligning New Zealand's regulations and standards with international equivalents will bring existing industry learnings to the market at the speed required to enable early hydrogen projects.

Policy objective 3: Bring forward and support early demand for hydrogen, linked to the most viable use cases within New Zealand's energy system, and aligned with other Government priorities including economic development and supporting just transitions for key affected communities.

Bringing forward and supporting early hydrogen demand is the most meaningful thing that the Government can do to achieve its overarching aim above.

Many of New Zealand's largest companies are increasing their focus on decarbonisation under the new Climate Financial Disclosure Requirements and are searching for low emission solutions in their transport portfolios. Helping these companies adopt low emission freight technologies will help decarbonise the supply chains that transport many of our domestically and globally consumed goods to market. New Zealand has free trade agreements with the EU (our fourth largest export market[10]) who has already launched a CBAM, the United Kingdom (our sixth largest export market[11]) who is currently consulting on their CBAM,[12] and Australia (our second largest export market[13]) whose Climate Change Minister is currently investigating a CBAM.[14]

Heavy vehicles comprise 23% of our transport emissions, even though they only account for 6% of the annual road vehicle kms travelled.[15] With freight volumes expected to increase 33% by 2050,[16] transitioning the heavy vehicle fleet to zero emission technology presents a critical opportunity to reduce our otherwise growing emissions.

The bulk of heavy truck fleets are owned by a few dozen commercially minded fleet operators (as opposed to millions of passenger vehicle owners). Empowering this segment is effort and cost efficient for Government, with a high emissions abatement return on investment as outlined in Figure 7.

[10] https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-concluded-but-not-in-force/new-zealand-european-union-free-trade-agreement/
[11] https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-in-force/new-zealand-united-kingdom-free-trade-agreement/benefits-to-new-zealand-trade/
[12] https://www.gov.uk/government/consultations/addressing-carbon-leakage-risk-to-support-decarbonisation
[13] https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-in-force/nz-australia-closer-economic-relations-cer/
[14] https://www.afr.com/policy/energy-and-climate/bowen-s-green-tariff-to-shield-steel-cement-against-carbon-leakage-20230814-p5dwew
[15] https://www.transport.govt.nz//assets/Uploads/Discussion/Transport-EmissionsHikinateKohuparaDiscussionDoc.pdf
[16] https://www.sbc.org.nz/insights/2021/low-carbon-freight-pathway

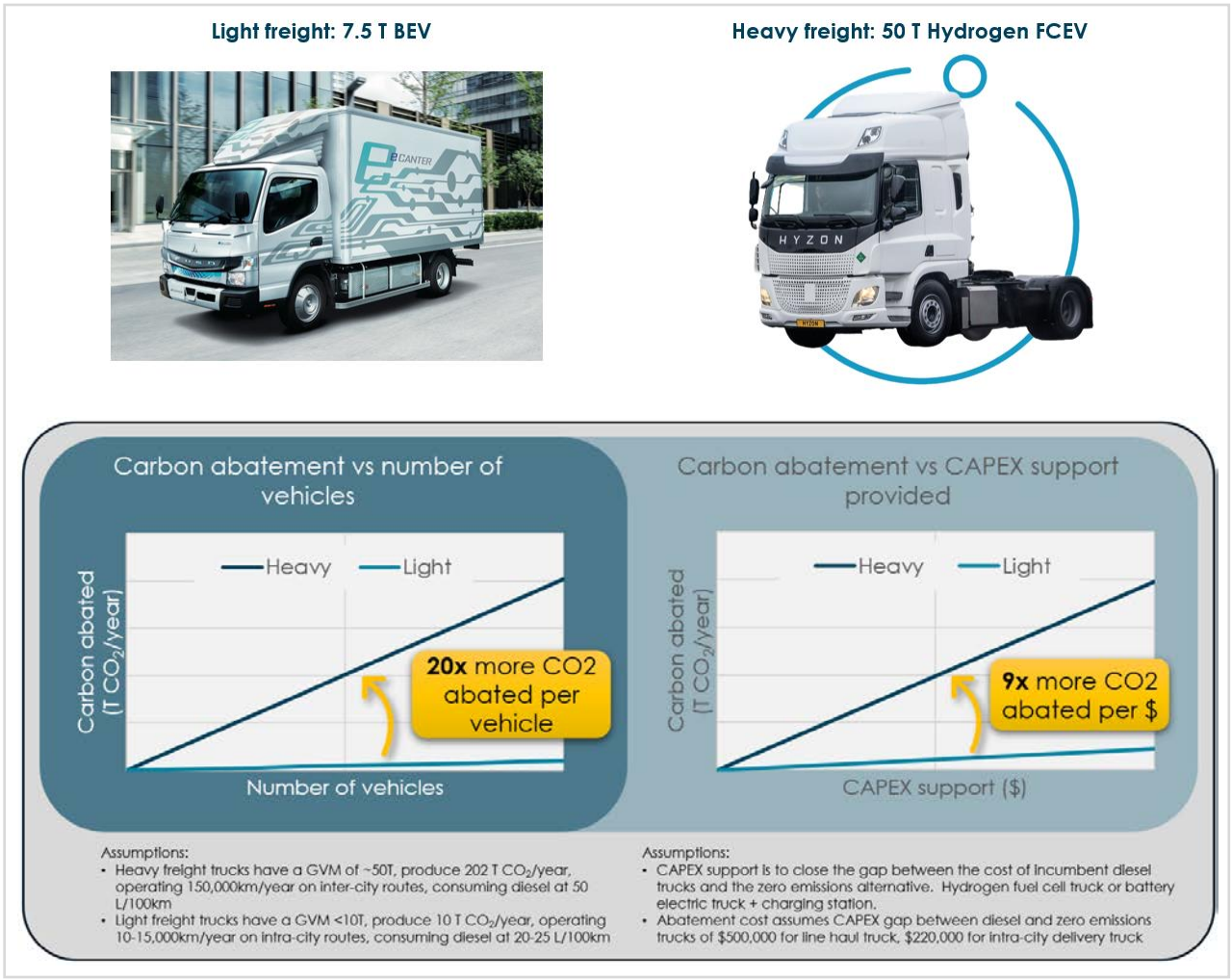

Figure 7 Focusing heavy transport early supports a lower cost pathway

While significant cost reductions have been experienced in recent years, the capital cost of zero emission heavy trucks remains a near term barrier to adoption. Releasing a 'Clean Heavy Vehicle Grant' would be a highly effective way to get zero emission trucks into the fleet in the near term and reduce emissions quickly. This hydrogen demand creation approach would be in-step with support programmes deployed in the USA, EU, and Canada.[17] We are aware of numerous heavy vehicle OEMs who are poised and ready to ramp up vehicle imports to meet the increased demand for hydrogen powered vehicles that this grant scheme would enable.

On the fleet operational cost side there remains an initial cost delta between diesel and green hydrogen fuel until high fixed costs in distribution and refuelling infrastructure can be more efficiently spread as utilisation ramps up. Hiringa and others within the hydrogen industry have been working with MBIE on the proposed 'Green Hydrogen Consumption Rebate' for some time. This stimulus programme will address the hesitation that truck fleet operators have about the cost to operate hydrogen powered trucks.

[17] https://www.iea.org/reports/global-hydrogen-review-2023

The above two Government stimulus programmes have the potential to kickstart New Zealand's low emission freight sector to the extent that Government support may not be required after 2030 having seeded a self-sufficient hydrogen market by that point. This kind of early demand stimulus will be needed if the Government is to achieve its overarching aim in a timely manner, before the global hydrogen industry evolves to the point where is will be difficult for New Zealand to procure the technology required to decarbonise hard-to-electrify sectors. If we move now, we will remain near the front of the global hydrogen pack and it will be our domestic supply chain that is one of the earliest in the world to decarbonise, giving 'New Zealand Inc' a much-needed advantage given our distance to many of our global trading partners.

Policy objective 4: Monitor outcomes and progress over time.

As with any successful strategic planning exercise, monitoring, and reporting on progress towards targeting outcomes is essential. We believe that the Government in conjunction with the mooted Sector Coordination Body can play a critical role in identifying industry challenges as well as their solutions. This body should be adequately resourced so that it can have a meaningful impact and can be held accountable for achieving the targeted outcomes. Refer to the Feedback on actions section for more information.

Feedback on actions

Governance, oversight, and monitoring

Action 1: We plan to establish a government and sector coordination body to help coordinate ongoing action to support hydrogen deployment.

There is currently a lack of 'joined up thinking' and pace in the implementation of laws, policies, regulations, and support mechanisms that would enable New Zealand's hydrogen economy to establish swiftly and thrive.

We support this action wholeheartedly as we have been lobbying for a Hydrogen Taskforce similar to those in Queensland[18] and United Kingdom[19] for some time. By calling it a Taskforce it has an inherent focus on outcomes which is what New Zealand's nascent hydrogen industry needs.

We recommend that the Hydrogen Taskforce is an empowered, resourced and focussed multilateral leadership body that draws in expertise and influence across Government departments, iwi, industry representative bodies, hydrogen producers/transporters/consumers, EDAs, CRIs, universities and educators to further New Zealand's hydrogen economy.

We recommend that the Taskforce is charged with the responsibility of delivering on the Actions of this Interim Hydrogen Roadmap and PwC regulatory review and reports directly to the Energy Minister and other key stakeholders to ensure accountability and that progress is achieved as we head towards the Final Hydrogen Roadmap and overarching Energy Strategy.

Regulatory settings and standards

Action 2: We are committing to regulatory work to enable safe basic operation of hydrogen projects to support near term use cases.

Action 3: We will continue work to consider the wider regulatory environment on an ongoing basis as a market for hydrogen continues to develop.

We agree that enabling safe operation with appropriate safeguards is a top priority for the hydrogen sector and we acknowledge some of the great progress made in this space.

We strongly recommend that PECPR regulations[20] are added to the list of regulatory regimes in scope of the work programme. Although Hiringa will store hydrogen in cylinders, we were required to comply with PECPR due to the size (1,700L). Ordinarily, cylinders are excluded from PECPR, however HSW(HS)R defines a cylinder as less than 500L for class 2 substances, this is out of step with other countries where the limit is 3000L.

[18] https://www.epw.qld.gov.au/about/initiatives/hydrogen/taskforce
[19] https://hydrogen-uk.org/about-us/
[20] Health & Safety in Employment Regulations 1999

The Code of Practice under PECPR is too prescriptive and not fit for purpose for new innovative storage solutions (i.e. larger, composite cylinders). The Design Verification process for PECPR (for a type-certified cylinder) incurred significant amounts of time and money as we had to navigate compliance with COP requirements which weren't relevant to our vessel type and design. It is recommended that the HSW(HS)R definitions and PECPR regulations are amended to align with similar international regulations to expedite the roll out of hydrogen technology.

Support for price and long-term certainty to allow hydrogen to scale for key use cases

Action 4: Budget 2023 included up to $100 million over ten years to establish the Regional Hydrogen Transition consumption rebate scheme, to support regional transitions.

We strongly concur with the following statement and view this as a cornerstone to a successful hydrogen economy. *"One way we can help to build forward certainty about a future hydrogen market is through clear government signalling through the Hydrogen Roadmap itself, in order to encourage investment by positioning hydrogen as part of New Zealand's clean energy transition."*

The Regional Hydrogen Transition consumption rebate is going to be extremely powerful in terms of closing the price gap between diesel powered and green hydrogen powered heavy freight, enabling early adopters to immediately reduce their heavy vehicle emissions. This is essential to *"building certainty about a future hydrogen market"* as outlined above. Please refer to Section 3 and to Hiringa's submission on the Regional Hydrogen Transition initiative for more information.

Support for capital investment for hydrogen projects

Action 5: Budget 2023 included $30 million over three years to establish a Clean Heavy Vehicle Grant for zero emissions heavy vehicles, including hydrogen fuel cell heavy vehicles.

A Clean Heavy Vehicle Grant is critical for encouraging heavy vehicle fleet owners to adopt low emission heavy freight technologies in the near term. Please refer to Section 3 and to Hiringa's submission on the Regional Hydrogen Transition initiative for more information.

Government as a purchaser of goods and services

As a large consumer of goods and services, Government can encourage transition within the freight sector, should it prescribe low emission supply chains as a prerequisite of suppliers. This would ultimately increase demand for low emission fuels and therefore assist in their commercialisation.

The Government could require 'green freight' in their logistics contracts to reward and encourage those freight operators who choose low emission truck technology. Of note is the work that the Sustainable Business Council and the Ministry of Transport are doing in relation to developing a Renewable Freight Certificate scheme.[21]

[21] https://sbc.org.nz/sbc-partners-with-mot-to-deliver-feasibility-study-focused-on-decarbonising-heavy-freight/

Hiringa has also engaged with a wide variety of Government agencies and there is a high degree of interest in hydrogen powered specialty vehicles and stationary power generators. It is suggested that a coordinated approach under the Carbon Neutral Government Programme would be an efficient way to realise decarbonisation opportunities for hard-to-electrify use cases.

Including a variety of battery electric and hydrogen fuel cell vehicles in the All of Government procurement programme would also be an effective way to start establishing international supply, on-selling second hand low emission vehicles on the domestic market (trickle-down effect), setting up domestic recharging/refuelling infrastructure and beginning the social acceptance process.

Supporting frameworks to allow market trading of hydrogen to occur domestically and internationally

Action 6: We will continue working with other countries to support the development of emissions-intensity standards and guarantee of origin schemes that allow for trading and certification hydrogen production sources, to support the development of a market for green hydrogen.

We support the development of emissions-intensity standards and guarantee of origin schemes to allow the domestic and international trading of green hydrogen.

However, Hiringa strongly cautions against imposing 'time of use' and 'additionality' requirements for green hydrogen production in New Zealand. Hiringa's strategy for making green hydrogen as cost competitive as possible involves building new renewable generation to supply our hydrogen production assets and will result in our electrolysers following both electricity market price curves and renewable generation profiles. This strategy utilises a high percentage of renewable electricity in the production of green hydrogen that can be easily certified using existing electricity certification methodologies which reconcile electricity consumption on an annual basis. Imposing 'time of use' and 'additionality' restrictions on hydrogen production will increase the complexity and cost of green hydrogen production projects, ultimately slowing the speed of development and uptake in New Zealand. Imposing these restrictions also risks disadvantaging green hydrogen against other technologies that do not have the same requirements.

Workforce, skills, and training

Action 7: The government and sector coordination body should work in coordination with relevant workforce entities to scope future skills and workforce requirements, challenges, and opportunities in more detail, to support a rollout of hydrogen.

Hiringa acknowledges the inroads that have been made in this space to date but agrees that a coordinated plan needs to be developed amongst key stakeholders that identifies the current and future workforce gaps and lays out a series of actions to address the gaps. The Hydrogen Taskforce should be well represented by stakeholders in this space.

Infrastructure needs

Action 8: The government and sector coordination body should inform the scoping of future hydrogen infrastructure requirements, challenges, and opportunities in more detail.

Assuming the members of the Hydrogen Taskforce span a variety of links in the hydrogen supply chain they should be able to identify actual and potential barriers to hydrogen infrastructure construction and commercialisation. It will be important for the views of large potential hydrogen consumers (such as industrial feedstock, aviation, shipping, export) to be heard as it is their potentially significant demand that will drive production and supply projects. Please refer to the Venture Taranaki Power-to-X report[22] for more information on the opportunities and challenges with large scale low emission infrastructure projects that leverage green hydrogen to decarbonise hard-to-electrify sectors within New Zealand and abroad. Refer to Figure 8 for IRENA's perspective of the increasing role for Power-to-X commodities.

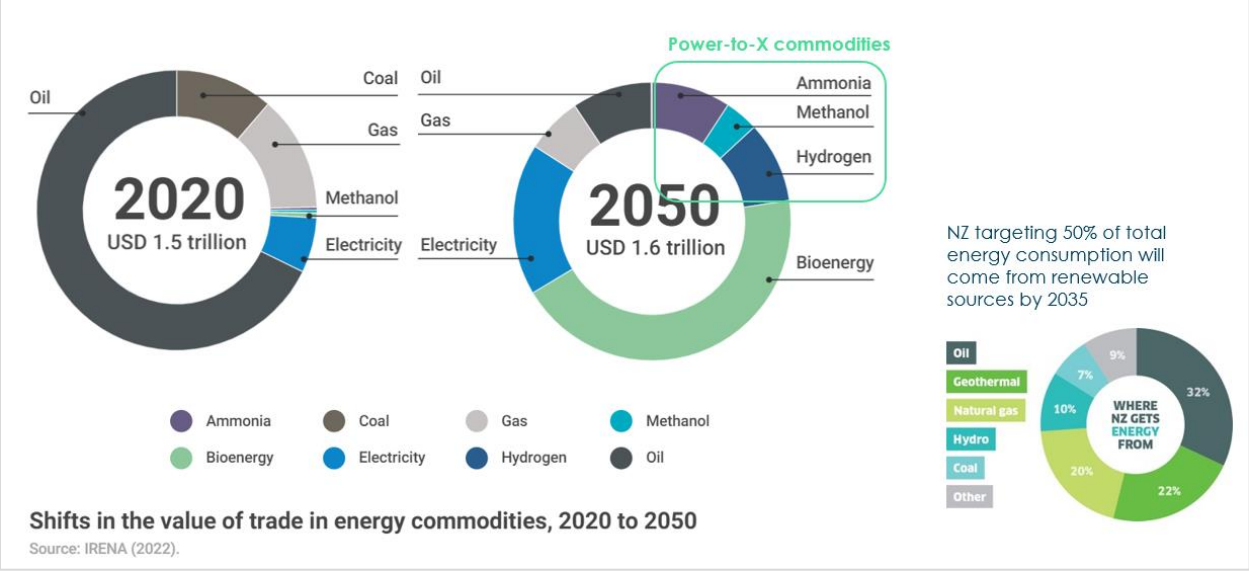

Figure 8 Macro shift from fossil dominant energy to diversified mix, including Power-to-X commodities

Taranaki is a great example of a regional hub where renewable electricity generation can be directly coupled with green hydrogen production (and its derivatives) and efficiently supplied to large scale customers or export projects. Such hubs are known as Hydrogen Valleys.[23] Applying Renewable Energy Zone[24] thinking to a region like Taranaki where new renewables can be coordinated with energy transmission and energy demand would help accelerate low emission Power-to-X commodities for the benefit of New Zealand's emissions profile as well as bring new international trading opportunities.

Planning system

Action 9: As part of our ongoing hydrogen work programme, we could consider:

a. *The potential to add hydrogen equipment to definitions of renewable/clean energy in planning legislation, and the fast-track consenting regime.*

[22] https://www.venture.org.nz/sector-development/energy/
[23] https://h2v.eu/hydrogen-valleys
[24] https://arena.gov.au/blog/what-are-renewable-energy-zones-and-why-do-they-matter/

b. *Supporting initiatives that promote greater awareness and understanding of hydrogen technology for key decision makers, such as consenting authorities.*
c. *Whether resource management regime settings are sufficient to incentivise the required renewable electricity generation to accompany investments in hydrogen production.*

Hiringa supports the infrastructure fast-track process outlined in the National Party 'Infrastructure for the future' manifesto. Under this system the Minister for Infrastructure has the ability to classify projects such as "electricity generation, gas pipelines including hydrogen and hydrogen vehicle charging" as Major Infrastructure Priorities and as a result issue "a decision issued within one year."

With storage volumes of hydrogen required for high-capacity hydrogen refuelling stations often exceeding those set within District Plans around the country it is important that this aspect is also included in the definition of "hydrogen vehicle charging". There will also be significant storage volumes of hydrogen and its derivatives such as green ammonia, e-methanol and sustainable aviation fuel required to decarbonise our hard-to-electrify sectors and unlock global commodity trading opportunities. Large storage volumes of Power-to-X commodities (green hydrogen derivatives) should also be included in the definition of Major Infrastructure Priorities. Please refer to the Venture Taranaki Power-to-X report for more information.

A key aspect to the Fast-Track Process will be how appeals are managed to avoid lengthy court procedures with uncertain timeframes that result in a higher project cost for energy project developers. There is a careful balance to be found between the democratic participation of key stakeholders and the need to achieve the required degree of certainty and expediency.

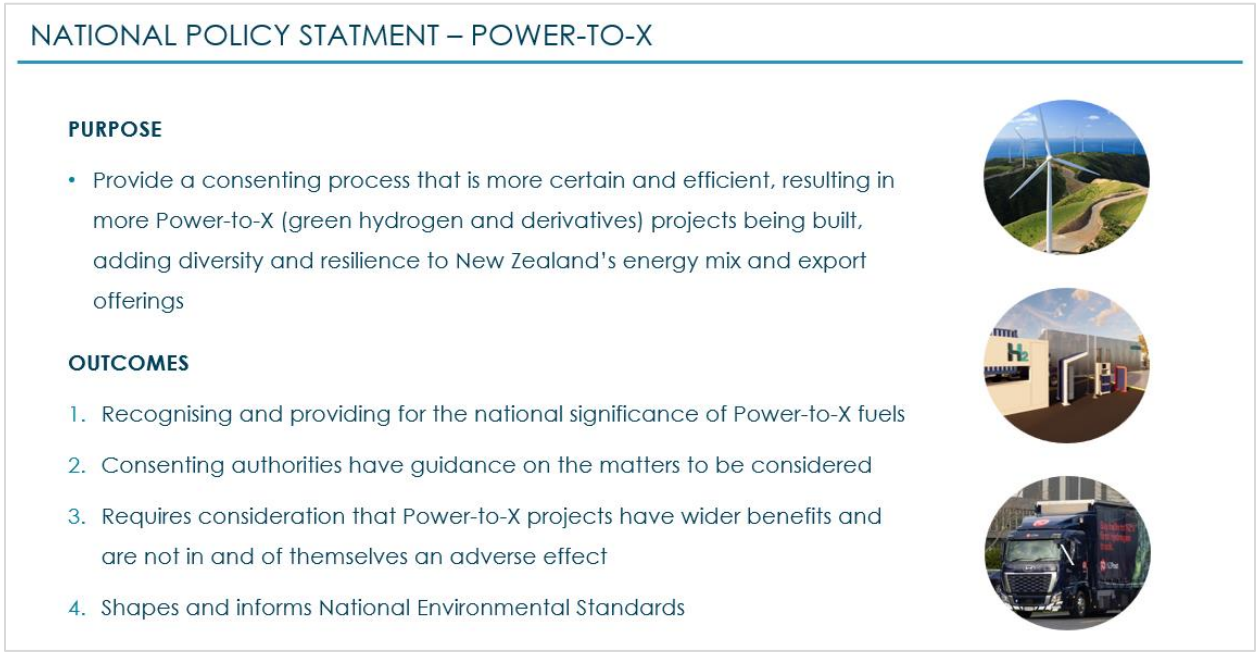

Figure 9 National Policy Statement for Power-to-X

We support the introduction of a National Policy Statement – Hydrogen as outlined in the National Party 'Electrify NZ' manifesto. However, we recommend that its scope is widened to include the low emission derivatives of green hydrogen, such as green ammonia, e-methanol and sustainable aviation fuel required to decarbonise our hard-to-electrify sectors and provide new export opportunities, which are

commonly referred to as Power-to-X. Refer to Figure 9 for more information on the purpose and desired outcomes of a National Policy Statement for Power-to-X.

Research, development, and deployment

Action 10: As part of our ongoing hydrogen work programme, we will continue to work collaboratively wherever possible on joint research challenges to deploying green hydrogen. We will consider the long-term research environment for hydrogen alongside related work, such as the Te Ara Paerangi – Future Pathways programme.

Hiringa supports the existing research programme of works and is happy to contribute industry learnings as we deploy and commercialise our hydrogen production and supply infrastructure.

Action 11: As part of our ongoing hydrogen work programme, we will review available funding and support avenues, including whether there are gaps across the existing technology level readiness scale to help enable hydrogen use cases to become a commercial reality.

Government funding and support mechanisms to date have been incredibly enabling. However, support is needed in the short term to scale up the initial momentum generated. Refer to Sections 2 and 3 for more information.

Targeting funding to stimulate key hubs within our freight supply chain should also be a focus of Government. As key nodes of our economy, our logistics hubs such as seaports, airports and regional rail/road freight hubs are logical places to support the investment in zero emission transportation.

International partnership and cooperation

Action 12: As part of our ongoing hydrogen work programme, we will continue to build our international relationships on hydrogen through our existing cooperation arrangements, participation in international working groups. We will seek out new opportunities for collaboration in line with our positions set out in the Interim and upcoming Final Hydrogen Roadmap.

Aligning New Zealand's Final Hydrogen Roadmap, policy mechanisms and regulatory framework with those leading the world in hydrogen technology commercialisation and our key trading partners is key to enabling the Government's aim of optimising hydrogen's role within our economy.

A strong, clear pathway for hydrogen deployment is required if New Zealand companies are to attract the investment required to deliver a self-sustaining hydrogen industry that can decarbonise our hard-to-electrify sectors and the supply chains that get our export commodities to the global market.

International investors look closely at the hydrogen uptake volumes and timing estimated by the New Zealand Government. Hiringa therefore requests that in-depth industry consultation occurs when modelling those hydrogen sectors most likely to take-up hydrogen because the economics make the most sense e.g. heavy freight. Refer to Section 2 for more information.

Public awareness

Action 13: As part of our ongoing hydrogen work programme, we will continue to raise the public profile of hydrogen through the development of the Final Hydrogen Roadmap. The government and sector coordination body could also play a role to help shape public awareness of hydrogen.

Demonstrating commercially sustainable hydrogen deployment is the single most powerful education tool the industry and Government have.

New Zealand's biggest companies are currently focussing more than ever on their emissions profiles as a result of the mandatory Climate Related Financial Disclosure system. A targeted campaign articulating the opportunities that green hydrogen brings for decarbonising hard-to-electrify use cases would be timely.

Global emission reporting and management mechanisms such as the EU's Carbon Border Adjustment Mechanism will place increasing stringent requirements on New Zealand exporters who will be analysing every opportunity to decarbonise they have available. Decarbonising their road based linehaul supply chain within New Zealand is now a low hanging fruit with green hydrogen refuelling stations and hydrogen fuel cell trucks domestically available.

There are a number of good case studies within the Interim Hydrogen Roadmap. To help truck fleet operators and their customers better understand the pros and cons of battery electric and hydrogen fuel cell heavy vehicles, a case study on one of New Zealand's largest fleet owners (e.g. TR Group) articulating the use cases in which they have successfully deployed each technology would be helpful.

Hydrogen presents a wide variety of STEM learning opportunities in schools such as Horizon's H_2 Grand Prix[25] and the Murihiku Regeneration's He Ao Hou programme.[26]

A key message to articulate to the general public is that green hydrogen does not detract from the electrification of our economy, instead it enhances it by helping establish better renewable generation project economics as well as enabling the renewable electricity to reach parts of our economy that would otherwise have no choice but to use liquid fossil fuels.

[25] H2 Grand prix Homepage
[26] https://ngaitahu.iwi.nz/our_stories/hydrogen-kit-in-schools/