



Hydrogen Team
Energy and Resource Markets Branch
Ministry of Business, Innovation and Employment
15 Stout Street
Wellington

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Submitted by email

Submission on:

Interim Hydrogen Roadmap

By Carbon and Energy Professionals New Zealand



INTRODUCTION

CEP welcomes the opportunity to comment on MBIE's consultation on the Interim Hydrogen Roadmap.

For context, CEP is the professional body that represents energy efficiency and carbon professionals in New Zealand. We train and certify individuals in a wide array of energy efficiency, carbon management and carbon measurement disciplines. CEP and our members will be crucial to the success of policies aimed at creating a low emissions future and we welcome the opportunity to input into the development of policies and strategies.

CEP is affiliated with Engineering New Zealand as a Collaborating Technical Society. The CEP membership comprises expert level practitioners in energy efficiency and carbon management, the people who will deliver the engineering expertise to transition to a low emissions economy.

CEP is a not-for-profit Incorporated Society. Supporting effective energy, carbon and sustainability management is embedded in our constitution.

We focus our comments on areas where our organisation and membership can provide relevant comment, advice or provide information that may not have been considered already.

We section our submission in line with the sections in the consultation document.

1. THE EMERGENCE OF HYDROGEN AS AN IMPORTANT PART OF THE FUTURE GLOBAL ENERGY SYSTEM

Discussion question:

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

The opportunities for the use of hydrogen are well explored in the discussion document. However, it is extremely light on acknowledging the risks associated with hydrogen, in particular, those associated with storage and transportation. The molecular size and volatility of hydrogen gas makes its storage and transportation risky and while it is possible to reduce or manage some of this risk, it is extremely expensive to store and transport hydrogen safely. Storage and transportation in liquid form is also expensive as are storage in associated forms, such as ammonia. Solid state hydrogen storage is being researched around the world but it is unclear if any of the current developments can become commercially viable. The lack of acknowledgment of likely substantial handling costs and how these might be addressed or mitigated does give the roadmap an unbalanced feel. Considerations of storage and transport costs are a major omission in an assessment of the strategic landscape for hydrogen.

2. THE ROLE FOR HYDROGEN IN NEW ZEALAND'S ENERGY TRANSITION

DISCUSSION QUESTIONS

- Do you agree with our assessment of the most viable use cases of hydrogen in New Zealand's energy transition?
 - Do you support some of these uses more than others?
 - What other factors should we be considering when assessing the right roles for hydrogen in New Zealand's energy transition?
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- Do you agree with this assessment of the potential for hydrogen supply and demand in New Zealand?
 - Do you agree with the key factors we have set out that are likely to determine how hydrogen deployment could play out?
 - What do you think needs to happen to address these factors?
 - Do you have any evidence to help us build a clearer picture?

Hydrogen will likely make some contribution to helping New Zealand transition to a low emissions economy. The areas of opportunity are in transitioning hard to abate sectors such as steel and cement production and, potentially, as a storage medium for excess renewables.

Notwithstanding the possibility of use as a storage medium, the loss of energy in the electrolysis process means hydrogen is an inefficient storage medium relative to alternatives such as the many emerging battery technologies (chemical or thermal) or pumped hydro systems.

While too early to dismiss hydrogen as a transport fuel, developments of other technologies are currently indicating hydrogen will not play a prominent role in transport. Presently, electrification is a more practical and more economic route for heavy road transport¹. Short-hop coastal shipping can also be economically electrified² and short-haul electric aircraft are

¹ CEP webinar:

<https://www.gotostage.com/channel/2710bccc39054752bb31ba46db2e6ae8/recording/cef13e5ace6b4fecb0100f15544e34cd/watch?source=CHANNEL>

² <https://www.nature.com/articles/s41560-022-01065-y>

emerging as viable alternatives to fossil fuelled flight³. The development of sustainable aviation fuels as an alternative, drop-in fuel (also meaning no major infrastructure or storage implications in aircraft design or airports) for long haul flights is more advanced than the use of hydrogen⁴⁵. In Germany, the first commercial hydrogen fuelled train network has recently been withdrawn to be replaced by electric units⁶. While hydrogen should not be discounted as a transport fuel, at this point it is certainly significantly lagging in likelihood of becoming a significant transport fuel, begging the question of value in establishing a hydrogen network.

The production of hydrogen for use as a feedstock for fertiliser may also become redundant. Recent technological advances have enabled the low-tech, low-energy production of ammonia⁷.

The use of hydrogen as a domestic fuel is questionable. While, technically, it could be mixed with other gasses for distribution through the network, the proportion of hydrogen that could be injected into the mix will be heavily limited without significant upgrading of the network infrastructure. With electrification being an easy, cost effective, safe and clean alternative with an established network, there is little merit on pursuing the use of hydrogen as a domestic fuel.

It is very difficult to see hydrogen becoming a significant export earner for New Zealand. The main users, Europe, North America, China, Japan and South Korea are expected to consume all domestically generated green hydrogen and create a market for exporters, although a recent report commissioned by the EU suggests it could be self sufficient⁸. Given its geographic location, consequent higher transport costs and higher renewable costs than sun-rich countries such as Chile, Australia and Morocco, it is unlikely New Zealand hydrogen exports could be cost competitive. Chile, Australia and Morocco are among the countries attracting interest from investors as potential exporters of hydrogen.

³ <https://www.stuff.co.nz/travel/green-travel/300384673/couldnt-be-prouder-sounds-air-locks-in-electric-plane-deal>

⁴ <https://news.mit.edu/2023/making-aviation-fuel-biomass-0823>

⁵ <https://www.pnas.org/doi/10.1073/pnas.2221483120>

⁶ <https://qz.com/the-dream-of-the-first-hydrogen-rail-network-has-died-a-1850712386>

⁷ <https://news.stanford.edu/2023/04/24/ecofriendly-ammonia-just-add-water/>

⁸ https://op.europa.eu/en/publication-detail/-/publication/72954c87-327a-11ee-83b8-01aa75ed71a1/language-en?WT_mc_id=Searchresult&WT_ria_c=37085&WT_ria_f=3608&WT_ria_ev=search&WT_URL=https%3A//energy.ec.europa.eu/

DISCUSSION QUESTIONS

- 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?
- Do you have any insights we should consider on what is needed to make hydrogen commercially viable?
- Is there any further evidence you think we should be considering?

Given the current relatively high cost of producing green hydrogen through electrolysis, the emergence of more economically attractive transport fuels and methods of ammonia production combined with a questionable export market for New Zealand mean hydrogen will likely play a minor role in New Zealand's energy future. The potential for hydrogen to contribute to emissions reduction in New Zealand will remain limited to hard to abate industries.

3. GOVERNMENT POSITION AND ACTIONS

DISCUSSION QUESTIONS

- Do you agree with our policy objectives?
- Do you agree with our positioning on hydrogen's renewable electricity impacts and export sector?
- Do you agree with the proposed actions and considerations we have made under each focus area?
- Is there any evidence we should be considering to better target actions in the final Hydrogen Roadmap?

There is limited potential for hydrogen to contribute to New Zealand's emission reduction targets. While it will be important to have a competitive hydrogen market for use by domestic, hard to abate industries, widespread use of hydrogen is unlikely. Resources currently allocated to developing a substantial hydrogen economy in New Zealand would be more productively allocated to improving energy efficiency and exerting downward pressure on electricity demand.

