[redacted]

From: no-reply@mbie.govt.nz
Sent: Friday, 25 October 2019 4:39 p.m.
To: [redacted]; Hydrogen
Subject: Hydrogen green paper - submission
Attachments: Online-submission-form-uploadsHydrogen-green-paperSubmission-to-MBIE-on-hydrogen-green-paper.pdf

Submission on Hydrogen green paper recevied:

Introduction
Name

[redacted]

Email

[redacted]

Business name or organisation (if applicable):

Mercury

Position title (if applicable):

[redacted]

Is this an individual submission or on behalf of a group or organisation?

Behalf of group or organisation

Please give the name of the group or organisation this submission is on behalf of.

Mercury

What is the role of Government in developing hydrogen for storage and distribution?

see attached pdf

What are the challenges for using hydrogen for storage and distribution?

see attached pdf

What are the opportunities for using hydrogen for storage and distribution?

see attached pdf

What is the role of Government in developing the complementary role of electricity and hydrogen?

see attached pdf

What are the challenges for achieving this complementary role of electricity and hydrogen?

see attached pdf

What are the opportunities for this complementary role of electricity and hydrogen?

see attached pdf

What is the role of Government in supporting hydrogen use for the transport sector?

see attached pdf

What are the challenges when using hydrogen for mobility and transport?

see attached pdf

What are the opportunities for using hydrogen for mobility and transport?

see attached pdf

What is the role of Government in encouraging the use of hydrogen for industrial processes including process heat supply?

see attached pdf

What are the challenges for using hydrogen in industrial processes?

see attached pdf

What are the opportunities for the use of hydrogen in industrial processes?

see attached pdf

What is the role of Government in encouraging hydrogen uptake for decarbonisation of our natural gas uses?

see attached pdf

What are the challenges for hydrogen to decarbonise the applications using natural gas?

see attached pdf

What are the opportunities for hydrogen to decarbonise our gas demand?

see attached pdf

What is the role of Government in producing hydrogen in sufficient volume for export?

see attached pdf

What are the challenges for hydrogen if produced for export?

see attached pdf

In addition, we welcome your feedback about the opportunities of hydrogen to Māori and how this will support their aspirations for social and economic development.

see attached pdf

What are the opportunities for hydrogen if produced for export?

see attached pdf

If you wish to, you can attach a document to this submission.

[redacted]

Use and release of information
We intend to upload submissions to our website at www.mbie.govt.nz. Can we include your submission on the website?

Yes

Can we include your name?

No

Can we include your email address?

No

Can we include your business name or organisation?

Yes

Can we include your position title?

No

Can we include the group or organisation your submission represents (if submitting on behalf of a group or organisation)?

Yes

If there are any other parts to your submission that you do not want public on the website please note them below:
OIA warning
If there is information in your submission that you wish to remain confidential, please note them below:

Ministry of Employment Business and Innovation
Via email: mark.pickup@mbie.govt.nz

25 October 2019

A Vision for hydrogen in New Zealand Green Paper

Mercury welcomes the opportunity to make a submission on 'A Vision for hydrogen in New Zealand' Green Paper. We support considering the role hydrogen could play in assisting New Zealand to reduce its carbon emissions as part of our commitment to global emissions reduction. It is also important to consider whether there are aspects of hydrogen technology and development where New Zealand may have comparative advantages that can be leveraged to enhance our economic opportunities.

The key question is how the hydrogen fits within the overall framework for renewable energy given New Zealand's unique energy profile. Unlike most developed countries, New Zealand is in the fortunate position of having access to an abundance of renewable electricity and significant development potential. In comparison, the main driver behind consideration of hydrogen in other countries is a lack of renewable alternatives to fossil fuels, either for direct use or electricity generation.

Mercury agrees with the findings contained in the Concept study commissioned by the Government[1] and those in the Independent Climate Change Commission final report and Productivity Commission that even with high carbon prices, it will be simpler and far less expensive to use renewable electricity directly to decarbonise the New Zealand economy, particularly the transport and process heat sectors. This is due to the significant energy losses and capital costs associated with converting electricity into hydrogen. For example, hydrogen would be at least three times more expensive than using renewable electricity directly for transport. The Green Paper summarises well the nature of the hydrogen challenge.

> *'These…include cost and technological maturity, safety, regulatory and policy uncertainty and gaps, infrastructure development, building the hydrogen economy, utilizing additional natural resources such as water, developing renewable energy, the perception of inefficient use of energy and lack of understanding of, the need for lifecycle assessments in investment decisions.'* [2]

Mercury considers longer-term the most viable opportunity for hydrogen in New Zealand is for export as highlighted in the green paper. This would require an international market for hydrogen to emerge and significant investment in excess renewable electricity generation as well as in hydrogen storage and distribution infrastructure. Mercury supports the market delivering this investment over time rather than the Government and potentially New Zealand electricity consumers underwriting the risks and costs in anticipation of an international market emerging. We agree that it is important New Zealand keeps its options open and is prepared to take advantage of any opportunities that arise if the current barriers to export are resolved.

New Zealand has limited resources in terms of people, capital and time to address the climate change challenge and must focus on the most cost-effective and efficient options to deliver emissions reductions. For New Zealand this means direct-use of our abundant renewable electricity. The value of the Government's hydrogen strategy will be in providing robust scientific and commercial analysis to ensure only credible and viable applications are understood and considered.

[1] Hydrogen in New Zealand, Concept, Version 04, 29/01/2019.
[2] Ibid pg 12.

The Mercury Building, 33 Broadway, Newmarket 1023
PO Box 90399, Auckland 1142 New Zealand
PHONE: + 64 9 308 8200
FAX: + 64 9 308 8209
mercury.co.nz

If you have any questions contact [redacted].

Yours sincerely

[redacted]

Attachment: Mercury Response to Consultation Questions

1a What is the role of Government in developing hydrogen for storage and distribution?
Government should monitor and if necessary remove any regulatory barriers to development of hydrogen storage and distribution. We would caution against government taking on the risks associated with investing directly in hydrogen storage and distribution, this is best left to the market and research interests with expertise in the area.

1b What are the challenges for using hydrogen for storage and distribution?
The challenges are considerable and broadly summarized in the Green Paper. One of the main challenges relates to hydrogen storage. Because of the physics associated with hydrogen it is not currently possible to store it easily and cost effectively in large quantities. To store hydrogen in compressed liquid form would require large and thick-walled pressurised containment vessels. The other option is to store the hydrogen as ammonia, but the inefficiencies associated with the chemical conversion processes are prohibitively expensive.

New Zealand's main challenge in terms of electricity supply is ensuring there is adequate and deep energy storage available to transfer energy across seasons and meet peak demand in winter. New Zealand's flexible hydro storage and highly efficient transmission system currently deliver this outcome at least-cost for consumers. Delivering the New Zealand's seasonal energy storage needs with hydrogen would not be feasible given there is no scale technology available (and is not likely to be available) to store the vast quantities of energy required to meet demand in a safe manner.

1c What are the opportunities for using hydrogen for storage and distribution?
There may be opportunities in the future if an export market for hydrogen evolves. The key uncertainty is how the substantial costs required to underwrite the hydrogen storage and distribution network would be funded given the significant risks and uncertainty for investors. Neither electricity consumers nor the New Zealand government should underwrite such risks, particularly if the net effect is to raise electricity prices which will make reducing New Zealand's emissions more expensive than is necessary.

2a What is the role of Government in developing the complementary role of electricity and hydrogen?
See our response to question 1a and 1c. In the New Zealand context we don't see electricity and hydrogen as complementary as it is more cost effective to use renewable electricity directly to meet New Zealand's energy needs rather than take the extra step of converting renewable electricity into green hydrogen. Government should promote direct use of electricity first and only consider the complementary role of hydrogen where there is robust scientific and commercial analysis on credible and viable applications.

2b What are the challenges for achieving this complementary role of electricity and hydrogen?
We agree with the findings in the Concept Report that it is not credible that hydrogen could displace baseload generation. We need to double New Zealand's renewable generation to reach the Government's target of net zero emissions by 2050 by using renewable electricity directly. This figure is triple if hydrogen is utilised reflecting the significant conversion inefficiencies. While this would benefit electricity generation companies it would not be of benefit to the country as a whole.

2c What are the opportunities of this complementary role of electricity and hydrogen?
If an export market for green hydrogen develops in the future, there may be scope for considering development of hydrogen export capability in New Zealand.

3a What is the role of Government in supporting hydrogen use for the transport sector?
Beyond ensuring there are no regulatory barriers to hydrogen uptake for transport applications Mercury does not consider there is a material role for government. New Zealand will be a technology taker and hydrogen for transport will be market-led. Government already offers contestable funding for low emissions vehicles which supports trials of niche applications for hydrogen transport related projects.

3b What are the challenges when using hydrogen for mobility and transport?
Hydrogen is not cost-effective for most mobility/transport applications. If you start with 100 units of electricity and convert it into hydrogen, compress it, distribute it and reconvert it to electricity via a fuel cell, less than 25% of the original energy remains by the time it reaches the wheels. This is less efficient than an Internal Combustion Engine. In comparison, the efficiency of using electricity directly is around 80%.

These inefficiencies mean the electricity sector would need to build more than three times as much new generation to power New Zealand's light transport fleet than if electricity was simply used directly. Put another way, electricity costs the equivalent of around 30c per litre for petrol for an electric vehicle, but going from electricity to hydrogen and then back to electricity again would be at least three times more expensive.

The other main challenge is that no refuelling infrastructure currently exists for hydrogen vehicles whereas electric vehicles can be charged from any domestic three-pin socket. This has been a material barrier to hydrogen vehicle uptake overseas along with safety concerns from refuelling station explosions in California and Norway.

3c What are the opportunities for using hydrogen for mobility and transport?
Concept looked at the cost effectiveness of diesel, battery-electric and hydrogen heavy linehaul trucks. The key differences between the three technology options were fuel costs and vehicle capital costs. Electric vehicles have superior inherent vehicle fuel efficiency, coupled with lower delivered fuel prices. 'We predict this will result in the future fuel costs for electric vehicles being less than a third the fuel costs for diesel and hydrogen vehicles[3]. Concept found that hydrogen may be better in certain niche return-to-base operations, for example, forklifts and port crane operations. We note that the Port of Auckland is running a pilot to test this.

4a What is the role of Government in encouraging the use of hydrogen for industrial processes including process heat supply?
We do not consider there is a material role for government given New Zealand will largely be a technology taker for hydrogen. Government already provides funding for various hydrogen related industrial trials and partnerships to test potential commercial applications.

4b What are the challenges for using hydrogen in industrial processes?
Mercury notes the findings from modelling undertaken by Concept for MBIE which strongly suggest that hydrogen is likely to have limited application for industrial processes or space and water heating regardless of how high the price of carbon rises. As with transport, the challenges of process losses and capital costs associated with producing and storing hydrogen from electricity are significant even if production times could be shifted to take advantage of off-peak electricity demand and network prices.

4c What are the opportunities for the use of hydrogen in industrial processes?
No comment.

5a What is the role of Government in encouraging hydrogen uptake for decarbonisation of our natural gas users?
Consistent with our previous responses, government could play a role remove any regulatory barriers to the adoption of hydrogen technologies if they prove to be viable in the future.

5b What are the challenges for hydrogen to decarbonise the applications using natural gas?
Concept notes that hydrogen can be blended into existing pipelines but only up to a point. Beyond 10% a complete changeover to hydrogen is a more likely approach which requires a coordinated changeover and inspection of all end use appliance to ensure safe operation. Concept estimates changeover only becomes economic when carbon prices reach $650 per tonne. Carbon prices of this magnitude illustrate hydrogen is highly unlikely to be cost-effective option to reducing carbon emissions relative to other opportunities lower on the carbon abatement cost curve available to New Zealand.

[3] Hydrogen in New Zealand, Concept, Version 04, p10.

5c What are the opportunities for hydrogen to decarbonise gas demand?
No comment.

6a What is the role of Government in producing hydrogen in sufficient volume for export?

Mercury does not consider Government should have a direct role in the production of hydrogen for potential export. Hydrogen export will require an international market for hydrogen to emerge and significant investment in excess renewable electricity generation as well as in hydrogen storage and distribution infrastructure. Mercury supports the market delivering this investment over time rather than the Government and potentially New Zealand electricity consumers underwriting the risks and costs in anticipation of an international market emerging.

We agree that it is important New Zealand keeps its options open and is prepared to take advantage of any opportunities that arise if the current barriers to export are resolved. Government could actively engage with other countries that are trialling hydrogen technologies and are potentially looking to import green hydrogen to foster potential trade opportunities. This would ensure we are well placed to take advantage of any opportunities if an international market for green hydrogen emerges.

6b What are the challenges for hydrogen if produced for export?

Concept estimated that the delivered cost of green hydrogen produced in New Zealand and shipped to Japan could be around $44 per GJ by 2040. This compares to LNG prices of approximately $14 per GJ. New Zealand's green hydrogen would therefore only be competitive with LNG at a carbon price of around $550/ tonne of carbon[4]. This is a prohibitive cost differential which underscores the challenges hydrogen production needs to overcome to be considered viable for export.

6c What are the opportunities for hydrogen if produced for export?

The main opportunity is increased demand for New Zealand's renewable electricity and overcoming the country's geographic isolation which means physical transmission interconnection is uneconomic. As Concept note: 'From a New Zealand production point of view, the attractiveness of hydrogen export would be weighed up against domestic uses (such as electrifying transport) – noting that developing renewable generation for hydrogen export will 'use up' some of our developable renewable resource and increase electricity prices to a certain extent – and other opportunities for exporting energy-intensive products (such as aluminium).[5]

[4] Ibid pg16.
[5] Ibid pg 15.