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Submission on the Hydrogen Green Paper
Ministry of Business, Innovation and Employment
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PEPANZ Submission on the Green Paper on Hydrogen in New Zealand

Introduction

1. The Petroleum Exploration and Production Association of New Zealand ("PEPANZ") represents private sector companies holding petroleum exploration and mining permits, service companies and individuals working in the industry.
2. This document constitutes PEPANZ's submission on the "A vision for hydrogen in New Zealand – Green Paper".
3. We note the submission deadline of 25 October 2019.

The Green Paper prefers green hydrogen without an adequate case against alternative sources

4. The Green Paper makes clear that it prefers "green hydrogen" (hydrogen from electrolysis) over "blue hydrogen" (hydrogen from steam methane reformation of natural gas with carbon capture and storage). Specifically, it states:

> "While hydrogen produced from fossil fuels and industrial processes (brown, blue and grey) may play a role in the transition of New Zealand's regions and existing industries, the Government considers there is greater opportunity for New Zealand in exploring the use of our renewable energy to produce green hydrogen as an alternative fuel for domestic use and for export." (p11)

5. This preference for green hydrogen (compared to blue hydrogen) is not adequately explained. It appears to be driven by a pre-determined preference for renewables over hydrocarbons (thereby preferring one fuel source and not having regard to the actual matter of greenhouse gas emissions). If the Green Paper is to favour one fuel source for producing hydrogen it should adequately explain why one is preferred and what the problems are with alternatives (blue hydrogen specifically). It will be unsurprising that we prefer a neutral playing field which positively allows for all sources of hydrogen where it is technically feasible, economically viable, and sought by consumers.
6. The challenges for green hydrogen are numerous and quite well-documented in the Green Paper. Aside from the generic issues facing all hydrogen (such as distribution networks and markets), the key challenges for blue hydrogen in New Zealand are access to adequate reserve of natural gas and the current regulatory uncertainty for carbon capture and storage. The decision to end new petroleum exploration permits outside onshore Taranaki, however, compromises the security of supply of natural gas which makes it more difficult for investors to justify capital costs of producing blue hydrogen in New Zealand.
7. Even if the government has a preference for green hydrogen, the Green Paper should acknowledge that hydrogen produced from natural gas could enable customers to invest in hydrogen infrastructure while electrolysis technology is developed and becomes more cost effective over time. Industrial scale uptake of hydrogen will require large-scale availability and security of supply. That will require baseload availability at large volumes, and only steam methane reformation of natural gas can offer that currently at meaningful scale. If green hydrogen is produced, this would likely start incrementally, and will be easier to commercialise if there is already a large market enabled by blue hydrogen. A diverse range of suppliers can promote any transition to hydrogen by increasing confidence in supply.

Carbon capture and storage faces regulatory barriers which the Green Paper should propose be addressed

8. The Green Paper states that "There is potential for CCS to be used to capture most of the carbon dioxide produced during this reformation process, should it prove technically and financially viable." (p41).

9. CCS is, contrary to the apparent view in the Green Paper, already technically and financially viable. Large scale CCS is a reality today, with at least 18 large scale CCS facilities operating with five under construction and 20 in various stages of development. This includes the major CCS project at the Gorgon natural gas field in Western Australia.
10. We recommend that, to promote a level playing field, the Green Paper notes the regulatory barriers to CCS (expanded on below) and recommends these be remedied. Two recent reports identify regulatory barriers and make the following summary remarks.
    - In *Carbon Capture and Storage: Designing the Legal and Regulatory Framework for New Zealand*[1] Barry Barton of Waikato University states CCS "is probably not actually possible at all under the existing law".
    - The Productivity Commission's *Low Emissions Economy*[2] report considers that the current law "*is not set up to deal with the complexities of CCS, and acts as a barrier to the uptake of these technologies*" (page 449).
11. Appendix One highlights other key findings from these two reports.

Impacts of higher electricity costs on broader decarbonisation goals from green hydrogen should be considered

12. The Concept Consulting report *H2 in NZ - A study of the potential economics of hydrogen technologies in New Zealand*[3] made the insightful point that

    > "exporting a meaningful amount of hydrogen to Japan would significantly draw upon our own developable resources and increase New Zealand electricity prices to some extent.[4]"

13. We know from the ICCC *Accelerating Electrification* report[5] that affordable electricity is critical to promote the electrification of process heat and transport. Given that interest in energy (as opposed to feedstock) use of hydrogen is primarily driven by potential emission reductions, it is important to take a holistic view of the whole economy to ensure that trade-offs are well-understood and that lowest marginal cost abatement is preferred.
14. If exporting hydrogen materially increases electricity costs, the government should be mindful of 'picking winners', especially if that may compromise the larger gain of electrifying process heat and transport. This is a key lesson from the ICCC and highlights the importance of simply ensuring a reasonably level playing field between technologies and letting the market, informed by the carbon price, make decisions on the efficient allocation of resources.

The premise of surplus electricity is unrealistic

15. The fundamental premise of green hydrogen appears to be based upon a surplus of electricity (generated from low emission sources) which produces hydrogen through electrolysis of water. Aside from the fact that generators will only produce electricity where there is a reliable market to justify investment, there are arguably regulatory barriers to the levels of renewable generation envisaged in the Green Paper.
16. Installed generation capacity across New Zealand is presently around 9,800MW, developed over the last 100 years, where only 7% is wind. An increase of 10,000MW in wind generation would only realistically take place over a period of 25-30 years. Hydro generation opportunities are negligible, leaving primarily wind or geothermal renewable solutions. Geothermal generation (primarily in the Taupo region), with base load generation and off-peak hydrogen production, could realistically produce an additional 2-2,500MW over the next 10-15 years. Use of the 400kV Whakamaru to Auckland transmission line, already in place, and operated at 220kV, would use this generation for peak supply, creating a balanced energy usage which would benefit both electricity and hydrogen users. Geothermal generation for hydrogen production is technically feasible and ideally located.
17. Wind power in an electrically 'weak' system, in excess of around 10-15% is unadvisable. New Zealand, with physical separation between generation to the south and load to the north, would require considerable transmission and distribution investment to reinforce the system to accommodate significant wind power growth outside major load centres. This would require thermal (geothermal, natural gas or coal) turbines to provide network stability, due to the nature of New Zealand's system, ensuring voltage support and generation during periods where the wind resource is not available. Wind generation is therefore constrained, and should not be considered as viable for more than 15% of NZ generation, unless hydrogen production is directly supplied by wind-farms, and the hydrogen is viewed as the output energy carrier. In this scenario wind generation would be directly connected to hydrogen production. This minimises technical issues with the electricity system, where hydrogen can be produced when the wind resource is available. We therefore recommend that increases in wind energy for hydrogen production are viewed independently of New Zealand's electricity network. Direct wind-to-hydrogen production is

[1] https://www.waikato.ac.nz/__data/assets/pdf_file/0011/179570/University-of-Waikato-CCS-Report-2013-web.pdf
[2] https://www.productivity.govt.nz/sites/default/files/Productivity%20Commission_Low-emissions%20economy_Final%20Report_FINAL_2.pdf
[3] http://www.concept.co.nz/publications.html
[4] Page 3 Hydrogen in New Zealand Report 1 – Summary
[5] https://www.iccc.mfe.govt.nz/what-we-do/energy/electricity-inquiry-final-report/

both proven and technically viable, particularly if remote windfarms generate hydrogen into a national gas pipeline.

18. Even if there is sufficient capacity in the electricity generation market to produce green hydrogen, the next question is about the realism of exporting hydrogen that is more affordable or desirable than that produced in other countries. Exports must primarily be competitive on a price basis, especially if specifications are uniform from different countries.

Appendix One: Regulation of carbon capture and storage

Although carbon capture and storage is not specifically prohibited in New Zealand, there is no legislation that sets out a CCS regime or specific consenting process. This uncertain and ill-defined framework means that CCS operators could theoretically apply for consents, but detailed reports advise that the Resource Management Act is not equipped to deal with the nuances of CCS (even if "called-in" by the Minister for the Environment). The two key reports are listed below and reach the stated conclusions.

- In *Carbon Capture and Storage: Designing the Legal and Regulatory Framework for New Zealand*[6] Barry Barton of Waikato University states CCS "is probably not actually possible at all under the existing law".
- The Productivity Commission's *Low Emissions Economy*[7] report considers that the current law "*is not set up to deal with the complexities of CCS, and acts as a barrier to the uptake of these technologies*" (page 449).

The Productivity Commission's *Low Emissions Economy* report and the Waikato University paper both recommend a bespoke CCS Act.

The Waikato University paper states "*A close analysis of the RMA, the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act), and the Crown Minerals Act 1991 produces the conclusion that* ***none of those Acts is capable****, either in its detail or its general architecture,* ***of delivering the legal framework that is required for CCS***".

The main comments of the Commission and University include the following.

1. CCS is a 'removal activity' under the Climate Change Response Act ("ETS Act"). That means the removing entity (i.e. an operator of a suitable geological formation) could receive 1 ETS credit for every tonne of CO2 removed and stored (s64(1), CCRA).
2. However, that only applies where the capture and storage is related to a given operator's activities. So, if an operator were to store carbon on behalf of a third party, then that operator could not currently claim ETS credits.
3. One of the Commission's recommendations (R14.7) is to change the ETS Act so that an entity performing CCS (including capture) can receive ETS credits, regardless of whether or not that entity was the source of the CO2.
4. Like the Commission's R14.7 recommendation, the University paper recommends that the definition of 'removal activity' be wider than currently stated for CCS, i.e. that CCS be a removal activity "*whether or not the CO2 is from an activity that is required to surrender units*".
5. The Commission considers that the combined effect of the RMA, EEZ Act and Crown Minerals Act is not capable of delivering the legal framework required for CCS. In particular, the RMA was singled out for not being fit-for-purpose for CCS. For example, the RMA is not equipped to deal with the long-term liability required for CCS operations.
6. The University paper aligns with the Commission's findings on the RMA, stating "*The overall consequence appears to be that the positive effect of CCS on climate change cannot be taken into account (it is not a renewable energy project), but its possible negative effects on the environment more broadly can be. This could make it practically impossible to get consent for a CCS project…*"
7. To deal with this issue, the Commission recommends (R14.6) that a whole new piece of legislation, a CCS Act, be drafted to regulate CCS.
8. The University paper also considers that a new CCS Act is the preferred option. To clarify the interplay between any new CCS Act and current regimes like the RMA and EEZ Acts, the paper states (emphasis added) "*We conclude that new legislation should be enacted that specifically regulates the injection of CO2 for permanent sequestration, any subsequent leakage or migration, and exploration for storage formations.* ***We propose that those matters will be removed from control under the RMA and EEZ Act, and will not require permits under them***" (Executive summary, page vii)
9. The University paper (page 57) recommends any new CCS Act apply only to the injection and storage aspects of CCS operations, but other CCS activities will likely still be covered by the RMA.
10. The University paper (page 49) concludes that permits for CCS cannot be issued under the Crown Minerals Act, as CCS is outside the definition of 'mining'. The University notes that the CMA does not prohibit CCS.

[6] https://www.waikato.ac.nz/__data/assets/pdf_file/0011/179570/University-of-Waikato-CCS-Report-2013-web.pdf
[7] https://www.productivity.govt.nz/sites/default/files/Productivity%20Commission_Low-emissions%20economy_Final%20Report_FINAL_2.pdf