

Submission

A vision for hydrogen in New Zealand

We welcome the opportunity to submit on the Green Paper, a vision for hydrogen in New Zealand. The discussion document provides an important opportunity to discuss the role hydrogen may play in New Zealand's transition to a low carbon economy.

Fonterra is a member of the Major Gas Users' Group (MGUG) and Major Energy User Group (MEUG) and supports the points raised in those submissions, as well as making additional points in this submission.

As our Co-operative is proudly owned by around 10,000 New Zealand farmers and their families, we take a long-term view for our industry and country. Embedding sustainability at the heart of everything we do is a strategic priority.

Fonterra operates 30 manufacturing sites across New Zealand. Roughly one third of our sites rely on coal as the primary source of energy, and most of these are in the South Island where there is no gas or feasible energy alternatives. The remainder of our manufacturing sites use natural gas to provide process heat. While the size of the challenge to transition to clean energy is significant, we have been taking steps to change our energy profile.

Since 2003 we have been improving the energy efficiency of our sites and we are on track to reach our goal of a 20% reduction in energy intensity by 2020, based on 2003 levels.

In 2017, with the Ministry for the Environment we created a Roadmap to a Low Emissions Future. We have committed to achieving net zero emissions by 2050, on the way to using 100% renewable energy for our manufacturing operations. We have set an interim target of achieving a 30% reduction in emissions by 2030 based on 2015 levels.

We have recently announced that six of our manufacturing sites in water-stressed regions will reduce their water use by 30% by 2030, and that all other sites will continuously improve water efficiency. We have also announced that we will not install any new coal boilers or increase capacity to burn coal.

Some recent examples of our commitment to changing our energy profile are:

- In 2018, our Brightwater site near Nelson switched to co-firing biomass, helping reduce CO₂ emissions by 25%, or about the same as taking 530 cars off the road.
- Earlier this year we successfully trialled replacing coal with wood pellets at our Te Awamutu site.
- We are progressing our 'electric milk' program, with electrification of our Stirling site in Otago. By moving to electricity, coal use will be reduced by about 10,000 tonnes per year.
- Fonterra has worked closely with Z Energy since 2014 to introduce biodiesel to New Zealand. Now more than 150 of our milk tankers in the Waikato and Bay of Plenty regions use this product.

Fonterra's decarbonisation journey will be a combination of many different process and technical changes.

Our transition to low emission generation of process heat requires significant investment in many different areas. Another consideration is the range of technology and fuel sources currently available to ensure we can continue to efficiently process our farmers' milk while meeting these targets. We also have a range of existing assets, many of which still have considerable life left.

We would not look at opportunities for hydrogen in isolation but would need to consider a range of options in synchronicity to meet our emissions reduction targets.

Fonterra supports the Government's goal of transitioning to a low carbon future, which includes opportunities for the use of hydrogen for industrial processes in New Zealand. We are committed to working with others and playing a leading role in ensuring the New Zealand dairy industry remains at the forefront of low emissions food production.

Regards

A handwritten signature in blue ink, appearing to read 'A.M. Oosten', with a long horizontal line extending to the right.

Tony Oosten

Sustainable Energy and Utilities Manager

**Our Co-operative, empowering people, to create goodness for generations,
You, me, us, together
Tātou, Tātou**

Response to questions

Building hydrogen into a low emissions economy

Reference	Question	Response
1a	What is the role of Government in developing hydrogen for storage and distribution?	<p>Hydrogen is just one of many potential, low carbon, energy sources that should be investigated for feasibility in New Zealand's transition to a low emissions economy. While hydrogen will have application in some areas, it will not be the only solution.</p> <p>As hydrogen is just one part of the energy transition, the government will have an important role in ensuring policy and regulation is timely and relevant for transitional changes across the entire energy network.</p>
1b	What are the challenges for using hydrogen for storage and distribution?	<p>The transition to a low emissions economy will require significant changes across all areas of the energy sector. Hydrogen will be one factor of this transition.</p> <p>A significant challenge will be balancing the potential development of hydrogen alongside other energy opportunities.</p> <p>The benefits and costs of an energy transition – whether that be hydrogen or another source - will be split between the public and private sectors. Likewise, the allocation of these costs and benefits will be challenging.</p>
1c	What are the opportunities for using hydrogen for storage and distribution?	<p>Green hydrogen presents an opportunity along with other renewable energy sources to help New Zealand meet its decarbonisation targets.</p> <p>There may be an opportunity to produce hydrogen from electricity in periods of low demand on the national grid and store this hydrogen for peak demand periods. Stored hydrogen may support the business case for the increased and faster build of renewable electricity capacity in New Zealand, as it would allow greater asset utilisation.</p> <p>Stored hydrogen could also provide options for existing gas generators to generate electricity during peak periods and therefore manage spot price peaks.</p>

Hydrogen for a resilient energy system

Reference	Question	Response
2a	What is the role of Government in developing the complementary role of electricity and hydrogen?	<p>Hydrogen is just one of many potential, low carbon, energy sources that should be investigated for feasibility in New Zealand's transition to a low emissions economy.</p> <p>As hydrogen is just one part of the energy transition, the government will have an important role in ensuring policy and regulation is timely and relevant for transitional changes across the entire energy network.</p> <p>New Zealand can expect significant growth in demand for electricity from the decarbonisation of process heat and</p>

		<p>transport. Legislation should facilitate the development of supply to match demand growth.</p> <p>The government should also ensure domestic decarbonisation and energy security are not compromised by prioritisation of export revenue opportunities.</p>
2b	What are the challenges for achieving this complementary role of electricity and hydrogen?	<p>There is a risk that should New Zealand begin exporting hydrogen, domestic users could face international pricing for hydrogen. This could both increase and create volatility in pricing.</p> <p>This could also affect New Zealand's electricity prices if electricity is able to be converted to hydrogen for export at higher revenue than supplying the domestic market.</p> <p>We note that there is limited discussion in the Green Paper about the source of water used to generate hydrogen.</p> <p>Water is an important resource for many sectors in New Zealand, including manufacturing and agriculture. As water resources are constrained in many parts of the country, the location of hydrogen production needs to consider availability of water resources in the early stages of feasibility and design.</p>
2c	What are the opportunities for this complementary role of electricity and hydrogen?	<p>Green hydrogen presents an opportunity along with other renewable energy sources to help New Zealand's transition to a low emissions economy.</p> <p>There may be an opportunity to produce hydrogen from electricity in periods of low demand on the national grid and then store this hydrogen for peak demand periods. This may support the business case for increased and faster build of renewable electricity capacity in New Zealand, as it would allow greater utilisation of capital.</p>

Hydrogen for mobility

Reference	Question	Response
3a	What is the role of Government in supporting hydrogen use for the transport sector?	<p>As outlined in the Green Paper, there are a range of options for decarbonisation in transport. We believe that the government must work with industry when developing regulations to ensure they will be appropriate for all transport applications.</p> <p>Fonterra would support collaborative Industry-Government pilot studies to test the feasibility of hydrogen transport in our industry.</p>
3b	What are the challenges when using hydrogen for mobility and transport?	<p>Fonterra manage a fleet of 520 milk tankers in New Zealand. Our tankers visit our Farmer shareholders everyday throughout the milk season in locations right across New Zealand. Each year our tankers cover around 96 million kilometres.</p> <p>Fonterra's transport team are committed to reducing emissions and are constantly engaged in reviewing truck technology for new innovations. Due to the long-distances covered by our tankers and variable road conditions, there are currently no</p>

		<p>technically feasible options for hydrogen tankers that would suit New Zealand conditions.</p> <p>Additionally, our manufacturing sites are largely based in rural locations, so building and maintaining infrastructure for hydrogen re-fuelling could be costly. These factors will influence the technical feasibility and economics of hydrogen compared to other low emission options. This makes it difficult to provide a useful assessment of the potential of hydrogen as a fuel for our tanker fleet.</p>
3c	What are the opportunities for using hydrogen for mobility and transport?	As stated in the Paper, hydrogen vehicles may have some advantage over electric batteries due to range and weight. Due to the lack of maturity of both technologies for our application, it is too early to have a preference for either technology or compare to other low emission options.

Hydrogen for industrial processes

Reference	Question	Response
Pg61	General comment	<p>We note the Paper states there are 99 dairy manufacturing sites in New Zealand (66 in the North Island and 33 in the South Island). Fonterra operates approximately 30 sites in New Zealand and is the largest dairy manufacturer, so this number appears to be too high.</p> <p>We believe the report may be referring to the number of boilers Fonterra operates. If so, this number would still be inaccurate as there are many other dairy manufacturers located around New Zealand who also operate boilers meaning the number will be higher than 99.</p>
4a	What is the role of Government in encouraging the use of hydrogen for industrial processes including process heat supply?	<p>We support the assertion made in the paper that the key opportunity for Fonterra is to work closely with Government and other industrial processing sectors on an integrated approach to decarbonise.</p> <p>We have previously engaged with the government and wider industry through various workstreams currently underway including Process Heat, Electricity Price Review, Transmission Pricing Methodology Review, changes to the Gas Act, and ICC work on 100% Renewable Electricity Target. We encourage continued collaboration between industry and government on these workstreams.</p> <p>We believe it would be beneficial to have greater coordination between the multiple workstreams, including a clearer understanding of the impact each workstream has on the others.</p> <p>Fonterra’s decarbonisation journey will be a combination of many different process and technical changes, so we would not look at opportunities for hydrogen in isolation but would need to</p>

		consider a range of options in synchronicity to meet our decarbonisation targets.
4b	What are the challenges for using hydrogen in industrial processes?	<p>Fonterra agrees with challenges outlined in the paper, including: security of supply, price of hydrogen, long-term predictability of price, cost of transitioning, certainty of policy around energy network changes and cost allocations for infrastructure.</p> <p>We believe the risk of New Zealand investment in hydrogen generation from renewable electricity is that should we begin exporting hydrogen we could face international market prices for hydrogen, and potential price volatility.</p> <p>A potential challenge for industrial scale hydrogen is that electricity and water are required – both of which are key process inputs for Fonterra’s operations. Depending on the location of hydrogen processing plants, this could create resource competition for Fonterra, particularly in water constrained regions.</p> <p>The electrification of process heat is an important part of Fonterra’s decarbonisation plan. The paper states several times that New Zealand has an abundance of renewable energy, but renewable electricity in the volumes required to support process heat transition from fossil fuels is not yet available.</p> <p>We see a risk in renewable electricity growth being used to support hydrogen production rather than the transition of fossil fuel process heat to electricity. It is likely to be more efficient to use electricity directly rather than convert to hydrogen, and then use hydrogen for process heat.</p> <p>The timing of hydrogen manufacture, infrastructure build, and reliable distribution is an important factor of uptake of this technology. The challenge is whether hydrogen is ready for industrial use in New Zealand before we have already transitioned our sites to alternative energy sources.</p> <p>Fonterra has committed to a 30% reduction in emissions by 2030 in our New Zealand Operations, going to net zero by 2050. As part of this, we have already started implementing our emission reduction plan, with capital spend on boilers and electrification at several of our manufacturing sites. As noted in the paper, current boiler infrastructure has a long lifespan. Replacement happens infrequently and takes time to plan. Hydrogen is not currently at the stage where we can start building the use of it into our transition plans.</p>
4c	What are the opportunities for the use of hydrogen in industrial processes?	<p>As noted in the paper there is an opportunity for government to work with Industry to understand how hydrogen can be incorporated into the dairy sectors energy requirements.</p> <p>Fonterra would like to continue engagement on opportunities for the use of hydrogen for industrial processes in New Zealand.</p> <p>There is potential to utilise some of our current gas boilers for hydrogen due to a lower capital cost than a complete replacement to another technology.</p>

Decarbonising Gas Supply

Reference	Question	Response
5a	What is the role of Government in encouraging hydrogen uptake for decarbonisation of our natural gas uses?	<p>We believe the government has an important role in ensuring legislation and regulation is suitable to allow the development of hydrogen.</p> <p>In May 2019, changes to the Gas Act (1992) were proposed and submissions on the discussion document 'Options for amending the gas act 1992' were sought. It is important that workstreams, such as the Green Paper: A vision for hydrogen, and the review of the Gas Act are co-ordinated. As an example, the Gas Act review states that hydrogen can be incorporated in the natural gas pipeline up to 15%, and the hydrogen Green Paper cites up to 20%.</p> <p>The government could look to leverage work already commissioned in other countries to answer some of these feasibility questions.</p>
5b	What are the challenges for hydrogen to decarbonise the applications using natural gas?	<p>As noted in the paper, variability of hydrogen volumes blended into natural gas would have an adverse impact of operation of existing equipment. Prioritisation of consistency is important. A predictable, consistent incorporation to maintain a constant calorific value will allow users to manage blended gas with minimal impact. It will also allow pricing based on energy content to be consistent and fair.</p> <p>The timeline of extending hydrogen to 20% of natural gas supply by 2035 is challenging to current timelines for meeting climate targets in 2030 and 2050. Longer term decisions around investment in infrastructure and alternative technologies will be developed before 2035.</p>
5c	What are the opportunities for hydrogen to decarbonise our gas demand?	<p>There is an opportunity to incorporate hydrogen at low volume in a blend with natural gas using the existing gas network in the North Island. This will allow some reduction in carbon at a reasonable infrastructure cost.</p>

Hydrogen for export

Reference	Question	Response
6a	What is the role of Government in producing hydrogen in sufficient volume for export?	<p>The paper states that exporting hydrogen is an aspirational goal and is based on New Zealand's abundant renewable resources. We believe the government has a key role in ensuring that this aspiration is balanced with the demands of the domestic energy market. Policy and infrastructure must be developed to support the growth of this market without sacrificing domestic energy sovereignty, security or price.</p>
6b	What are the challenges for hydrogen if produced for export?	<p>As stated in the paper, a major challenge and risk is to ensure both hydrogen and indirectly, renewable electricity, are not priced to an international market at the disadvantage of domestic consumers. We note this occurred on the east coast</p>

		<p>of Australia in 2016 when the LNG market was developed for export.</p> <p>We agree that the government needs to ensure that there is no adverse effect on the security of New Zealand's domestic electricity supply or pricing.</p>
6c	What are the opportunities for hydrogen if produced for export?	Revenue generated from exporting hydrogen made from excess renewable energy may support the business case for increased and faster build of renewable electricity capacity in New Zealand, as it would allow greater utilisation of capital.

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