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Ministry of Business, Innovation and Employment

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Interim Hydrogen Roadmap

Meridian appreciates the opportunity to comment on the Government's Interim Hydrogen Roadmap. Nothing in this submission is confidential.

Meridian agrees with many of the observations in the Interim Hydrogen Roadmap, in particular that hydrogen has potential in parts of the New Zealand economy where emissions are difficult to abate through electrification. We also see a significant opportunity to grow the New Zealand economy both through the export of low-emission hydrogen (likely in the form of ammonia) and through support for domestic consumers as demand develops.

Meridian strongly supports the position statement from the Government welcoming private hydrogen export activity like Southern Green Hydrogen

Meridian, Woodside Energy, Mitsui & Co, and Ngāi Tahu are working on a partnership to develop a world-class hydrogen and ammonia export facility in Southland, New Zealand, called Southern Green Hydrogen (SGH).

The delivery of a new, low-cost, low-emission hydrogen and ammonia facility fuelled (wholly or predominantly) by renewable energy or certified as such, and backed by large and credible organisations, will be globally significant and an important step in global decarbonisation efforts. SGH will provide benefits to the local Southland community during construction and once the facility is up and running.

This large-scale green hydrogen facility, initially focused on the export market, will help accelerate the development of a new hydrogen economy in New Zealand and help strengthen the country's ability to decarbonise the hard-to-abate heavy transport and industrial sectors. The aim is to create a world-class collaboration that covers the full green hydrogen and ammonia supply chain, creating jobs and a new industry for Aotearoa. The project would also incentivise generation development in the Southland region.

Meridian's SGH project is focused initially on export markets and would open up domestic opportunities in the longer term

The Interim Hydrogen Roadmap acknowledges that export could play a role in underpinning the commercial viability of hydrogen production in New Zealand by allowing an industry to scale ahead of domestic demand. Meridian agrees with this view. We consider production at scale to be necessary for the commercial success of hydrogen production. The market for low-emissions hydrogen in New Zealand is small and nascent. Therefore, to support large-scale production, the SGH project is seeking large cornerstone customers for the offtake. Given New Zealand's location, we see markets like Japan and South Korea as our obvious end market.

Markets like Japan are on their own decarbonization journey but do not have the abundance of renewable resources that New Zealand enjoys. We therefore expect the decarbonization of such economies to be reliant on the emergence of a hydrogen and ammonia export market. The effort to mitigate climate change is global. If New Zealand can use its renewable energy advantage to help decarbonize other countries, while growing the New Zealand economy, it will be a win-win.

The emergence of an export market could also enable domestic uses of hydrogen in hard to abate sectors like heavy transport. While SGH would initially serve the export market, hydrogen production is inherently scalable and modular so to the extent that domestic demand for the product eventuates, SGH would be able to scale up production with relative ease and lower cost than stand-alone, smaller-scale production options.

SGH will be able to supply the domestic market to the extent that domestic demand grows and a market for the product emerges. Meridian hopes the commitment of \$100 million over ten years from the Government's Budget 2023 will help to build a domestic market for hydrogen by closing the price gap between green hydrogen and fossil fuels through long-term contracts between the Government and commercial hydrogen consumers. The scheme

should help build skills, industry knowledge, and supply chains, to support the emergence of a domestic green hydrogen industry and further growth that would be enabled by SGH.

We understand that the Government wants to ensure hydrogen deployment happens at pace with the supporting generation and transmission investment

The Government has indicated that it intends to undertake further work to better understand the integration of hydrogen in the broader electricity system. The consultation paper also expresses some concerns that exporting hydrogen has the potential to more directly link New Zealand's electricity prices to a global commodity market, although it acknowledges that the extent to which this could occur is uncertain.

Meridian does not think exporting hydrogen would more directly link New Zealand electricity prices to a global commodity market. That has not been the case for energy intensive aluminium production in New Zealand and there is no reason to think hydrogen would be any different. We would expect SGH to compete in a globally competitive market but that in order to invest with confidence offtake agreements would be long-term in nature and for a fixed price. Any hydrogen production facility would also enter long term electricity contracts to secure price certainty for the energy inputs. These long-term contractual arrangements would mean that fluctuations in international prices for hydrogen would not flow through to wholesale electricity prices.

Fundamentally we also dispute the hypothesis that changes in the contractual arrangements between parties to an electricity agreement will have a flow on impact to wholesale electricity prices. Any change in contract prices agreed between the parties will affect the commercial position of the parties but will not have any impact on the supply and demand balance in the rest of the market and or the underlying investment incentives for new generation to enter the market as demand grows and/or wholesale prices are forecast to be higher in the long-term.

Meridian is also aware of concerns from other stakeholders about the potential effects of large-scale hydrogen production on wholesale electricity prices. In Meridian's opinion such caution is unfounded.

Any scenario with both aluminium and hydrogen production in Southland (i.e. leading to a net increase in existing demand) would be contingent on simultaneous generation development and there are many development opportunities in the South Island due to historic

underinvestment for various reasons.¹ There is a strong pipeline of renewable generation development options that exceeds demand forecasts and could reasonably be expected to also supply hydrogen production.

The electricity sector commissioned Boston Consulting Group (BCG) to, amongst other things, assess the strength of the renewable generation pipeline in New Zealand. Based on information provided by the sector, BCG found that “there is more than enough renewable energy generation in the project pipeline to achieve the roadmap’s aim of 98% renewable generation by 2030.” In fact, as the chart below indicates, the pipeline of available options is more than double the anticipated system needs for 2030.



The Electricity Authority has also observed “evidence of a promising pipeline of committed and actively pursued investment in new renewable generation”.² Meridian alone has committed to a target of bringing seven new large-scale renewable generation projects into operation around Aotearoa in the next seven years.³

The Ministry of Business, Innovation and Employment’s own analysis also identifies a healthy pipeline of renewable generation options estimating that New Zealand’s identifiable on-shore wind options at between 37 and 42TWh.⁴ In addition there is an estimated 8 to 12TWh of geothermal options,⁵ and 5 to 10TWh of grid-scale solar potential. Clearly, Aotearoa has an abundance of affordable new renewable generation options, and some combination of these options could be developed to serve the 5TWh of additional electricity demand that could be created if SGH proceeded alongside the aluminum smelter. That additional 5TWh would be

¹ For example, prior to 1 April 2023 the transmission pricing methodology required South Island generators exclusively to pay the costs of the HVDC cable between the North and South Islands, despite the national benefits of that cable. The Electricity Authority said this “acts like a tax on South Island generation” and “inefficiently discourages investment in South Island generation”.

² https://www.ea.govt.nz/documents/3017/Decision_paper_promoting_competition_through_the_transition.pdf

³ <https://www.meridianenergy.co.nz/news-and-events/meridian-energy-targets-seven-large-new-renewable-energy-projects>

⁴ <https://www.mbie.govt.nz/assets/wind-generation-stack-update.pdf>

⁵ <https://www.mbie.govt.nz/assets/future-geothermal-generation-stack.pdf>

over and above other baseload, industrial and transport electricity demand growth estimated at an additional 10TWh per decade to 2050.⁶

Historically, the industry has a strong track record of building the necessary renewable generation to support increases in electricity demand. Since 1996, the market has seen the New Zealand electricity sector invest in over 20,000 GWh of new electricity generation at a cost of over \$9 billion. This investment has been diversified and has not been dominated by any particular technology or fuel source or by any single company or companies. The risks of these investments have been borne by private investors rather than directly by taxpayers. We note that:

- ten years ago, around 65 percent of New Zealand's electricity was from renewable sources (compared to around 85 percent today);
- since 2012, 1026 MW of thermal capacity has been retired and replaced by new largely renewable generation; and
- between 2003 and 2014, Meridian alone commissioned over 400MW of wind generation.

We are confident that the market will continue to deliver new generation as and when required to meet the expected growth in electricity demand as we move towards the 2050 target in Aotearoa, including if hydrogen production accelerates in New Zealand.

There is a significant opportunity for flexible hydrogen production to address dry year and peak capacity needs, reducing current reliance on fossil fuels

In Meridian's opinion, building new renewable electricity generation to support hydrogen production is not likely to be a significant issue. The greater challenge for the electricity system is the need for flexible resources that can alter their supply or demand in harmony with the electricity system to:

- manage dry years; and
- ensure peak capacity is available to serve demand on cold, dark, windless winter evenings (this challenge is immediate and may become more pronounced in future).

Currently, fossil-fuelled electricity generation provides that flexibility. However, as thermal generators reach their end of life and emissions prices make further investment in thermal generation more expensive, the value of flexible renewable resources will increase.

⁶ <https://web-assets.bcg.com/b3/79/19665b7f40c8ba52d5b372cf7e6c/the-future-is-electric-full-report-october-2022.pdf>

The economics of any investment in hydrogen production in Aotearoa are finely balanced and we consider the key factor to be the flexibility of electrolysis. Financially rewarding that flexibility can reduce the total energy input cost and make hydrogen production in New Zealand commercially viable.

Concept Consulting has modelled the potential for flexible electrolysis plant in Southland, finding that:⁷

“... large-scale flexible demand from a facility such as a hydrogen production plant can potentially deliver significant system flexibility benefits. Coupled with renewable overbuild, and assuming the plant could manage significant reductions in output during dry years, such a facility could help New Zealand cost-effectively achieve 100% renewable generation.”

The analysis also found that:

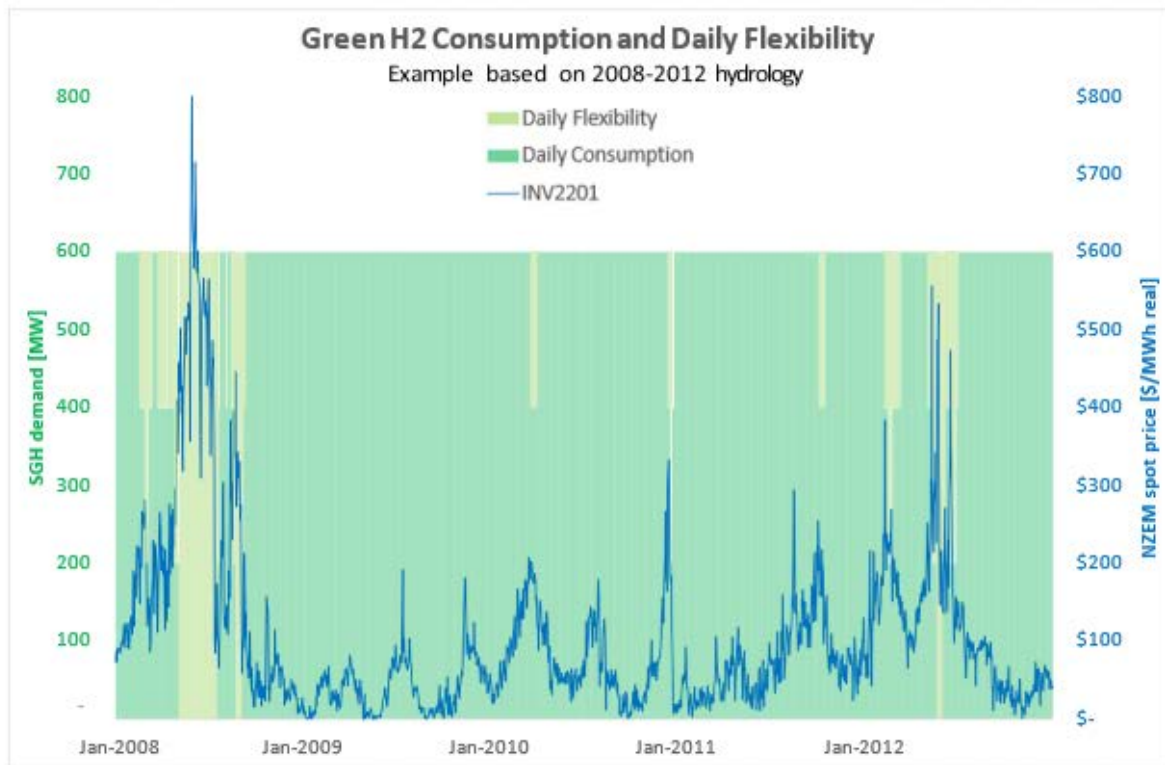
- over-build will increasingly reduce the amount of resource required to meet year-to-year variations in hydro generation. i.e. we will still have a dry-year problem, but the size of the dry-year problem will become progressively less over time; and
- the significant increase in wind and solar generation with their much greater short-term volatility will give rise to greater need for flexibility resources that can operate over shorter durations: within-day and within-week.

Meridian believes that a green hydrogen facility can commercially and technically provide a demand-side response back to the New Zealand power system during dry years through a reduction in its production from time to time achieved by ramping down hydrogen electrolyzers. This demand-side response is valuable to New Zealand and is a key element of the project to commercially reward the supplier of the flexibility and improve the economics of hydrogen production overall.

An example of what may be possible is shown in the chart below. The chart shows that, historically, as New Zealand’s hydro storage levels have declined in response to prolonged lower-than-average rainfall, spot market power prices (blue) have naturally begun to increase in response to tightening supply and demand conditions. The commercial response from the operators of the SGH facility would be to reduce consumption in line with flexibility requirements until such time as spot power prices begin to decrease and lake levels start to recover. We expect to see SGH load during periods of market stress reduce (light green),

⁷ https://www.concept.co.nz/uploads/1/2/8/3/128396759/h2_flex_analysis_v3.0.pdf

while facility consumption and operation most of the rest of the time would otherwise be baseload (dark green).



In addition to dry years (which are expected to be less of a problem in future) the demand response envisaged at the SGH facility would be able to respond to any high price event that has some visibility in advance. In this way we expect SGH would offer demand response not only in support of dry years but also to support the peak capacity needs of the power system.

The actions proposed in the Interim Hydrogen Roadmap

Meridian considers it likely that the emergence of a hydrogen economy in New Zealand will be driven primarily by market forces and emissions pricing. However, Meridian is broadly supportive of several of the proposed actions outlined in the Interim Hydrogen Roadmap, which would be regulatory enablers. In particular:

- Consideration of whether resource management regime settings are supportive of the required renewable electricity generation to accompany investments in hydrogen production (or for that matter necessary to meet other electricity demand growth). There is currently a risk that the proposed reforms will not improve the situation and will create additional investment uncertainty during the transition.

- Consideration of the potential to add hydrogen infrastructure to definitions of renewable energy infrastructure in planning legislation, and the fast-track consenting regime as well as supporting initiatives to promote greater awareness and understanding of hydrogen technology amongst decision-makers like consenting authorities.
- Consideration of whether emissions-intensity standards and guarantee of origin schemes could be developed by government to enable certification of hydrogen production sources and support the development of a market for green hydrogen. In Meridian's opinion, such certification schemes will be dependent on the needs of international purchasers and Meridian would appreciate government working with the SGH project in the event that hydrogen purchasers identify a need for government certification or assurance of product origins.

We note that the Interim Hydrogen Roadmap also sets out a plan to establish a government and sector body to help coordinate ongoing action to support hydrogen deployment. It is not clear to us what role this coordination body would play. However, if it is established, it is critical that the electricity industry is well represented given that electricity costs are the main cost component in hydrogen production and many of the governments concerns seem to be about the effects of increased demand for electricity as a result of hydrogen production.

Conclusion

Regardless of whether or not development of a Hydrogen Roadmap continues under the new government, Meridian considers the three actions listed above to be no-regrets actions that should be considered by any government as they will deliver benefits to consumers, enable the growth of the New Zealand economy, and help to reduce global emissions.

Meridian would be happy to discuss the views in this submission with Ministers and officials.