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Consultation on advancing New Zealand's energy transition

Genesis Energy welcomes the opportunity to provide feedback on the Ministry of Business, Innovation and Employment's package of consultations on advancing New Zealand's energy transition. We would like to also express our gratitude for the opportunities to engage directly with officials since the papers were released, and over the course of the ongoing process of developing the New Zealand Energy Strategy.

From the outset, we note that this consultation package was produced and released to support a policy direction that, subject to the final results of General Election 2023 and subsequent coalition negotiations, appears unlikely to be entirely consistent with the incoming Government's objectives over the next parliamentary term.

Recognising this, this response focuses on issues Genesis considers to be 'evergreen', and on which we are well placed to offer a view. Given the linkages between the distinct parts of the energy system, this letter constitutes Genesis' response to:

- **Measures for transition to an expanded and highly renewable electricity system**
- **Gas Transition Plan issues paper**
- **Interim hydrogen roadmap**
- **Developing a regulatory framework for offshore renewable energy**

Irrespective of shorter-term changes to the policy environment, New Zealand's objective of net-zero long lived emissions by 2050 has been legislated with near-unanimous support. The energy system will play a key role in meeting this objective, with the contribution of New Zealand's highly and increasingly renewable electricity system a key enabler.

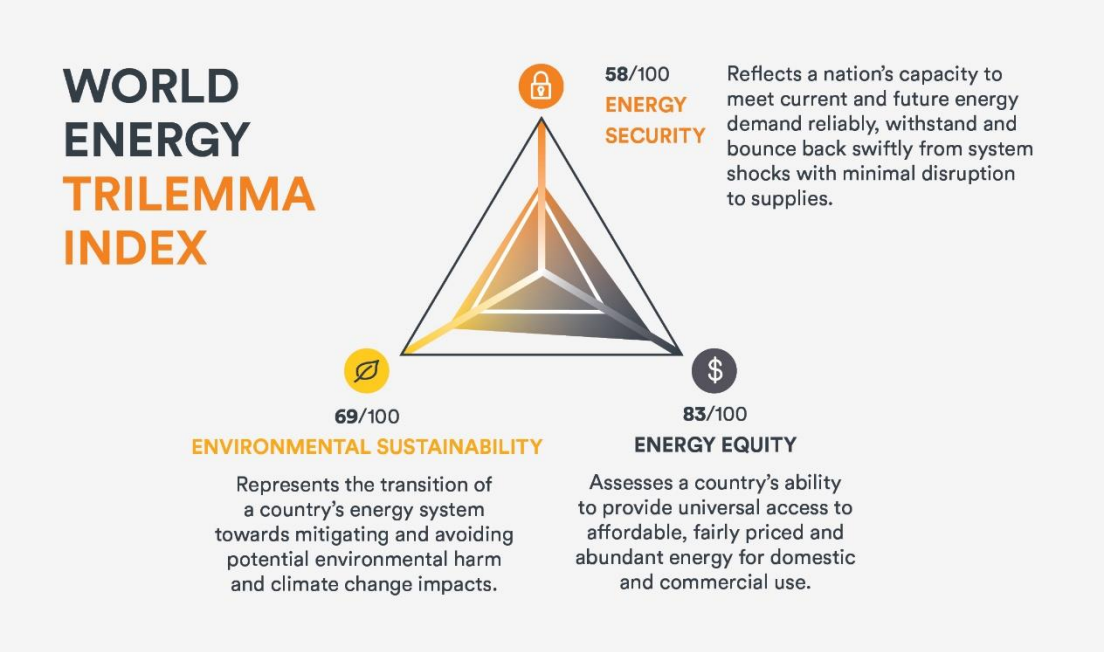
While the 'destination' for New Zealand's decarbonisation journey (net-zero long lived gases by January 2050) is clear in legislation[1], the form that transition will take is uncertain. A stable

[1] https://www.legislation.govt.nz/act/public/2002/0040/latest/whole.html?search=sw_096be8ed81dba45e_operator_25_se&p=1#LMS282014

and well-functioning emissions trading scheme will be a key tool in driving behaviour change among households and businesses, but technological change (including cost), consumer preferences, and external factors will all play a role in the pace at which different sectors of the economy decarbonise.

What is certain is the scale of the opportunity New Zealand's abundant resources offer in supporting the transition. Historically, Aotearoa has enjoyed a highly renewable electricity system that delivers high levels of reliability at some of the most competitive consumer prices in the OECD. An orderly and equitable transition relies on upscaling this electricity system, while continuing to ensure these three pillars of the 'energy trilemma' are kept in balance.

Figure 1



[2]

In the remainder of this submission, we set out our views on the following key points:

1. Renewable electricity is and will become increasingly critical to a just transition for Aotearoa. While renewables make up an increasing proportion of New Zealand's electricity generation, it will be critical to ensure availability of the flexible assets that can provide security across short (capacity) and long (energy) durations.
2. 'Dry years' are likely to become increasingly less frequent, but the need to manage the system through them remains as important as ever. We urge policymakers to be mindful of the economics of providing dry year cover as the electricity system evolves further away from the one the architects of the current market had in mind. Flexible gas supply has an important role to play.
3. Offshore wind and, potentially, hydrogen have considerable potential to contribute to New Zealand's transition and future economy. It is worth considering how established assets and businesses can help accelerate the development of renewable resources.

Renewable electricity is growing

[2] World Energy Council 2020

The will is there to make the investments required to grow the electricity system to meet demand, and to do this with renewable technologies. With global capital competing for opportunities to invest in the transition to net-zero, the key determinant of how quickly new renewable generation gets built resides on the demand side.

Analysis from Boston Consulting Group (BCG) in 2022[3] found that New Zealand's aggregate renewable build pipeline was more than adequate to meet the country's expected requirements in 2030, including supporting greater electrification across the economy.

While encouraging, this analysis does come with caveats:

1. More than half of the 10.9 GW of intended new build was unconsented at the time of the study. Accordingly, the resource management framework of the day remains a key influence over the speed with which new assets can be connected to the system.
2. Almost all of the new capacity is wind or utility scale solar generation. The system will need to retain sufficient backup through dispatchable, non-weather dependent generation and demand response to ensure secure supply when the weather does not support generation.

Considering the above, it is reasonable to conclude that market settings remain appropriate to support investment in the new renewable generation that will be required to drive the transition, subject to the ability to secure the necessary approvals.

MBIE's *Measures for transition to an expanded and highly renewable electricity system* (EMM) paper raises for discussion a range of measures in use in overseas jurisdictions to increase the contribution of renewable technologies to countries' electricity systems. It is worth noting that the territories cited – United Kingdom, Spain, Germany, and Victoria (Australia) – still secure more than half of their electricity supply from non-renewable sources. In contrast, New Zealand's proportion of renewable generation was 87% last year, and 91% in the June quarter 2023[4].

Genesis' analysis suggests, based on publicly available information, New Zealand's electricity system is on track to be 90% renewable by 2025, and 96%-98% renewable by 2030.

Accordingly, whilst it is important to remain watchful for the emergence of issues that could stunt or reverse New Zealand's progress towards a more highly renewable and lower carbon system, security of supply and ensuring an orderly and equitable transition remain critical to achieving our goals in a practicable way.

Security required across various durations

MBIE's EMM paper rightly draws the important distinction between the different security requirements of the current electricity system. Short-term (hours / days) supply constraints have historically been associated with demand peaks approaching the level of available supply. Increasingly, these constraints can be expected to be associated with periods that are unusually or unexpectedly still and / or cloudy. Furthermore, the forecast large increase in solar capacity on the system will be of little use during early morning and evening peaks, absent associated storage capacity or co-optimisation with dispatchable assets.

[3] https://web-assets.bcg.com/b3/79/19665b7f40c8ba52d5b372cf7e6c/the-future-is-electric-full-report-october-2022.pdf
[4] MBIE statistics; https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/electricity-statistics/

The ‘capacity’ constraints described above are becoming more common. MBIE, the Electricity Authority and others have noted that as intermittent renewables increasingly dominate the supply side, meeting peak demand is becoming more challenging.

Conversely, New Zealand’s historic challenge concerning managing longer-duration constraints (weeks, months, or seasons where hydro inflows are low) is becoming a less pressing concern.

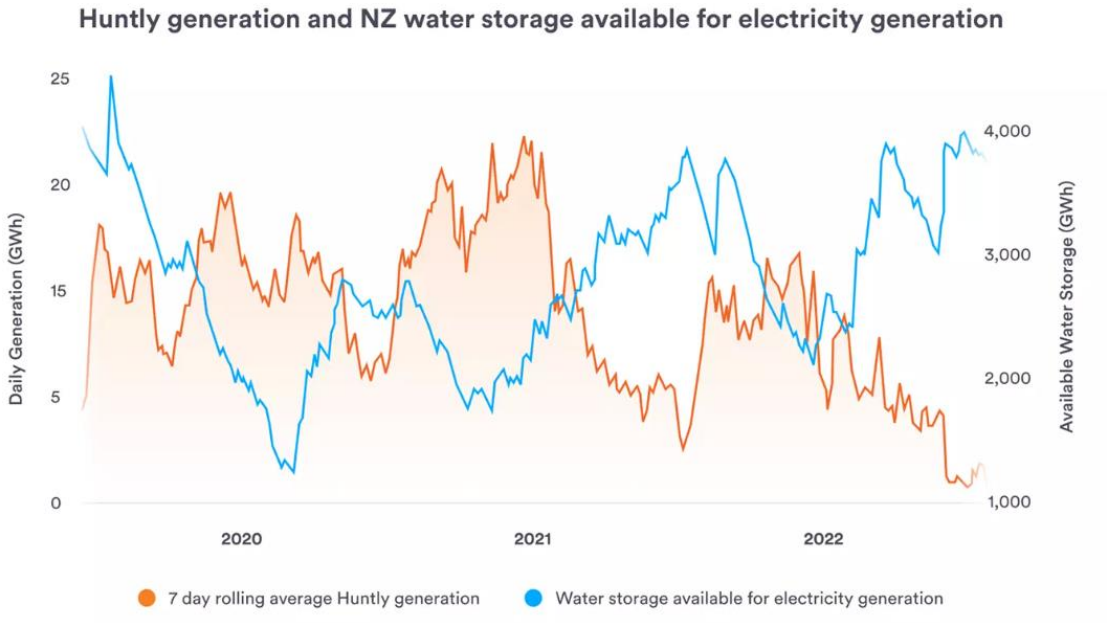
Nevertheless, while extended dry spells resulting in constrained electricity supply are likely to occur less often in future, there are still expected to be periods when the aggregate of energy available to renewable sources is insufficient to meet demand without thermal backup.

For more than forty years, the gas- and coal-fired Rankine units at Huntly Power Station have been called upon to see the system through hydro shortfalls. Currently, three of these slow-start units are available to generate depending on market conditions, offering a combined 750 MW of capacity.

Unit 5 (formerly e3p) was commissioned in 2007, adding 400 MW of high efficiency baseload gas generation to the site. Unit 6, a 51 MW fast start peaker plant that can run on gas or diesel, was commissioned in 2004.

As figure two below demonstrates, generation from Huntly Power Station is highly correlated with periods of low storage in New Zealand’s hydro catchments.

Figure 2



[5]

New renewables, both intermittent and baseload, will increasingly supplement the current hydro-dominated system. But as demand increases, and activities historically reliant on fossil

[5] Genesis analysis

fuels (in particular transport and low- and medium-temperature process heat) become reliant on electricity, the consequences of energy shortfalls become more severe.

The challenge is economics, not asset capability

Higher demand and greater intermittency are not problems in themselves. Aotearoa currently has sufficient backup capacity via Huntly Power Station and other remaining thermal plants to meet demand.

Ensuring security of supply requires consideration of the distinct peak / capacity and energy requirements of the system. The Electricity Authority, Transpower, and industry have done a considerable amount of work[6] on options to manage peak demand in winter and this work continues.

Genesis agrees that the costs associated with establishing and administering a capacity market are unlikely to be outweighed by benefits in improved security of supply, which we anticipate would be limited. However, appropriately targeted mechanisms, such as that proposed by the CEO Forum in response to security of supply concerns around winter 2023[7], should remain under consideration until peak supply margins improve.

We believe that, over time, shorter-term (hours / days) supply constraints will be manageable with available technology, and that the high spot prices likely to accompany greater intermittency in the system should provide sufficient incentives for the necessary investments (in capacity, short term storage, and demand response) to occur. For example, Transpower data indicates[8] that the grid owner has received 12 live connection enquiries for battery electric storage systems (BESS), which depending on their size could make meaningful contributions to improving capacity margins. Genesis considers that BESS are likely to play a role within our portfolio in future, including located at Huntly Power Station.

To the extent that additional fast-start gas-fired generation is necessary to meet peak demand, there are additional considerations to the above with respect to investment certainty and accessing fuel on appropriate terms. These are addressed below in response to the matters raised in the Gas Transition Plan issues paper.

While we consider peak demand to be well understood and relatively manageable, it is not obvious that this is the case with respect to longer-duration security.

In its recent *Ensuring an orderly thermal transition* consultation paper[9], the Electricity Authority concludes that while (particularly slow-start) thermal utilisation is expected to decline over the coming decade, the current Energy Only Market will provide sufficient revenue for asset owners to ensure the necessary level of thermal backup remains available.

Genesis' internal modelling differs from that commissioned for the Authority's study. However, at a high level the analysis is consistent in finding there remains a need for storage-backed capacity like the Huntly Rankine units in providing dry year security into the future. The analysis is also broadly consistent in finding that the expected declining utilisation rates of this plant result in very volatile cashflows; negative in most years but able to generate sufficiently in very dry periods to cover their long run costs over time.

[6] https://www.ea.govt.nz/projects/all/managing-peak-winter-electricity-demand/consultation/driving-efficient-solutions-to-promote-consumer-interests-through-winter-2023/
[7] https://www.ea.govt.nz/documents/1655/CEO-Forum-Submission-161222-1383294.pdf
[8] https://experience.arcgis.com/experience/97d4604079b545448280423f9269b9ea/page/Dashboard/
[9] https://www.ea.govt.nz/documents/3148/Ensuring_an_Orderly_Thermal_Transition_6_June_20231397102.1_1.pdf

The Authority notes that this 'lumpy' cashflow could be smoothed via forward contracts. Historically, this has been the case with 'swaption' contracts providing sufficient revenue certainty to justify maintaining the assets.

However, these contracts are no longer in place and Genesis' attempts to replace them have been unable to contract equivalent volumes. Accordingly, we consider that there is a risk that it becomes economically unsustainable to continue to invest to keep the assets available, before the system ceases to need them in dry years.

Genesis continues to seek commercial solutions to closing the gap between the Rankines' standing costs and the revenue the units generate in normal years. In early 2023, we successfully trialled fuelling the units on advanced wood pellets (biomass), and continue to develop our understanding of the viability of a sustainable biomass domestic supply chain that could deliver to the plant's fuel requirements at near net-zero carbon.

High level discussions with electricity sector participants have indicated that a renewables-backed security product, that could be enabled by access to biomass on appropriate terms, could have sufficient appeal to replace the role previously performed by the swaptions. Genesis will continue to develop these opportunities.

Whilst studies continue, analysis to date indicates to us that biomass-fuelled Rankine units are the most economic low carbon solution to providing dry year security to the grid. Desktop studies show that Rankine capacity could continue to be available to at least 2040 with ongoing stable investment.

However, unless and until appropriate commercial solutions can be found we would caution against concluding that the management of prolonged low hydro sequences is without risk at a system level over the medium term. We want to work with Government and industry to ensure a secure and low carbon system long into the future.

The gas transition

MBIE is to be commended on a thoughtful analysis of the issues facing the gas sector. Ensuring sufficient fuel continues to be available on acceptable terms as long as it is required is not trivial.

Genesis' position in New Zealand's gas market is unique. We are one of the country's largest gas and LPG suppliers to homes and businesses, have ownership interests in the producing Kupe oil and gas field, own LPG reticulation networks in the South Island, and use gas to fuel all our thermal generation assets at Huntly at different times.

It is worth noting that the consented site envelope at Huntly Power Station would provide for connection of additional gas peaking capacity, but we do not have live plans to progress such an investment at this time.

In any case, securing access to gas on sufficiently flexible terms is currently a barrier to reducing emissions at Huntly, to the extent that the right gas supply arrangements could enable to us to substantially reduce the system's reliance on coal. Huntly runs predominantly on gas today, but this proportion could increase further (potentially replacing coal entirely) with access to flexible gas.

This flexibility could, in theory, be provided in various ways including via contract and / or demand response from large users. However, in Genesis' experience these arrangements typically only come into the frame during supply shocks, and tend to be expensive. This effect is magnified over longer durations, meaning gas demand response is likely to be a very expensive substitute for water for electricity generation in dry years.

We agree with MBIE that liquified natural gas imports are unlikely to be a suitable solution for New Zealand's requirements. Aside from the considerable cost, LNG could only rise to meet shortfalls in gas supply, rather than remove supply from the system and in doing so providing balance.

Accordingly, Genesis considers that additional physical gas storage as contemplated in the paper would be a key enabler in improving the operation of the gas market, and would provide crucial support to the electricity system by enabling flexible thermal operation and reducing coal consumption.

Additional gas storage would also serve to de-risk investment in new peaking capacity by providing security concerning short-term fuel availability, and provide a longer-term signal that gas has a future in Aotearoa for certain applications thereby supporting the case for the continued investment in field development that the paper notes is necessary.

The role of hydrogen, offshore wind

Genesis supports the Government working to fully understand the role hydrogen may play in the New Zealand economy and energy system.

We also agree that direct financial government investment is not desirable, but the proposed actions concerning government and sector coordination, development of standards and a supportive regulatory framework, and developing international networks are likely to be valuable.

Genesis is currently working to better understand the role hydrogen might play in our fuel mix. The manufacturer of the 400 MW high efficiency Unit 5 at Huntly Power Station considers that unit can run on a blend of more than 20% hydrogen to natural gas without material modification. This could rise to 100% with currently available technology, if a business case could be developed to support the necessary investment.

There is broad agreement that the economics of hydrogen are unlikely to be competitive with natural gas, even with escalating carbon prices, for most domestic and commercial applications in the medium term. However, we agree with the roadmap's analysis that if the gas can be produced at scale there are likely to be an increasing range of niche applications over time.

On the sector's current pathway, it doesn't appear likely we will see a significant overbuild of renewables that would lower electricity costs such that the relative economics of hydrogen drastically improve. However, should a large offshore wind farm be established in New Zealand waters, hydrogen manufacture to soak up 'spill' when the site's output is surplus to the system's requirements could improve hydrogen's economics materially.

Broadly, Genesis is supportive of a staged permitting regime for offshore wind projects. In many respects, this mirrors the well understood and effective regime for petroleum exploration and production.

Similar to exploration permits, Genesis recommends that permit applications be required to submit a work programme with which the applicant would be required to comply. This would reward prospective developers who are highly motivated to bring projects to fruition.

The benefits of such a regime could also be shared more broadly, with information gathered over the course of a feasibility permit work programme published for evaluation by other prospective developers upon surrender of a permit. Again, this system works well in the existing petroleum and minerals regime.

An opportunity to transition the petroleum sector

Genesis also recommends further consideration of the interaction and potential synergies between existing petroleum development activity, and the nascent offshore wind sector.

An accident of geography and geology has led to New Zealand's only producing hydrocarbon basin, Taranaki, doubling as one of our most prospective offshore wind locations with several developers having already expressed an interest in investing in the region. The Taranaki 2050 Roadmap envisages the region's infrastructure and considerable skill base transitioning into 'new' energy activities into the future[10].

Genesis considers this could go a step further, and recommends policymakers evaluate how synergies between offshore wind, hydrogen, and existing petroleum production activities can be leveraged to benefit both sunset assets / fuels, and emerging technologies.

This is beginning to happen organically. Existing petroleum production infrastructure is already being leveraged to support greater understanding of Taranaki's offshore wind power potential, including at the Kupe field in which Genesis is a Joint Venture partner[11]. Internationally, established energy companies are leveraging their existing capabilities and strong balance sheets to move into the renewables development space[12].

It is worth considering the potential to *extend* the petroleum permitting regime into offshore wind developments, given the synergies between the sectors (including the opportunity to transition existing infrastructure into production and transport of hydrogen). Further, the expected lifetimes of existing fields dovetail well with projections of when offshore wind generation may become a physical reality in Aotearoa.

Accordingly, Genesis believes there is a case for evaluating the value of transitioning existing petroleum permits into offshore wind feasibility permits over time, and / or enabling offshore wind feasibility activities to be carried out in conjunction with petroleum permit activities with a streamlined process for transitioning into commercial permits over time.

[10] https://www.taranaki.co.nz/assets/Uploads/Like-No-Other/Taranaki-2050-Roadmap.pdf

[11] https://static1.squarespace.com/static/634c93e9c297a25f06938ba4/t/64d348195ca28106628d7a03/1691568153871/Kupe+LiDAR.pdf

[12] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/how-oil-and-gas-companies-can-be-successful-in-renewable-power#/

This would both stimulate interest in New Zealand's offshore wind potential among established and trusted energy companies and provide a commercial transition pathway for the country's petroleum sector.

Conclusion

New Zealand's transition to net-zero 2050 poses significant challenges, but our highly renewable electricity system provides an excellent launching pad. With a healthy generation development pipeline and, in aggregate, ample capital seeking deployment, we can be confident renewables will play an increasing role in powering Aotearoa.

Ensuring the transition is orderly and equitable relies on the electricity system delivering reliable and affordable supply. Whilst managing through periods of tight capacity availability, it is important not to lose sight of the less frequent but much higher impact periods of longer duration energy shortage that could arise.

Genesis is committed to continuing to play a key role in supporting the renewable system, while increasing our own contribution to renewable electricity supply and decarbonising our thermal assets. We are eager to continue to engage with Government and industry on how this can be done in the most economically sensible way.

We would welcome any opportunity to discuss the matters covered in this submission. Please do not hesitate to get in touch if a further conversation would be useful.

Yours faithfully