1 October 2021

Transpower

22 Boulcott Street,

Wellington Central, 6011

Email: nzgp@transpower.co.nz

Tēnā koutou katoa,

Submission on: Transpower Consultation on Net Zero Grid Pathways 1 Major Capex Project (Staged) Investigation (Long List) (August 2021)

This document is submitted on behalf of the New Zealand Geothermal Association by Kennie Tsui (Chief Executive). We thank you for this opportunity to provide feedback on the Net Zero Grid Pathways Phase 1.

New Zealand Geothermal Association (NZGA)

1. The NZGA, incorporated in 1992, is a non-political, non-governmental and not-for-profit organisation, with a focus on fostering a sustainable future for Aotearoa New Zealand through use, development and protection of geothermal resources. The NZGA is an affiliated member of the International Geothermal Association and the Royal Society of New Zealand. The NZGA connects with global geothermal communities and is well positioned to positively influence geothermal initiatives on the international stage.
2. NZGA membership comprises ca. 400 individuals, as well as corporate members, representing geothermal electricity generators, research organisations, regional councils, engineering consultants, technology companies, planning consultants and Māori trusts. This diverse and skilled network of people work and live with Aotearoa's geothermal resources.
3. This submission has been prepared by members of the New Zealand geothermal community. This submission was approved for release by the NZGA board.

Geothermal is an Aotearoa New Zealand icon and has been part of Māori culture for generations

4. Geothermal[1] is an iconic kiwi symbol. Geothermal stories and geothermal energy have been part of Māori culture for generations, and geothermal is entrenched in our modern history. Over the past nearly 100 years, geothermal has been a vibrant, proven, indigenous renewable resource, which enables other industries to thrive and our regions to grow while holding the responsibility to care for and protect those taonga entrusted to us.

[1] The reference to "Geothermal" throughout this submission is a term that is used to describe both low enthalpy resources (potentially down to ambient conditions for geothermal heat pumps), and high-enthalpy conventional geothermal resources (<~3.5 km deep with reservoir temperatures <350°C).

Key recommendations:

Our key recommendations are summarised in the table below. More detailed explanations for each recommendation can be found in the following sections.

Rec No.	Descriptions
1.	For future grid planning, transitioning to greater use of renewable resources, geothermal energy already supplies around 18% of electricity generation in Aotearoa New Zealand and are a low-carbon electricity solution with significant growth potential and continuous development of new sites built upon decades of best practices. We ask Transpower to include this geothermal potential in the generation scenarios (Response to Question 13: Is our choice of scenarios to include in our analysis reasonable?)
2.	We recommend that the Optgen model be revised to adequately account for these renewable energy technologies that are fundamental building blocks of our low carbon New Zealand electricity generation (Response to Question 13: Is our choice of scenarios to include in our analysis reasonable?).
3.	Current Options B2 and B3 in Table 3.4 could adversely generate high carbon emissions in unplanned events. We note that no criteria in the long list would swing choices in favour of low emissions options so ask Transpower to reconsider its approach (Response to Question 6: Are our long-list options for enhancing capacity of the Wairakei Ring reasonable?)
4.	We note that two of the proposed 15 scenarios in Table 5-7 have significant geothermal expansion, though this should be an element of Global, Growth and Disruptive scenario options too i.e. include geothermal expansion in all of the EDGS scenarios (Response to Question 11: Is our process for identifying potential generation scenarios reasonable?)
5.	Opportunities exist for non-transmission solutions by fostering the uptake of industrial process heat and low-enthalpy applications using geothermal resources, including heat pumping technologies (Response to Appendix A request for information from proponents on non-transmission solutions).
6.	Develop criterion to include carbon emissions reduction when evaluating long-list of options and reducing it to a short-list in achieving the "Net Zero" target (Response to Question 7: Are there other criteria we should consider when evaluating our long-list of options and reducing it to a short-list?)
7.	Growth in geothermal generation should be integral to all scenarios, rather than simply giving it prominence in 2 of 15 scenarios (Response to Question 11: Is our process for identifying potential generation scenarios reasonable?)
8.	Planning for these renewable energy projects can take several years and ability to get maximum generation is important to the business case, so timely investment (or commitment to investment) ahead of generation is needed (Response to Question 2: Should Transpower be looking to enable investment in new generation and demand ahead of when that generation or demand is confirmed?)
9.	We recommend that Northland should be placed as its own region in Figure 5-9 and the relating analysis in section 5-53 (Response to Question 12: Is our approach to determining an appropriate number of scenarios reasonable?)
10.	(In response to Question 17 on additional costs and benefits to include in the Investment Test), we recommend: • inclusion of a projected market or shadow price or carbon (now a major cost), especially as we attempt to move to "Net Zero" carbon emissions. This will help future-proof decisions to incorporate long-term abatement cost values consistent with climate change goals in cost-benefit or cost-effectiveness analysis,

	• consideration of the impact of those decisions is distributed across Māori/iwi especially in view of their connection to geothermal development and regions. Therefore, we ask Transpower to mitigate the impacts of decisions on iwi and Māori, employees, employers, regions, and wider communities in the Investment Test Analysis.

We have developed the following detailed sections in response to the consultation questions.

Geothermal resources are a low-carbon electricity solution with significant growth potential, and we consider the current consultation document underplays the future role of geothermal resources in Aotearoa New Zealand future electricity solutions

5. Geothermal energy generates about 18% of New Zealand's electricity[2], and supplies ca.21% of New Zealand's primary energy[3]. Geothermal has been decarbonising the New Zealand energy sector for over sixty years. In the last ten years, the overall GHG emissions intensity of New Zealand's electricity sector approximately halved, due to displacement of fossil-fuel based generation, primarily by geothermal.

6. Geothermal energy offers a reliable, renewable baseload electricity supply (i.e. producing power at a constant rate regardless of weather or climatic conditions). This manner of operation will enable further decarbonisation of the energy grid, with geothermal energy acting as the primary renewable electricity baseload option, replacing gas/coal, and thus (unlike other renewables) does not require an overbuild of infrastructure or massive storage assets to ensure reliability.

7. In future, there will be an increased demand for renewable electricity baseload power to stabilise the grid, with increasing variable power generation capacity expected (due to reduction in baseload fossil fuel plants and increase in weather- and climate-dependent renewables).

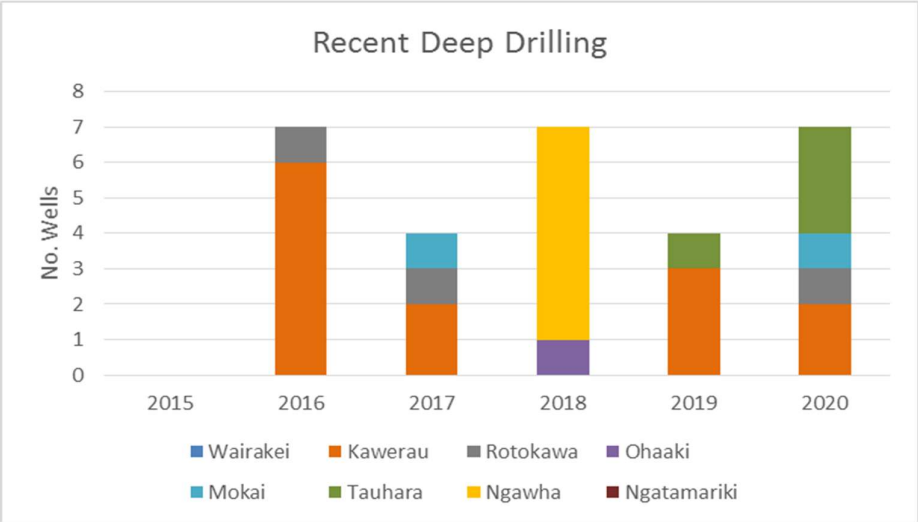
8. Figure 1 below shows the number of wells and fields drilled in Aotearoa New Zealand between Jan 2016 and Dec 2020 for electricity generation or large scale direct use. Some projects have included[4]:

    - new production and injection wells for the Te Ahi o Maui development at Kawerau which included the establishment of a new 25MW binary plant, a project between Eastland Generation and Māori landowners.
    - additional wells installed at Kawerau by Mercury and Eastland Generation for the existing electricity plants and by NTGA for mixed electricity/direct heat use, and
    - wells associated with the Top Energy 32 MWe expansion at Ngāwhā.

9. Geothermal is an Aotearoa New Zealand pioneering engineering innovation. We have developed expertise that has revolutionised the global geothermal industry. Over the decades, New Zealand's geothermal companies have helped to develop international best practice – including exploration, reservoir management, design, engineering, and environmental modelling.

[2] MBIE Electricity Statistics, 2021.
[3] MBIE Energy in New Zealand, 2021.
[4] https://nzgeothermal.org.nz/2020-nzga-international-geothermal-power-review/

Figure 1: Recent deep drilling activities in Aotearoa New Zealand[5]



10. On the question of potential future generation, we make the following observations:

    a. There have been published papers feeding in to the MBIE Energy Demand and Generation Scenarios[6] which indicate some additional potential using a stored heat calculation, and this forms a useful guide.

    b. It cannot be assumed that generation is maximised at existing geothermal developments. Several geothermal fields have the potential for further expansion of generation, including (but not limited to): Wairakei, Tauhara and Ngawha.

    c. Contact Energy is currently developing Tauhara II with consents in place that will allow further expansion, again when the market conditions are right and using all available information[7]. Contact Energy is also investigating options for the redevelopment of Wairakei.

    d. Ngāwhā Generation has just completed a 32MW expansion project and has a further stage consented. They will assess the next stage following a period of resource monitoring and an assessment of market conditions[8].

    e. Eastland is currently preparing for drilling at Taheke, showing that developers continue to see potential for competitive geothermal generation at currently undeveloped locations[9].

    f. We note that existing geothermal developers continue to support teams of scientists and engineers capable of maintaining existing developments, expanding these or developing new sites. This is consistent with generation scenarios associated with ongoing growth in geothermal generation.

[5] https://nzgeothermal.org.nz/2020-nzga-international-geothermal-power-review/
[6] Lawless, J., van Campen, B. and Randle, J. (March 2020) Future Geothermal Generation Stack, Revision D
[7] https://contact.co.nz/aboutus/our-story/our-projects/tauhara
[8] http://ngawhageneration.co.nz/
[9] https://www.gisborneherald.co.nz/local-news/20200806/11-9m-shovel-ready-boost-for-plant/

Recommendation 1 For future grid planning, transitioning to greater use of renewable resources, geothermal energy already supplies around 18% of electricity generation in Aotearoa New Zealand and are a low-carbon electricity solution with significant growth potential and continuous development of new sites built upon decades of best practices. We ask Transpower to include this geothermal potential in the generation scenarios (Response to Question 13: Is our choice of scenarios to include in our analysis reasonable?)

11. We note your concerns in Footnote 16 on page 53 of the consultation report relating to the Optgen model apparently in not properly weighing generation types with entirely different operating modes. As examples baseload geothermal is not preferred over gas peakers, while intermittent wind and solar are shown as being especially cheap base-load options. This has created special consultation on balancing wind and solar, while the consultation proposes to run high geothermal generation scenarios.

Recommendation 2: We recommend that the Optgen model be revised to adequately account for these renewable energy technologies that are fundamental building blocks of our low carbon New Zealand electricity generation (Response to Question 13: Is our choice of scenarios to include in our analysis reasonable?).

Options B2 and B3 in Table 3.4 where shedding geothermal and hydro South of the Wairakei Ring in preference to thermal generational North of the Ring could adversely generate high carbon emissions in unplanned events.

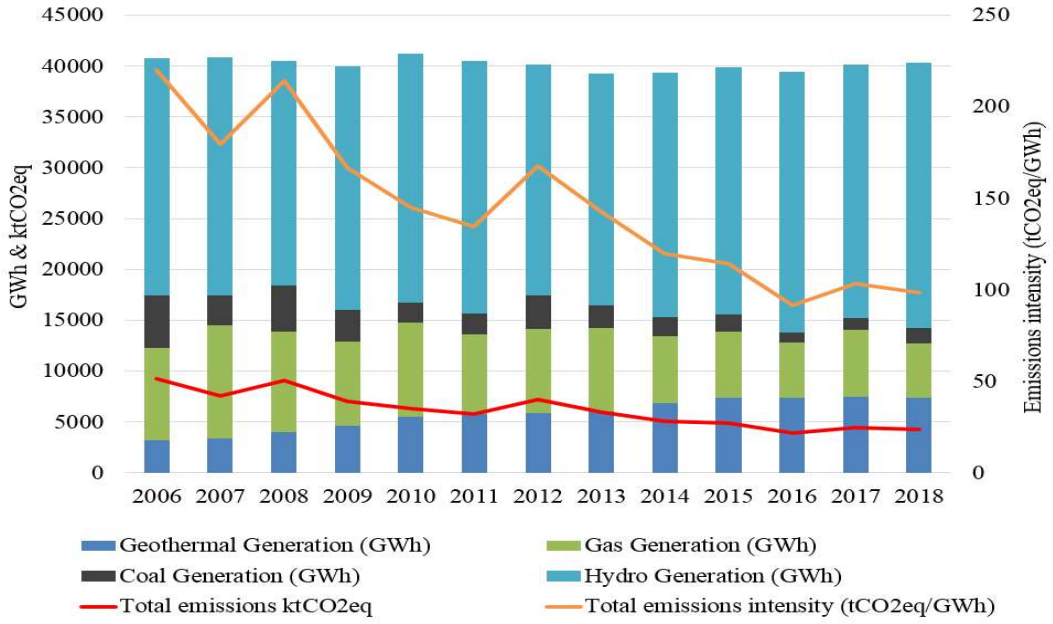
12. Geothermal energy is ideally base-loaded in operation. The current situations envisaged in Table 3.4 Options B2 and B3 discussing generation redispatch or load shedding in the event of Wairakei Ring circuits overloading would not easily apply to the geothermal generation in the region. Rapid demand response from geothermal stations would likely involve wasteful venting of steam. We note too that there may be a mismatch with hydro stations connected to the Ring, in that the Waikato hydro stations are cascaded, so that holding back flow from hydro stations within the Ring will deprive hydro stations closer to Auckland that might otherwise be called on to increase generation, though this would be an issue where the constraint applied for days rather than hours.

Recommendation 3: Current Options B2 and B3 in Table 3.4 could adversely generate high carbon emissions in unplanned events. We note that no criteria in the long list would swing choices in favour of low emissions options so ask Transpower to reconsider its approach (Response to Question 6: Are our long-list options for enhancing capacity of the Wairakei Ring reasonable?)

Geothermal resource is the heavy-lifter in transitioning to a low-carbon economy for Aotearoa New Zealand, and the geothermal community is committed to find innovation solutions to net-zero carbon

13. Between 2006 and 2018, increasing geothermal electricity generation by 50% has decoupled the emissions intensity in our electricity generation by 62% (see Figure 2).

Figure 2: New Zealand electricity generation by fuel types and the emissions intensity between 2006 and 2018[10].



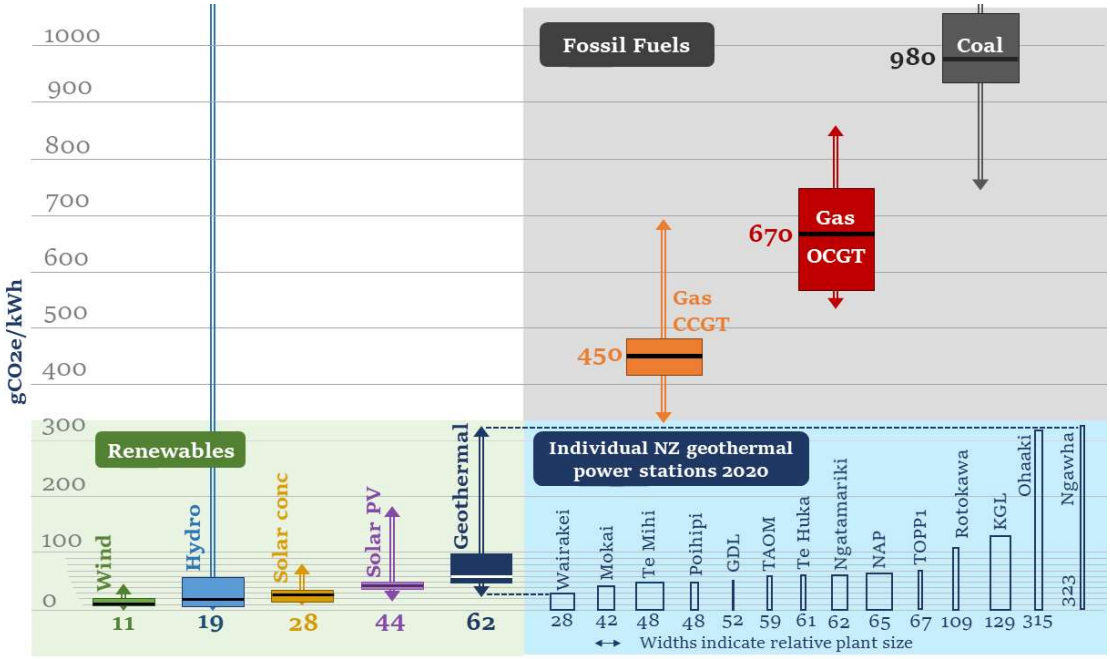
14. Unlike solar and wind, which do not produce emissions directly during operation, geothermal power stations do release CO_2e during operation. However, operational emissions are only one part of the emissions story, and there are *no zero-emission sources of energy*.

15. A full life-cycle assessment (LCA) of emissions is necessary, to include all emissions associated with materials and construction, operation, and decommissioning at the end of the project life. For this reason, lifecycle emissions are used by the IPCC when comparing different energy types. All the renewable energy types, including geothermal, have lifecycle emissions at least one order of magnitude less than fossil fuels (see Figure 3 below[11]). In the case of geothermal, most lifecycle emissions come from operational releases. In the case of solar and wind, the majority are related to materials, manufacturing, and construction. Hydro can be quite variable, as there can be significant emissions associated with land-use change (i.e., the creation of bodies of freshwater covering land formerly providing a carbon sink).

[10] McLean, K. and Richardson, I. (2019): Greenhouse gas emissions from New Zealand geothermal power generation in context. Proceedings of New Zealand Geothermal Workshop, 2019.

[11] McLean, K., Richardson, I., Quinao, J., Clark, T., and Owens, L. 2021. Greenhouse Gas Emissions From New Zealand Geothermal: Power Generation and Industrial Direct Use. Proceedings 43rd New Zealand Geothermal Workshop, Wellington, NZ, 23-25 November 2021.

Figure 3: Full life-cycle emissions intensity by electricity generation fuel types (gCO_2e/kWh)



16. NZGA is currently in partnership with its corporate geothermal power plant members to establish a special project team to actively investigate reducing CO_2e emissions towards net-zero. The international geothermal industry is producing emerging technologies for CO_2e to be reinjected back to geothermal reservoirs, that could be trialled and adapted for Aotearoa New Zealand conditions.

17. In section 5.51 it describes that "available firming technologies are natural gas, geothermal and hydro but the first two are (to varying degrees) in conflict with our greenhouse gas target …". We would be disappointed if this view has pervaded much of the underlying analysis. We note that the Climate Change Commission has modified its position recognising a low-carbon geothermal energy will play a key role in helping meet greenhouse gas targets in their Final Advice after reviewing the NZGA submission[12].

18. From that perspective, it is disappointing to see special efforts at achieving a balance of solar and wind in future generation to the exclusion or absence of geothermal energy e.g., Table 5-2.

Recommendation 4: We note that two of the proposed 15 scenarios in Table 5-7 have significant geothermal expansion, though this should be an element of Global, Growth and Disruptive scenario options too i.e. include geothermal expansion in all of the EDGS scenarios (Response to Question 11: Is our process for identifying potential generation scenarios reasonable?)

Geothermal is a low-carbon industrial process and low-enthalpy heat solutions that enables other industries to thrive

19. The consultation document requests information for non-transmission solutions (NTS) which could defer or replace the need for investment in transmission. It is our view that any project that helps meet energy needs but delays the requirement for grid reinforcement (or other solution) would be a non-transmission

[12] https://nzgeothermal.org.nz/app/uploads/2021/03/NZGA-CCC-Submission-FINAL-March-2021.pdf

solution. Much of industry and domestic energy demand is for heating, for which geothermal energy can help in two ways:

- The direct use of geothermal heat (ca.8 PJ pa[13]) offers significant opportunities for industrial energy efficiency and decarbonisation. As a clean, reliable energy source, geothermal reduces production costs and improves environmental performance across a range of strong and competitive business sectors, including food and beverage, wood processing, horticulture, and diary processing[14]. NZGA will publish the 2022-2023 Geoheat Action Plan in early 2022 and would be pleased to share draft copies with Transpower. Contact Energy has set aside land for industrial developments adjacent to its 152 MW Tauhara project and is talking with potential tenants[15].

- Even more widespread use could be made of geothermal heat pumps as highly efficient heat providers almost anywhere in New Zealand[16]. These systems are effective in supplying greater than 3 units of heat (or cool) for one unit of electricity, they are being adopted extensively in Europe as part of the energy transition being pursued by the European Commission. In some circumstances and for larger facilities they are able to provide some support for grid stability and line capacity management through central control of some of the operations.

Recommendation 5: Opportunities exist for non-transmission solutions by fostering the uptake of industrial process and low-enthalpy applications using geothermal resources, including heat pumping technologies (Response to Appendix A request for information from proponents on non-transmission solutions)

Excluding carbon emissions reduction in shortlisting options contradicts the purpose of this major work

20. The NZGA acknowledges the huge efforts have been involved to prepare for this consultation. We note that this is a consultation on Net Zero Grid Pathways for which carbon emission is not an explicit criterion but should be.

21. Arguably, carbon emissions play a role in the overall analysis in that cost of carbon is included in the Electricity Demand and Generation Scenarios (EDGS) analysis, but some of Transpower's choices have other emissions effects which currently have no influence on decisions. As an example, the tactical options in Table 3-4 B2 covering generation redispatch based around forcing generation south of Whakamaru off (mainly renewable) while options north of there (mainly thermal) are to be encouraged. This type of response would count against high capital cost, maximised load factor plant which include all types of renewable energy and so affect the relative economics.

22. The criteria around "Good electricity industry practice" which already includes ensuring "environmental protection" could be modified to include emissions considerations also which affect both our environment and our economy.

[13] MBIE Energy in New Zealand, 2021.
[14] Geoheat Strategy for Aotearoa New Zealand, 2017-2030.
[15] Energy News, 24 September 2021.
[16] https://www.nabersnz.govt.nz/about-nabersnz/previously-rated-buildings/hutt-city-council-administration-building/ https://www.beca.com/what-we-do/projects/transport-and-infrastructure/christchurch-airport-integrated-terminal https://www.aurecongroup.com/projects/energy/pita-te-hori-district-energy-scheme

Recommendation 6: Develop criterion to include carbon emissions reduction when evaluating long-list of options and reducing it to a short-list in achieving the "Net Zero" target (Response to Question 7: Are there other criteria we should consider when evaluating our long-list of options and reducing it to a short-list?)

Process for identifying potential generation scenarios need to include growth in geothermal generation

23. As noted previously, geothermal energy sits within the stack of renewable generation options. Several geothermal development projects are currently completed at Kawerau and Ngawha with construction underway at Tauhara. Section 5.51 focuses on wind and grid-scale solar options despite geothermal energy's low emissions, low cost and generation characteristics. Specifically Figure 5-8 shows a process for identifying potential generation scenarios but makes no mention of geothermal generation in all steps otherwise focussed around one of the grid constraints points around the Wairakei Ring. Geothermal generation is an immediate and ongoing option so needs to be fully accounted for in planning.

Recommendation 7: Growth in geothermal generation should be integral to all scenarios, rather than simply giving it prominence in 2 of 15 scenarios (Response to Question 11: Is our process for identifying potential generation scenarios reasonable?)

Clear investment signals provide certainty to businesses in the long-term

	Rationale
Region 1	Region 1 contains significant North Island demand centres. Generation expansion within this region is likely to reduce the need for upgrades in the Central North Island, Wairakei ring, and on the HVDC.
Region 2	Region 2 includes the Bay of Plenty, Taupo volcanic zone, and Hawkes bay. Generation expansion within this region is likely to exacerbate the transmission constraint on the Wairakei ring while reducing the need for upgrades in the Central North Island and on the HVDC.
Region 3	Region 3 includes the lower North Island, stretching up to Tokaanu. Generation expansion within this region is likely to primarily exacerbate the transmission constraint in the Central North Island. The Wairakei ring is also exposed to additional flows but to a lesser extent. Generation expansion within this region has potential to reduce the need for upgrades on the HVDC.
Region 4	Region 4 includes the entire South Island. This region has the potential for significant step changes in both load and generation. Any such step change is likely to have an immediate impact on the capacity requirement of the HVDC. Any increase in the net export of this region would also likely exacerbate the transmission constraint in the Central North Island.

Figure 5-9 Relevant regions for generation scenarios

24. Figure 5-9 in the consultation document is informative. Geothermal generation would be focussed on Region 2 with some further generation possible at Ngawha in the north of Region 1 in near-term or based on existing technologies. However, geothermal generations might be wider available when future technologies developed or appropriate market conditions.

25. The consultation document describes that Region 2 is "Generation expansion within this region is likely to exacerbate the transmission constraint on the Wairakei ring while reducing the need for upgrades in the Central North Island and on the HVDC."

26. Previously, Transpower recognised the importance of reinforcing the Wairakei ring as an enabler of geothermal energy, and grid investment was a factor in the geothermal generation installed ten to fifteen years ago. Enabling low-cost, low-emission renewables such as geothermal should remain a target in the decision process.

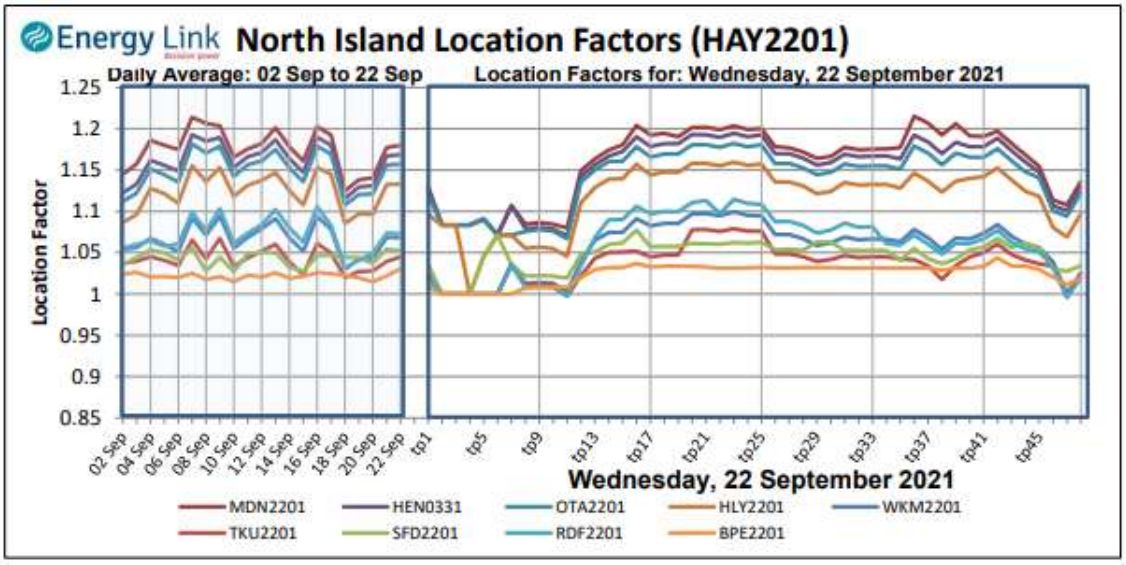
Recommendation 8: Planning for these renewable energy projects can take several years and ability to get maximum generation is important to the business case, so timely investment (or commitment to investment) ahead of generation is needed (Response to Question 2: Should Transpower be looking to enable investment in new generation and demand ahead of when that generation or demand is confirmed?)

Current mapping of regional allocation exposes Northland region in multiple risks

27. This map of regional allocation in Figure 5-9 brings out another issue for Northland while it also affects the list of market costs and benefits shown in section 5.10.

28. Northland is at the far end of the National Grid. There are renewable generation options available there including further expansion of Ngāwhā geothermal generation. Transmission losses are experienced across the length of the grid such that prices of electricity are generally highest in this region as shown in the following typical record (see Chart 4).

Chart 4: Recent location factors across the North Island with the Marsden Grid Exit Point (GXP) in Northland being the highest, above Auckland's Henderson GXP [Source: Energy Link]



Recommendation 9: We recommend that Northland should be placed as its own region in Figure 5-9 and the relating analysis in section 5-53 (Response to Question 12: Is our approach to determining an appropriate number of scenarios reasonable?)

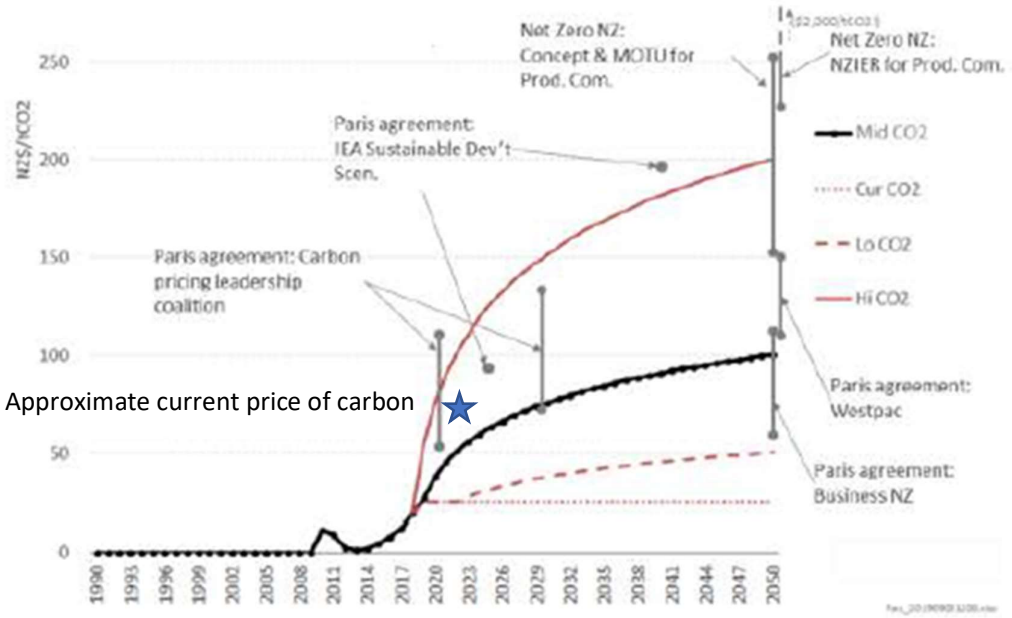
Considerations of the cost of carbon, partnership with Maori/iwi and regions in Investment Test Analysis

29. The cost of carbon is not mentioned specifically in the discussion on section 5.9 Investment Test (although implicit in the EDGS generation pricing). Achieving a "Net Zero" path would include cost of carbon as an explicit consideration.

30. NZGA fully supports the cost of carbon being included for all generation options including geothermal options. We understand the Climate Change Commission have both an expected value of carbon and a shadow price. Inclusion of a shadow price will help future-proof decisions to incorporate long-term abatement cost values consistent with climate change goals in cost-benefit or cost-effectiveness analysis.

31. A concern around the EDGS analysis is the cost of carbon inherent in that. Transpower has been using EDGS 2019 with updates for generation in 2020 and special consultation around the relative roles of wind and solar in 2021. However, market reviewers in 2019, 2020 or even earlier this year would have been reluctant to forecast carbon price where it is today (around \$64/t CO_2e), which even exceeds attempted caps set on price. Chart 5 shows projections from a Concept Consulting report in 2019[17] when a real possibility was for cost of carbon to remain at \$25/t CO_2e. Now even the Concept's "Mid" scenario has been left behind with price currently around \$64/t and now looking to follow an IEA Sustainable Development Scenario which heads to \$92/t by 2025. The concern is that carbon prices and forecasts built into EDGS in 2019 or 2020 may be significantly underestimated distorting the analysis.

Chart 5: Projections of Carbon price



32. NZGA notes the deep affinity between Māori and geothermal resources. Geothermal is the indigenous renewable energy solution in Aotearoa, and it creates genuine, active, and enduring partnerships with iwi/Māori. Māori are driven by principles of investing in projects that provide intergenerational prosperity and sustainability of natural resources. This philosophical view (combining kaitiaki and Māori economic

[17] Source: Concept Consulting (2019) Long-Term Gas Supply and Demand Scenarios

development) aligns with geothermal resource developments, with the long-term project life of geothermal power plants i.e. 30+ years.

33. The principles of Te Tiriti o Waitangi including self-governance, kaitiakitanga and resource ownership, are demonstrated by Māori landowners, Māori-owned enterprises and other partners in geothermal developments and enterprises. Multiple successful businesses led by Māori groups have leveraged their geothermal assets, people and resources in other sectors.[18] We also have the responsibility to care for and protect those taonga entrusted to us to halt further degradation of natural environments, while seeking to protect resources.

34. Since the Investment Test includes some non-quantifiable factors such as effects of competition, we also recommend consideration of the impact of those decisions across Māori/iwi especially in view of their connection to geothermal development. Responsibility for the long-term electricity grid development remains the core responsibility of Transpower but the impact of those decisions is distributed across Māori/iwi and regions. Therefore, we ask Transpower to mitigate the impacts of decisions on iwi and Māori, employees, employers, regions, and wider communities in the Investment Test Analysis.

Recommendation 10: (In response to Question 17 on additional costs and benefits to include in the Investment Test), we recommend:

- inclusion of a projected market or shadow price or carbon (now a major cost), especially as we attempt to move to "Net Zero" carbon emissions. This will help future-proof decisions to incorporate long-term abatement cost values consistent with climate change goals in cost-benefit or cost-effectiveness analysis.
- consideration of the impact of those decisions is distributed across Māori/iwi especially in view of their connection to geothermal development and regions. Therefore, we ask Transpower to mitigate the impacts of decisions on iwi and Māori, employees, employers, regions, and wider communities in the Investment Test Analysis.

Conclusion

In conclusion, the decisions or investments in long-lived assets must not lock Aotearoa New Zealand into a high-emissions development future or one that increases exposure to the impacts of climate change. Geothermal is a vibrant, proven, indigenous renewable resource, which enables other industries to thrive and regions to grow. The legacy of low-carbon geothermal use gives our nation a competitive advantage in transitioning its energy sector and economy while caring for and protecting those taonga entrusted to us.

I would be pleased to be contacted regarding this submission and can provide additional and supporting information on request.

Nāku noa, nā

Kennie Tsui
Chief Executive – New Zealand Geothermal Association
E. ce@nzgeothermal.org.nz

[18] Multiple successful Māori-led business cases can be found at the NZGA submission to the Climate Change Commission on the Draft Advice, 27 March 2021. https://nzgeothermal.org.nz/nzga-submission-on-he-pou-a-rangi-climate-change-commission-2021-draft-advice-for-consultation/