8 April 2022

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Tēnā koutou katoa,

Submission on: Transpower Consultation on Renewable Energy Zone and Northland Pilot Concept

The New Zealand Geothermal Association (NZGA) would like to thank Transpower, Northpower, and Top Energy for the opportunity to comment on both consultation documents: Renewable Energy Zones National Consultation 2022 and Renewable Energy Zones Northland Pilot Concept 2022.

We would be happy to discuss these two submissions further.

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 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 70 years, geothermal has been a vibrant, proven, indigenous renewable resource, which enables other industries to thrive and our regions to grow. Through this period the significance of the kaitiaki role of Māori of this taonga has been progressively recognised.

[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).

Some high-level comments to the National Renewable Energy Zone consultation

We acknowledge that the following comments do not readily sit under the questions asked under the consultation documents. However, we believe that they will feed into a broader discussion of the topic of Renewable Energy Zones.

NZGA is broadly supportive of initiatives designed to enable the uptake of renewable energy, in this case for electricity generation to meet our climate goals. Geothermal energy sits within the available suite of renewable energy resources. However, the detail will determine whether this initiative is truly enabling or will present a further set of obstacles to development.

The discussion document outlays out scenarios where connection would be directly into the transmission grid or through distribution networks. From that perspective, the proposed Northland RE Zone would yield useful cooperation between Transpower, Northpower and Top Energy to find the ideal solution to solve a complex situation and unlock the renewable electricity potential of the region.

Currently, the discussion document envisages two main scenarios in which a REZ would be established: *"to bring new renewable generation onto the grid"* and "*to help large industrial energy users connect into the grid and electrify their operations"* and a combination of these. We consider a third option which is alluded to in various parts of the document *"to release renewable generation for wider distribution where major industrial energy users exit the market."*

On this suggestion, the potential Southland aluminium smelter exit is a well repeated scenario impacting on the future delivery of Manapouri hydro generation to the market. Similarly, geothermal and hydro developers in the Bay of Plenty region face difficulties and potential constraints on generation following the closure of Norske Skog mill. These major industry closures can leave existing RE trapped behind transmission constraints, potentially limiting total generation. Some of these constraints are being addressed by current or planned grid investment.

At a higher level, we have considered where the most substantial investment is within our combined RE generation and transmission operating environment, and where control should rest so that the "tail doesn't wag the dog". There are endless generation scenarios looking forward but using the MBIE EDGS reference case (recognising this would underestimate RE generation) and IRENA estimates, we have roughly estimated replacement costs for our national RE portfolio to be nearly NZ$32b (hydro – NZ$15b, geothermal – NZ$13b, wind – NZ$4b). In contrast, we note that Transpower's 2021 Asset Management Plan refers to the grid as a $4.9b asset. Recognising this is depreciated and allowing for upcoming investment, the replacement value of transmission assets may be around $8b. In terms of the analogy above, we see that transmission is indeed the "tail" (with the generation assets being the 'dog') so more control should lie with the collectively substantial RE developers.

How might this developer control play out? Currently, Transpower envisage an auction system where they or an RE Zone coordinator announce a zone, capacity and timing and generators bid for access. If the "dog wagged the tail" then the generation developer could initiate the system. When a developer is ready, they would trigger the REZ coordinator to seek proposals for other developments in the area. This would couple with a view to discounted connection costs with say 1 or 2 years to finalise. Whilst the first mover would be guaranteed connection costs no greater than if they were the only connector with a possibility of discount if others joined.

We point out the obvious, that there are many factors influencing decision to invest, of which connection costs are just one. Other factors include Board risk appetite, perceived technology readiness, perceived movement in costs, perceived movement in exchange rate, readiness for land access, availability of consents, availability

of funds, information to hand, desire to stage, view on market response to major new generation, strategies to decarbonise generation overall – to list some.

In practice, there can be substantial gaps between serious intent to develop a RE resource and the full implementation of development. As an example, Contact Energy undertook substantial investigations leading up to their 2010 application to develop the Tauhara resource and in 2022 are in the process of developing the first stage of this. As another example, consider the development of wind generation in the Tararuas near Palmerston North. Putting aside consenting and land access management which predated construction, the following construction occurred in what could have been considered for an RE Zone: Tararua WF 1999 – 31.7MW, 2004 – 36.3MW, 2007 – 93MW; Te Apiti 2004 – 90MW; Te Rere Hau 2006 – 2.5MW then a further 46MW in two stages. Bidding of capacity may not bring commitments for these later stages and developments.

Responses to questions in the National consultation documents

Q1. Do you agree that the first mover disadvantage and high connection costs can be challenges for connecting new renewable generation and/or large electricity loads to the electricity network?

Response: NZGA agrees that there may be first mover disadvantages[2] due to high connection and grid upgrade costs; such costs (and easements) represent material hurdles for developing new renewable generation and/or electrifying industrial customers.

Under the current regulatory practice, the party requiring a new connection covers the full cost of constructing and maintaining the asset until another party connects to the asset and pays its share. Therefore, high upfront network costs may:

- inhibit or prevent new renewable and socially optimal investments in the future;
- competitively disadvantage an industrial facility attempting to electrify its production processes;
- Increase HV and LV transmission system congestion and the economic consequences of planned and forced outages;

Q2. Do you think the concept of a Renewable Energy Zone could be beneficial in a New Zealand context?

Response: NZGA considers the concept of a Renewable Energy Zone could be beneficial in an overall Aotearoa New Zealand context. The details, now unknown, will determine whether the concept proves to be progressive or poses a hinderance.

Geothermal energy generates about 18% of New Zealand's electricity[3], and supplies ca.21% of New Zealand's primary energy[4]. 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.

[2] Conversely, under the current regime, there may be significant first mover advantages if HV capacity is limited; the first to claim that capacity will have a competitive advantage.
[3] MBIE Electricity Statistics, 2021.
[4] MBIE Energy in New Zealand, 2021.

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.

In the future, unlocking reliable renewable energy investment will be required to meet both carbon reduction obligations as well as maintaining grid stability in the face of increasing variable power generation (due to reduction in baseload fossil fuel plants and increase in weather- and climate-dependent renewables).

Q3. What region(s) do you think would be suited to Renewable Energy Zones?

Response: NZGA suggests that regions with unusually high concentrations of industrial load and/or renewable energy potential will be credible candidates for trial schemes. We believe that Northland, Bay of Plenty, and the Taupo Volcanic Zone meet these criteria.

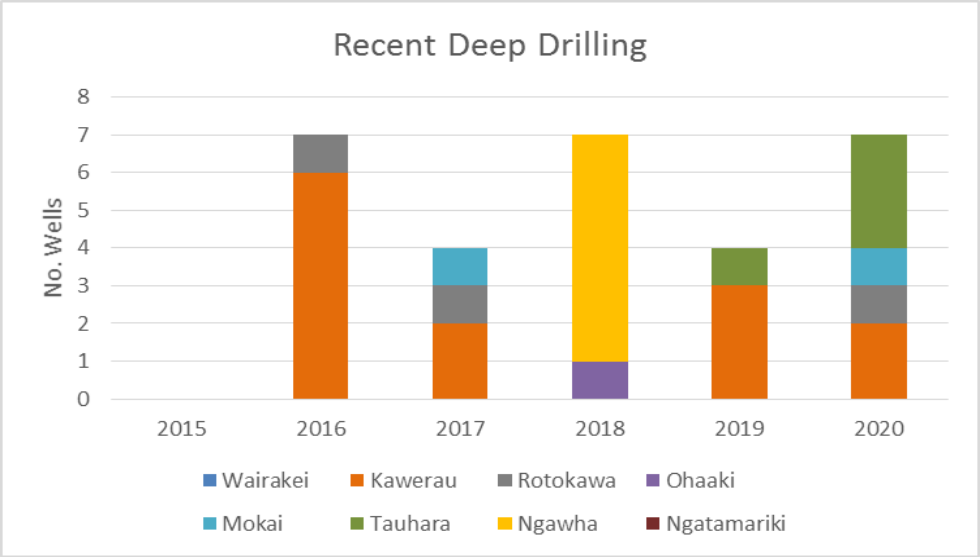
Figure 1 below shows the number of wells and fields drilled in Aotearoa New Zealand between Jan 2016 and Dec 2020 for electricity generation or large-scale direct use. Some of these projects have included[5]:

- new production and injection wells for the Te Ahi o Maui development at Kawerau which included the establishment of a new 26 MWe 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.

Geothermal is a pioneering engineering innovation here in Aotearoa New Zealand. 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.

[5] https://nzgeothermal.org.nz/2020-nzga-international-geothermal-power-review/

Figure 1: Recent deep drilling activities in Aotearoa New Zealand[6]



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[7] 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 Ngāwhā.

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[8]. Contact Energy is also investigating options for the redevelopment of Wairakei.

d. Ngāwhā Generation has just completed a 32 MWe 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[9].

e. Eastland is currently preparing for drilling at Taheke, showing that developers continue to see potential for competitive geothermal generation at currently undeveloped locations[10].

Apart from the three main areas, NZGA also suggests the following:

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

f. The direct use of geothermal heat (ca.8 PJ pa[11]) 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[12]. NZGA has published the 2022-2023 Geoheat Action Plan in early 2022.[13]

g. Even more widespread use could be made of geothermal heat pumps as highly efficient heat providers almost anywhere in New Zealand[14]. 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.

Q4. What benefits do you think should be considered in the decision-making process for Renewable Energy Zones in New Zealand?

- NZGA recommends: When considering supporting the achievement of a net-zero carbon economy, Transpower should include a projected market or shadow price for carbon (now a major cost). 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.
- When engaging with Māori/iwi in the specific REZ consultation, especially in view of their connection to geothermal development and regions, we ask Transpower to consider potential benefits for iwi and Māori, employees, employers, regions, and wider communities in the Investment Test Analysis.

Q5. Do you agree with the proposed guiding principles? Are there any that you would change or add?

Response: NZGA broadly agrees with the proposed guiding principles. However, if the recommendation at the start of the submission that generators should control the process is followed then Principle 6 especially around REZ participant selection would need to change. The participants would be any RE generator or any major load wanting to electrify, that will be prepared to negotiate and make firm commitments to connection cost sharing.

Q6. Do you agree with the proposed criteria for selecting suitable regions for REZ development? Are there any that you would change or add?

Response: If the recommendation at the start of our submission is followed, then a REZ would be any area where a renewable energy development is started should enable the developers to negotiate for shared connection. Broad areas of high renewable energy potential have already been identified enabling initial consultation.

[11] MBIE Energy in New Zealand, 2021.
[12] Geoheat Strategy for Aotearoa New Zealand, 2017-2030.
[13] https://www.nzgeothermal.org.nz/news--events/geoheat-action-plan-2022-2023-launch/
[14] 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

Q7. Do you agree with using a tender process for committing projects in a REZ? Are there alternative processes that could be considered?

Response: An alternative generator-led process has been suggested at the beginning of this submission.

Q8. Who should be involved with co-ordinating and undertaking the various steps within a REZ development process?

Response: We make no comment.

Q9. Do you agree with the proposed project criteria? Are there any that you would change or add?

Response: We make no comment.

Q10. Do you agree with the challenges we have identified?

Response: We agree with the challenges described in the consultation document. In addition, we have identified the following:

- There are impracticalities associated with the proposed 1-year warming period for Expression. In particular, the Resource Management Act reforms threaten to delay (by years) new, geothermal greenfield projects; such delays, deriving from other regulatory processes, will frustrate the co-ordination and aggregation functions;
- The role of the REZ co-ordinator is a 'broker' to collect information from new developers and collate for co-investment. To enable this role to be effective, they rely on access to independent public data. MBIE has identified there is an inherent tension in the provision of information regarding potential investments in generation. Developers will undertake significant investment in data before making investment decisions and see benefit in holding intellectual property (IP) on their new generation options. [15]
- the First-moving disadvantage already inhibits electricity conversion projects among industrial customers. Transpower's proposal to implement the trial REZ over the next 2-3 years does little to clear this backlog. During the trial period, developers or large energy users will continue to face first-mover disadvantages for new connections or transmission reinforcement; this will delay socially advantageous conversions and intensify the capacity pressures on current connections.

Q11. What are some of the ways to overcome these challenges and who should be involved?

Response: We make no further comment.

[15] https://www.mbie.govt.nz/dmsdocument/10402-section-10-connecting-to-the-national-grid

Q12. Do you see any other potential challenges that need to be considered?

Response: We make no further comment.

Responses to questions in the Northland pilot consultation documents

Q1: Do you support the development of a REZ in Northland? Please provide your reasons as to why or why not.

Response: NZGA supports the development of a REZ in Northland. Ngāwhā Generation currently has consents for an additional 31 MWe (OEC5) geothermal development. The establishment of a REZ in Northland will increase the certainty that the additional power can reach the NZ electricity market.

We see the cooperation between Transpower, Northpower and Top Energy as being a useful means of working through the detail of embedded RE generation.

We qualify this support in that the details of the operation of REZs if implemented still need to be worked through. Ideally, REZs should be enablers and not a further obstacle to development through added hurdles, processes and time.

Q2. What potential benefits of a REZ are important to you? Consider economic, social, cultural and environmental factors.

Response: Refer to Question 1 above.

Q3. What potential costs of a REZ are important to you? Consider economic, social, cultural and environmental factors?

Response: See comments above.

Q4. Do you support enabling developments through upgrades to existing lines and substations as demand for connections to the networks emerge? If not, what alternatives would you propose?

Response: Yes, this will be key and could apply at both transmission level and distribution level.

Q5. If new lines needed to be built to connect resources, where should they be constructed/not constructed?

Response: We have no specific comment

Q6. Are there alternative proposals that you think we should consider?

Response: We have suggested a generator-led model.

Q7. Do you have development projects that a REZ might assist you to construct and connect?

Response: We have no specific comment.

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 gives our nation a competitive advantage in transitioning its energy sector and economy while caring for and protecting those taonga entrusted to us.

The fundamental issue is how NZ should fund the transmission and/or distribution infrastructure necessary to enable investments in renewable energy. The REZ, as proposed, fails to remedy this issue. As long as Transpower retains its pricing model, HV transmission will always lag behind the demand for capacity and with it, the socially desirable level of renewable generation. An alternative funding regime, involving risks for Transpower, seems necessary to ferment smaller scale renewable projects.

We also see potential regulatory hurdles concerning the prohibited ownership of transmission (and sub-transmission) assets by generators. If renewable generators are to collectively fund "common assets", they will want the option to have an equity stake rather than imposed third party ownership.

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

Nāku noa, nā

Dr. Paul Siratovich

President, New Zealand Geothermal Association