

February 1, 2023

Attn: Committee Staff
Environment Committee
Parliament Buildings
Wellington
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Submission on *Natural and Built Environments Bill*, November 2022

This document is submitted on behalf of the New Zealand Geothermal Association by Kennie Tsui (Chief Executive).

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 the 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. 500 individuals, as well as corporate members, representing, research organisations, Māori trusts, regional councils, geothermal electricity generators, engineering consultants, technology companies and planning consultants. 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. The submission was reviewed by a reference group comprising experienced practitioners in the consenting of geothermal projects (including scientists, engineers, Māori, planners, lawyers and others). This submission was approved for release by the NZGA executive board.

Submission overview

4. This submission has been prepared to ensure that the Natural and Built Environments Act (NBA) reflects the important role of geothermal energy in New Zealand's energy future while recognising the complexity and uncertainty associated with geothermal resources and their use and development.
5. To meet the carbon neutral target for emissions by 2050 set by the Climate Change Response (Zero Carbon) Amendment Act 2019, our challenge as a nation is to maximise Aotearoa New Zealand's renewable, low carbon energy resource potential.

6. Geothermal energy is low carbon energy. Activity by the larger industrial geothermal players will see the carbon emissions reduce even further over the next few years. With this background Aotearoa New Zealand's geothermal energy resources are critical contributors to achieving the 2050 target, and that our legacy and future potential for low-carbon geothermal energy use gives the nation a competitive advantage in transitioning its energy sector.
7. Geothermal resources¹ are vibrant, proven and indigenous, and enable industries to thrive and regions to grow. The geothermal community seeks to ensure that reform of the Resource Management Act, not only allows, but *enables* further geothermal development while ensuring protection for significant geothermal features.
8. Aotearoa New Zealand's geothermal resources are already widely used to generate low-carbon electricity, and geothermal heat is used directly to support residential, commercial and industrial scale uses (from tourism, to recreation, and industrial heating).
9. Māori Ahu Whenua Trusts and Incorporations are actively involved in large scale geothermal resource development and utilisation in New Zealand. A paper presented at the 2022 New Zealand Geothermal Workshop (Climo et al 2022²) details some of the entities involved.
10. The NZGA is confident that there is much more that geothermal resources can contribute to New Zealand's renewable energy and carbon goals, with further exploration and development of existing resources and the potential for deeper hotter supercritical resources, particularly within the Taupō Volcanic Zone.
11. It is our position that the existing framework established under the RMA for the regulation of geothermal resource development has evolved over decades, and generally works well to balance environmental imperatives with renewable energy use. This system has attracted international interest and has served as a model to follow for other jurisdictions.
12. To enable future exploration, testing, understanding and sustainable utilisation of geothermal resources, the NBA needs to directly provide for a consideration of the local, regional, national and climate change benefits of renewable energy use, alongside a consideration of the actual and potential environmental effects of geothermal energy projects.
13. New Zealand's current approach to geothermal resource use and development is internationally recognised. Our global reputation for sound geothermal resource management is looked to by several other nations as a good practice example, and New Zealand is considered to be internationally leading in

¹ The reference to "Geothermal Resources" throughout this submission is a term that is used to describe both low enthalpy resources (>30°C), high-enthalpy conventional geothermal resources (<~3.5 km deep with reservoir temperatures <350°C), and potential (but not yet proven) supercritical geothermal resources (>5 km, >400°C)

² The paper is downloadable from [https://assets.website-files.com/5ee80754caf15981698cc972/637a818ecd58e421576e173d_NZGW22%20Paper%2021%20Commercial%20Arrangements%20\(18Nov2022\).pdf](https://assets.website-files.com/5ee80754caf15981698cc972/637a818ecd58e421576e173d_NZGW22%20Paper%2021%20Commercial%20Arrangements%20(18Nov2022).pdf)

this space. While there is always room for improvement, the NZGA seek that our good practice experience is not lost through the RMA reform process.

14. Under the RMA, sophisticated measures have been developed to manage the inherent uncertainties associated with the use and development of geothermal resources. This includes data-driven system management plans, monitoring, transparent reporting, adaptive management and the use of peer review panels. The uncertainty associated with geothermal resource use and development requires that the NBA provide flexibility to facilitate exploration to increase knowledge and understanding of geothermal resources, and to support an appropriate regulatory regime for geothermal development projects.
15. In Table 1 (**attached**), we offer comment on specific sections of the Bill.
16. A detailed case outlining the advantages of geothermal energy use can be found in the Appendix. In brief, the key advantages for Aotearoa New Zealand are:
 - a. Geothermal investment will accelerate decarbonisation
 - b. Geothermal resources provide significant opportunities for Māori socio-economic development
 - c. Geothermal resources are currently the only low-carbon baseload electricity solution with significant growth potential
 - d. Geothermal developments have been the single biggest contributors to reduction of fossil-fuel fired generation in the last two decades
 - e. Geothermal resources offer a low-carbon industrial process heat solution that enables other industries to thrive
 - f. Geothermal energy use catalyses regional growth
 - g. Geothermal resources provide innovative commercial opportunities
 - h. Geothermal resources are a New Zealand icon and legacy, on a global stage

I welcome the opportunity to present to the Select Committee regarding this submission and can provide additional and supporting information on request.

Nāku noa, nā,



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Table 1: Natural and Built Environment Bill - Submission Points for New Zealand Geothermal Association

NBA Bill Part/subpart	Section	NZGA Position	NZGA Reasons	NZGA Relief Sought
<p>Part 1 – Purpose and Preliminary matters</p> <p>Subpart 1 – Purpose and related matters</p>	<p>Section 5 – System Outcomes</p>	<p><i>Support with amendments</i></p>	<p>NZGA acknowledge the intent of system outcomes to guide national direction, strategies and plans which will then guide the consideration of resource consent applications in achieving the purpose of the Act.</p> <p>The explanatory note to the Bill acknowledges there is no hierarchy among the outcomes. The stated intent of this is “affording discretion for decision-makers in how they are pursued once limits and targets are met”.</p> <p>Section 5 outlines the requirement that the system outcomes “must” be provided for. However, the practical challenge with this, while setting and working toward the achievement of required limits and targets, arises where there may be conflict between providing for each of the stated system outcomes.</p> <p>Subsequent provisions of the NBA direct that the National Planning Framework (“NPF”) and NBA plans must include content that provides direction for the “resolution of conflicts” between or among the system outcomes expressed in Section 5 (NPF Section 57(1)(b), NBA Plans Section 102(2)(e)). However, NZGA consider that direction on how the resolution of conflicts between system outcomes is to be managed should be included in the NBA.</p> <p>It is inevitable that the development of renewable resources will have some form of impact on the environment. This applies to all renewable energy sectors (e.g. hydro, wind, solar, biofuel). There needs to be an ability to balance sometimes competing outcomes, particularly where proposed activities offer significant benefits to New Zealand and the achievement of carbon zero goals.</p>	<p>NZGA seeks amendment to the NBA to provide clear direction on the management of conflicts between system outcomes to inform the NPF and the subsequent planning framework.</p>
		<p><i>Support with amendments</i></p>	<p>NZGA are strongly supportive of the reduction in greenhouse gas emissions and the removal of greenhouse gases from the atmosphere. However, there is no system outcome focussed on the use of Renewable Energy Generation (“REG”) to achieve these outcomes and reduce reliance on fossil fuels.</p> <p>While NZGA acknowledges that REG is a method for achieving system outcomes focussed on greenhouse gas emission reduction, the section needs to be more explicit about the role of REG in achieving these outcomes.</p>	<p>NZGA strongly supports the retention of system outcomes related to the reduction of greenhouse gas emissions.</p> <p>NZGA considers that the use of Renewable Energy Generation is fundamental in achieving a reduction in the reliance on fossil fuels and requests amendment to Section 5(b) to clearly direct this.</p>
<p>Part 1 – Purpose and Preliminary matters</p> <p>Subpart 1 – Purpose and related matters</p>	<p>Section 6 – Decision-making principles</p>	<p><i>Requires amendment</i></p>	<p>Section 6(2) specifies that in making decisions where there is uncertainty or inadequate information available, all persons must favour both caution and “a level of environmental protection that is proportionate to the risks and effects involved”.</p> <p>The combination of the absence of direction as to the extent to which caution is pursued and the direction in relation to environmental protection (that it is proportionate to the risks and effects of the activity) could be interpreted to mean that</p>	<p>NZGA requests that the requirement to favour caution is stated to be proportionate to the risks and effects, consistent with the requirement to achieve an appropriate level of environmental protection.</p>

NBA Bill Part/subpart	Section	NZGA Position	NZGA Reasons	NZGA Relief Sought
			<p>greater caution is required than is proportionate to the risks and effects associated with the activity.</p> <p>NZGA identifies the risk that the inherent lack of certainty associated with research, development and exploration of geothermal resources, and uncertainties inherent in the operation of consented geothermal projects, could see development in this space stifled by the application of the precautionary approach to avoid adverse effects that may or may not occur, without considering the likely substantial benefits of using geothermal energy or measures that can be taken to successfully manage uncertainty, or without considering globally catastrophic consequences of continued emissions from fossil fuels if not substituted with low carbon options.</p> <p>The nature of geothermal resources means that there is greater complexity and uncertainty associated with them than other renewable energy sources. However, geothermal is also the only renewable energy source which is not reliant on weather or climatic conditions to function and is able to generate heat and energy 24 hours a day, 7 days a week. As a result, geothermal energy resources play an important role in New Zealand's energy future.</p> <p>NZGA is confident that there is much more that geothermal can contribute to New Zealand's renewable energy and carbon goals, with further exploration and development of existing known resources, as well as the potential for deeper, hotter supercritical resources, particularly within the Taupō Volcanic Zone. To enable future exploration, testing, understanding and sustainable utilisation of geothermal resources, the NBA needs to directly provide for a consideration of local, regional and national benefits of renewable energy use alongside a consideration of the actual and potential environmental effects of geothermal energy projects.</p> <p>Due to the variability in the characteristics of geothermal systems, and the challenges with accessing subsurface information about them, there is inherent uncertainty associated with the use and development of these resources. Resource development requires sequential reduction of uncertainty. This uncertainty requires that the NBA provide flexibility to facilitate exploration to increase knowledge and understanding of geothermal resources, and to support an appropriate regulatory regime for geothermal development projects.</p> <p>A regulatory approach that provides for operation, research and development, monitoring and adaptation within reasonable defined limits, rather than an overly cautious approach is needed.</p> <p>New Zealand's current approach to geothermal resource use and development is internationally recognised. Our global reputation for sound geothermal resource management is looked to by several other nations as a good practice example, and</p>	

NBA Bill Part/subpart	Section	NZGA Position	NZGA Reasons	NZGA Relief Sought
			New Zealand is considered to be internationally leading in this space. While there is always room for improvement, the NZGA seek that our good practice experience in the environmental regulation of geothermal activities is not lost through the RMA reform process.	
Part 1 – Purpose and Preliminary matters Subpart 2 – Other preliminary matters Definitions	Geothermal Energy	<i>Support with amendment</i>	NZGA supports the inclusion of a definition of geothermal energy but seek to amend the definition to reflect the current definition from the RMA which refers to energy generated “within the earth” not “with the earth” as proposed in the NBA. The latter appears to be a typographical error as the current wording does not make sense.	Amend the definition of Geothermal energy to reflect the current RMA definition as follows. <i>“geothermal energy means energy derived or derivable from and produced within the earth by natural heat phenomena; and includes all geothermal water”</i>
	Geothermal Water	<i>Support</i>	NZGA supports the definition of geothermal water as proposed in the NBA.	Retain the definition without amendment.
	Renewable Energy	<i>Support</i>	NZGA supports the definition of renewable energy as proposed in the NBA.	Retain the definition without amendment.
	Water body	<i>Support with amendment</i>	NZGA supports the inclusion of a definition of water body but seek to amend the proposed definition to remove reference to “in the whole” as this is surplus text that is not required. A waterbody should refer to fresh or geothermal water in any part of a river, lake, stream etc as outlined in the existing RMA definition of the term.	Amend the definition of waterbody to reflect the current RMA definition. <i>“water body means fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area”</i>
Part 3 – National planning framework Subpart 5 – Effects Management Framework	Section 66(1)(f) – Limits to exemptions [to the effects management framework]	<i>Support with amendments</i>	Section 64 of the NBA outlines the scope of possible exemptions to implementation of the effects management framework. Section 66 then outlines the limitations on the types of activities that exemptions can apply to. This includes Section 66(1) (f) which provides an exemption for “activities with effects on significant biodiversity areas within areas of geothermal activity”. NZGA are supportive of this section as it recognises that geothermal resource use and development is appropriate in some locations. NZGA also acknowledges that management of significant biodiversity areas is currently managed through existing regional planning documents in the Waikato and Bay of Plenty Regions through the classification of geothermal systems. NZGA also consider it is important that references to geothermal systems are consistent throughout the NBA. The term ‘geothermal systems’ is considered to better	NZGA supports the provision for exemptions through Section 66(1)(f). NZGA also seek that the NBA be amended to recognise the connected system nature of geothermal resources and refer to areas where geothermal resources are present as “geothermal systems” rather than “areas of geothermal activity” and ensure consistency of this approach throughout the NBA.

NBA Bill Part/subpart	Section	NZGA Position	NZGA Reasons	NZGA Relief Sought
			<p>represent the current terminology used to refer to areas where geothermal resources are present.</p>	
<p>Part 3 – National planning framework</p> <p>Subpart 9 – Directions on approaches and methods</p> <p>Allocation method</p>	<p>Section 88 - Use of market-based allocation method to determine right to apply for resource consent for certain activities</p>	<p><i>Requires amendments</i></p>	<p>Section 88 outlines how the National Planning Framework (“NPF”) can make allowance for (require or permit) the use of market-based allocation of resources including the taking and use of geothermal water (under 88(1)(a)) and taking and use of heat or energy from the material surrounding geothermal water (under 88(1)(e)). This would also apply to resources already allocated through existing resource consents.</p> <p>This approach to allocation does not specifically take into account the considerable existing investment in geothermal systems exploration and utilisation. NZGA are concerned that this approach to allocation of resources, without regard for the level of existing investment by geothermal energy providers, could disincentivise further uptake in geothermal energy use.</p> <p>Geothermal development in New Zealand was directly enabled by Crown investment in exploration drilling in the 1950s — this investment has underpinned an industry worth over \$3 billion³. New Crown investment, strong policy signals, enabling regulatory frameworks and suitable incentives will act as a springboard to build on this strong legacy of geothermal resource use.</p> <p>New Zealand led the world in harnessing geothermal energy at scale, industrial geothermal direct use operation, and recently became the second country in the world to use geothermal for hydrogen production. Geothermal is a key part of our low-carbon energy future and has room to grow. Viable opportunities exist for the industry to grow and reduce emissions, and technology can be deployed in short timeframes. Geothermal operators and industry are keen to develop or deploy lower-carbon tech solutions and welcome government/policy support to increase uptake and increase the speed of transition.</p>	<p>NZGA seeks that the NBA specifically requires that any allocation approach for geothermal resources includes recognition of existing consented activities that in many cases, are associated with significant existing investment.</p>
<p>Part 4 – Natural and built environment plans</p> <p>Subpart 2— Contents of plans</p>	<p>Section 105 – What plans may include</p>	<p><i>Support with amendments</i></p>	<p>NZGA is supportive in principle of an NBA Plan setting rules in relation to the maximum or minimum temperatures and pressures of geothermal water (under 105(2)).</p> <p>However, NZGA consider it is critical to ensure that any limits/targets on temperature or pressure imposed through rules, set for geothermal systems where existing geothermal resource use and development exists, are done so with consideration of the technical constraints and existing consent holders ability to adapt their operations. It is noted also that consideration will need to be given to future access to supercritical geothermal resources which will be at higher temperatures and pressures than current operations.</p>	<p>NZGA seeks that there is direction provided in s.105, for the setting of temperature and pressure limits in NBA Plans, to consider what limits are physically able to be achieved, and over what timescale, taking account of existing consented activities.</p>

³ business.scoop.co.nz/2017/04/27/wind-and-geothermal-emerge-as-significant-sources-of-energy/

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			Similarly, in future, plans should take account of detailed modelling based on measurements in determining whether a specific plan is acceptable.	
Part 4 – Natural and built environment plans Subpart 3— Rules in plans Limitations applying to certain rules	Section 124 – Limitations applying to making of rules relating to water and coastal marine area	<i>Amend</i>	Section 124 appears to duplicate Section 105 in relation to the inclusion of rules in a NBA plan relating to the maximum or minimum temperatures and pressures of geothermal water. NZGA consider this duplication is unnecessary but if the provision is to be retained, relief sought is the same as for section 105.	NZGA seeks that the unnecessary duplication between Section 105 and 124 in relation to applying a range of temperature or pressure in relation to geothermal water is reconciled. Relief sought in relation to Section 105 applies to this section also.
Part 4 – Natural and built environment plans Subpart 3— Rules in plans Allocation methods	Section 126 – Rules relating to allocation methods for certain resources	<i>Support with amendments</i>	Section 126(3) relates to the allocation of resources. While Section 88 provides for market-based allocation to be used in NBA plans, other allocation methods can also be used. Similar to the relief sought in relation to Section 88, NZGA seek to ensure that any allocation method takes into account the significant existing investment in geothermal systems exploration and development.	NZGA seeks to ensure that in the context of geothermal resource (water and energy) use, the value of existing investment in the geothermal resource, including research, exploration and development be considered in any method for allocating resources.
Part 5 – Resource consenting and proposals of national significance Subpart 5— Hearings and decisions Conditions of resource consents	Section 240 – Condition of certain consents to pay rent, royalties, etc	<i>Neutral</i>	Section 240(2) requires that a royalty be paid to the relevant regional council for the taking or use of geothermal energy. The ability to collect royalties for resources implies ownership. The RMA currently includes provisions for the collection of royalties from geothermal resources, but these provisions have not been implemented, presumably because discussions around the ownership of geothermal resources, in the context of Te Tiriti o Waitangi, are ongoing. NZGA acknowledges Tangata Whenua claims to geothermal resource, and queries whether the drafters of the NBA Bill have considered the ongoing nature of the discussions in this space.	NZGA seeks clarity on the intent behind Section 240, how it is to be practically implemented and how this is to be reconciled with ongoing Treaty settlement discussions between Tangata Whenua and the Crown.
Part 5 – Resource consenting and proposals of	Section 269 – When sections 270 and 271	<i>Support with amendments</i>	Similar to the relief sought in relation to Section 88, NZGA seeks to ensure that any allocation method take into account the significant existing investment in geothermal systems exploration and development.	NZGA seeks to ensure that in the context of geothermal resource (water and energy) use, the value of existing investment in the geothermal resource,

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national significance Subpart 5— Hearings and decisions Duration	apply and when they do not apply (Applications by existing consent holders or by persons who are not existing consent holders)			including research, exploration and development be considered in any method for allocating resources.
Part 5 – Resource consenting and proposals of national significance Subpart 8— Specified housing and infrastructure fast-track consenting process	Section 316 - Activities eligible for specified housing and infrastructure fast-track consenting process	<i>Support with amendments</i>	<p>NZGA supports in principle, the fast tracking of resource consent renewals as an alternative consenting process and specifically supports this process for the renewal of an existing consent for renewable energy use.</p> <p>NZGA notes that Section 316(e) provides specifically for the fast tracking of applications relating to wind or solar energy generation, but this approval does not explicitly extend to the consideration of geothermal energy use or generation.</p> <p>Geothermal energy generates 17% of New Zealand’s electricity⁴, and supplies 21% of New Zealand’s primary energy⁵. 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 <u>approximately halved⁶, due to displacement of fossil-fuel based generation, primarily by geothermal.</u></p> <p>Geothermal energy offers a reliable, renewable baseload 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 baseload option, replacing gas/coal. In future, there will be an increased demand for renewable 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).</p> <p>Expanding geothermal generation will assist in filling the gap in electricity supply, at a time when ca. 27 petajoules of electricity generation⁷ (17.5% of the current supply, for current demand) would be required if all New Zealand’s fossil fuel-based plants are closed. There are also opportunities to substitute electricity for fuels which currently</p>	<p>NZGA seeks to retain the renewal of a consent for renewable energy generation as an activity eligible for the fast track consenting process.</p> <p>NZGA seeks amendment to Section 316(e) as follows (additions underlined) or any alternative relief to achieve the same or similar outcome:</p> <p><i>(e) <u>geothermal, wind or solar energy</u> generation:</i></p>

⁴ MBIE Electricity Statistics, 2021

⁵ MBIE Energy in New Zealand, 2020

⁶ McLean, K. and Richardson, I. 2019. Greenhouse Gas Emissions from New Zealand Geothermal Power Generation in Context. Proceedings 41st New Zealand Geothermal Workshop, Auckland, 25-27 November, 2019.

⁷ MBIE Electricity Statistics, 2019

NBA Bill Part/subpart	Section	NZGA Position	NZGA Reasons	NZGA Relief Sought
			<p>power transport and process heat industries. World-class low-carbon geothermal resources advantage New Zealand environmentally, economically, and socially. The world energy markets are showing growing interest in geothermal as a sought-after sustainable energy solution.</p> <p>NZGA believes that our challenge as a nation is in ensuring that we maximise and optimise all our renewable energy resources during our transition to a low-carbon future, especially baseload renewables. Baseload geothermal energy partners with and enables other renewable energy sources, such as solar, wind, hydrogen, and biomass. Maximising geothermal development (with its high availability of 90%-99%), through a more enabling regime and policy at the national level will reduce the overbuild (and associated life-cycle emissions) likely required for ensuring reliability from variable and weather-dependent energy sources, while minimising New Zealand's current reliance on fossil-based sources. Increased geothermal generation will ensure that our decarbonised future will remain affordable⁸.</p> <p>NZGA therefore seeks to <u>include geothermal energy</u> generation alongside wind and solar energy generation as an activity eligible for the fast track consenting process.</p>	
<p>Part 8 – Matters relevant to natural and built environment plans</p> <p>Subpart 2— Heritage protection orders</p>	<p>Sections 562 -565</p>	<p>Support with amendments</p>	<p>NZGA are supportive in principle of the protection of areas of highly vulnerable biodiversity.</p> <p>Section 562 sets out the following highly vulnerable biodiversity area (HVBA) criteria:</p> <p><i>“(a) the area is the area of 1 or more nationally critical species:</i> <i>(b) the area is part of a critically endangered ecosystem:</i> <i>(c) the area includes residual indigenous ecosystems in a critically threatened area of land (including both terrestrial and wetland areas):</i> <i>(d) the area includes an ecosystem that is 1 of the few and best remaining examples nationally of that type of ecosystem:</i> <i>(e) the area includes any naturally rare...”</i></p>	<p>NZGA seek amendments to Section 562-565 to direct the consideration of exemptions for HVBA's within geothermal systems at a Regional Spatial Strategy or NBA Plan level.</p>

⁸ Sepulveda, N.A., Jenkins, J.D., de Sisternes, F.J., Lester, R.K. 2018. The Role of Firm Low-Carbon Electricity Resources in Deep Decarbonization of Power Generation. Joule. Volume 2, Issue 11, 2403-2420.

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Areas of highly vulnerable biodiversity			<p>Given the relative rarity of geothermal systems, ecosystems within these areas are likely to be captured in most instances by criterion (d) above. This would apply as currently drafted, even in those geothermal systems identified as appropriate for geothermal resource use and development.</p> <p>Section 563 provides that “<i>an activity that would have a more than trivial adverse effect on the attributes that make an area a HVBA must not be allowed by a rule, a resource consent, or designation, unless...</i>” exempt in s564 (where specified in National Planning Framework).</p> <p>Section 565 provides for exemptions via the National Planning Framework. However, these exemptions are limited to activities on Māori land, in plantation forestry, conservation, indigenous biodiversity activity maintenance or restoration and/or settlement legislation (but not renewable electricity generation).</p> <p>NZGA therefore requests amendments to Section 562 to direct the consideration of exemptions for HVBA within geothermal systems be at a Regional Spatial Strategy or NBA Plan level.</p>	
Part 12 – Miscellaneous provisions Regulations	Section 848(1)(b)(iv) Regulations relating to payment of fees and charges		<p>Section 848(1)(b)(iv) outlines that the Governor-General may make regulations for prescribing the amount, method of calculating the amount and circumstances and manner in which holders of resource consents are liable to pay for the use of geothermal energy.</p> <p>NZGA is unclear whether this section is intended to be linked to Section 240 in relation to the payment of royalties or whether the fees and charges referred to in this section are separate.</p>	NZGA seeks clarity in relation to the charges outlined in Section 240 and 848 to determine what each of the charges is required for in relation to the use of geothermal resources.

Appendix:

The Case for Enabling Renewable Geothermal Energy in Aotearoa New Zealand

1. Geothermal is a vibrant, proven, indigenous renewable resource, which enables other industries to thrive and regions to grow. Aotearoa's legacy of low-carbon geothermal use gives the nation a competitive advantage in transitioning its energy sector and economy. Many of the elements needed for low-carbon geothermal to make a greater contribution to New Zealand's energy scene are established.
2. Geothermal energy has been decarbonising New Zealand's electricity and process heat sectors for over sixty years and is capable of innovating to decarbonise further so as to be a key part of Aotearoa's future energy solution. A supportive policy and regulatory environment will incentivise greater geothermal investment, technology development and fuel switching. Growth should also be encouraged in non-energy socio-economic geothermal streams, such as minerals, industrial tourism, Māori innovation, and training/education.

Geothermal investment will accelerate decarbonisation

3. As a small country, we have the advantage of being able to mobilise efficiently for robust outcomes with the appropriate policies and leadership. Geothermal development in New Zealand was directly enabled by Crown investment in exploration drilling in the 1950s — this investment has underpinned an industry worth over \$3 billion⁹. New Crown investment, strong policy signals, enabling regulatory frameworks and suitable incentives will act as a springboard to build on this strong legacy of geothermal resource use.
4. New Zealand is a world leader in harnessing geothermal energy at scale, hosting some of the world's largest geothermal direct use operations and recently becoming the second country in the world to use geothermal for hydrogen production. Geothermal is a key part of our low-carbon energy future and has room to grow. There exist viable opportunities for the industry to grow and reduce emissions, and technology can be deployed in short timeframes. Geothermal operators and industry are keen to develop or deploy lower-carbon tech solutions and welcome government/policy support to increase uptake and increase the speed of transition.

Geothermal is a low-carbon industrial process heat solution that enables other industries to thrive

5. Geothermal is used for more than electricity generation — the direct use of geothermal heat offers significant opportunities for industrial energy efficiency and decarbonisation. As a clean, reliable energy source, geothermal reduces production costs and improves environmental

⁹ business.scoop.co.nz/2017/04/27/wind-and-geothermal-emerge-as-significant-sources-of-energy/

performance across a range of strong and competitive business sectors, including food and beverage, wood processing, horticulture, and dairy processing.

6. Since the 1950's, geothermal has offered New Zealand a low-carbon energy option that has been embraced by the timber and pulp/paper processing industries (e.g. Norske Skog Tasman, CHH, Asaleo Care, Oji Fibre Solutions, Sequal Lumber, Tenon). Successful industrial-scale conversions from fossil energy to geothermal sources have included Asaleo Care (tissue production, 2010), Tenon and Sequal (timber drying, 2007 and 2015, respectively), and Oji Fibre Solutions (pulp production, 2019). Geothermal heat is also being used directly for dairy processing (Miraka at Mokai, 2010; Waiū Dairy in Kawerau, 2019), and being used to make biomass (e.g. wood pellets at Nature's Flame) or free up biomass (Oji Fibre Solutions) to decarbonise other processes.
7. Opportunities exist to further decrease carbon emissions in process industries. For example, the conversion of Tenon to geothermal from natural gas resulted in a CO₂e emissions reduction of 93%¹⁰. The majority of process heat demand is supplied from fossil fuels, mainly coal or natural gas.
8. Geothermal process heat has scope for growth in co-located industrial processes around existing geothermal power plants, and recent conversions have occurred in Kawerau and Taupō to do just this. Existing or relocating process industries that utilise notable quantities of process heat should be encouraged and incentivised to relocate to a geothermal cluster.

Geothermal enables Māori socio-economic development

9. The principles of Te Tiriti o Waitangi, including self-governance, kaitiakitanga and resource ownership, are demonstrated by Māori land-owners, Māori-owned enterprises and other partners in geothermal developments and enterprises. There is scope to enhance this relationship by further embedding tikanga and Mātauranga Māori in geothermal management.
10. Geothermal is Aotearoa's indigenous renewable energy solution, 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 development) aligns with geothermal resource developments, with the long-term project life of geothermal power plants i.e. 30+ years.
11. Most geothermal fields that have operating power stations, have some form of commercial or other beneficial arrangement i.e. ownership, fluid supply, royalties, land lease etc., with a Māori-owned enterprise. Geothermal energy developments have enabled true partnership and participation for Māori in the energy industry, as owners, developers, or co-owners and co-

¹⁰ McLean, K., Richardson, I., Quinao, J., Clark, T. and Owens, L. 2020. Greenhouse Gas Emissions From New Zealand Geothermal: Power Generation and Industrial Direct Use. Proceedings 42nd New Zealand Geothermal Workshop, Waitangi, NZ, 24-26 November 2020.

developers of geothermal fields (e.g. energy ecosystem owned by Tuaropaki Trust at Mokai; Ngāti Tūwharetoa Geothermal Assets at Kawerau; Tauhara North No. 2 Trust at Rotokawa). At Ngawha, a community geothermal energy solution addresses a lack of regional renewable power generation and high energy transmission costs.

12. Māori groups have led and grown successful businesses by leveraging their geothermal assets, people, and resources in other sectors. Māori innovation is driving new approaches to geothermal developments: collectives such as Waiū Dairy (a group of eleven Māori groups processing dairy products using geothermal heat) and whole ecosystem approaches, like Tuaropaki Trust (building a business cluster that combines electricity, horticulture, green hydrogen, dairy processing, composting and more).
13. Significant revenues/profits from geothermal enterprises create opportunities for Māori shareholders to further development aspirations, and funds are reinvested in their people through financial, health, wellbeing, educational, cultural, and sporting endowments.

Geothermal energy use catalyses regional growth

14. High-temperature geothermal resources are a competitive regional advantage, catalysing decentralisation of high energy businesses and promoting regional tourism. Without conversion to electricity, geothermal heat energy (direct use) is typically used locally due to the costs of long (in excess of several kilometres) pipeline systems. This necessitates high energy users across a range of sectors (e.g. food and beverage, horticulture, tourism, wood processing) locating their businesses in these regions. Clusters of business parks can be (and are) created around geothermal (e.g. Kawerau and Tauhara).
15. For the Bay of Plenty, Waikato and Northland, high-temperature geothermal resources are a part of regional identity beyond electricity generation and industrial heat applications, supporting geothermal tourist parks, cultural experiences, and spa and wellness facilities. There is scope to not only grow electricity and industrial and commercial ventures, but also to pair geothermal tourism more closely with outreach, education, and industrial energy use into the future. Sustainable resource management frameworks (e.g. develop/protect classifications for geothermal fields) ensure these different uses for geothermal can be effectively supported.
16. Geothermal energy benefits regional economies by providing employment and stimulating economic activity (by attracting businesses into geothermal regions), while providing affordable and reliable energy. Geothermal energy developments can improve social outcomes as they are significant employers. For example, recent funding towards geothermal developments in Rotorua

support 460 jobs in the new Wai Ariki Hot Springs and Spa, and 190 jobs in the Taheke Geothermal Power Station¹¹ development.

Geothermal provides innovative commercial opportunities

17. The high temperature geothermal industry is keen to advance beyond existing technologies and conventional geothermal resources. Some opportunities on the horizon are:
- a. Hotter, deeper resources (supercritical geothermal) offer an as-yet unknown energy potential (being explored in the New Zealand Government funded *Geothermal: The Next Generation* research programme).
 - b. Geothermal energy could form a key component of hybrid energy systems. For example, surplus renewable electricity generation can be used to produce green hydrogen, which is stored and then rapidly converted back to electricity when renewables cannot meet energy demands. Tuaropaki Trust and Obayashi Corporation are exploring this opportunity.
 - c. Closed-loop and carbon recycling¹² technologies are being developed overseas, gaining investment from multi-national energy companies and could be deployed in New Zealand.
18. Additional opportunities, beyond expansion of electricity generation and process heat, include mineral extraction from geothermal fluids (e.g. Geo40, lithium-extraction), strategically aligned with increasing global demand for rare earths for EVs and batteries.
19. Geothermal energy also offers a sound opportunity for those regions without high-temperature geothermal fields. Low-temperature geothermal energy is everywhere. In all regions, the natural heat flow (increasing about 25-30°C for every kilometre depth) offers a primary energy for low-grade process heat. This geothermal energy can be accessed using existing technologies, in use internationally, and have potential, especially in large residential, large space builds. Ground-source heat pump technologies (for space heating and cooling) and low enthalpy power generation technologies are ready to deploy. While these technologies are in use extensively internationally, the market is immature in New Zealand. Growth in this area, to transition to or create new industries (which displace carbon-based heating) requires policy support and feasibility studies.

¹¹ www.beehive.govt.nz/release/rotorua-benefits-over-62-million-boost

¹² www.carbonrecycling.is/

Geothermal is a New Zealand icon and legacy, on a global stage

20. Geothermal is an iconic kiwi symbol. As well as being home to numerous world-class geothermal operations, Aotearoa benefits from the intrinsic value in our geothermal landscapes, biodiversity, and recreational potential. Geothermal stories and geothermal energy have been part of Māori culture for generations, and geothermal is entrenched in our modern history.
21. Geothermal is one of the ways we introduce New Zealand to the world. New Zealand's investment in geothermal has produced significant intellectual property (IP), and our experts, their knowledge, and technical skills, are sought-after internationally.
22. New Zealand leverages domestic geothermal skills and IP (consulting, science, engineering and training) to maintain a large international service industry. Entities include Jacobs, MB Century, MTL, Thorndon Cook, Aecom, Beca, Seequent, Upflow, GNS Science, Wintec and University of Auckland, as well as a host of smaller companies and independent consultants, and the work done overseas by New Zealand's geothermal electricity generation companies. Our expertise attracts students and professionals to train in New Zealand institutions and organisations. Our technical support for geothermal developments throughout the globe, (usually in places with high-carbon power generation markets) positively impacts the global carbon balance by displacing fossil-fuel based energy generation and reducing CO₂ emissions outside of New Zealand.
23. Geothermal is a New Zealand pioneering engineering innovation. We have developed expertise that has revolutionised the global geothermal industry. As early-adopters, New Zealand's geothermal companies have helped to develop international best practice – including exploration, reservoir management, design, engineering, and environmental modelling.
24. Our geothermal leadership has enabled New Zealand to expand its sphere of influence in foreign affairs and diplomatic settings. This includes support for NZ-based training of international students, and in New Zealand assistance programmes supporting geothermal development in, the Caribbean, Indonesia, and East Africa, where it is acknowledged that New Zealand geothermal skills have a key role to play in decarbonising the economies of these regions.