Submission in response to *From the Ground Up; A draft strategy to unlock New Zealand's geothermal potential*

Published by the Ministry of Business, Innovation and Employment
30 July 2025

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12 September 2025

1. This submission responds to the invitation to submit feedback on "From the Ground Up; A draft strategy to unlock New Zealand's geothermal potential," published by the Ministry of Business, Innovation and Employment (The Strategy) on or before 12 September 2025. We commend the Ministry of Business, Innovation and Employment for their sector leadership in publishing this draft strategy, just as we acknowledge the Honourable Shane Jones, Minister for Resources, for the role he has played.

2. Geo40 was established in 2010 to develop technologies to sustainably recover strategic minerals from geothermal fluids. The founders logic was leverage New Zealand's significant operating geothermal capacity, and the associated fluids being used for power generation, as a source of dissolved strategic minerals. This journey commenced with the development of technology to extract the silica that is ubiquitous in hot geothermal fluids across the world. The Company's ultimate aim was to target a broader range of high-value strategic minerals including caesium, lithium, boron and antimony. Geo40's investors include Ngāti Tūwharetoa, effected initially by two iwi, Tupu Angitu and the Opepe Farm Trust, alongside the Crown via Kānoa, the Regional Economic Development and investment Unit (Kānoa).

3. Today, Geo40 operates two silica plants on the Ohaaki geothermal field in a collaboration with Contact Energy and the Ngāti Tahu Tribal Lands Trust; a modest demonstration plant commissioned in 2016, and a significant full commercial-sized asset commissioned in 2021. These plants together process around 7,500,000 litres of geothermal fluid every 24 hours. The Company produces 2,000 to 3,000 tonnes per annum of high quality colloidal silica that it sells to a range of sectors in locations as diverse as the USA, Japan, Mexico and Australasia.

4. Removing silica from geothermal fluid is valuable in-and-of-itself, but offers wider benefits in the geothermal power generation ecosystem. Principal among these is the elimination of silica scaling in geothermal plants, reinjection piping and reinjection wells, which is understood to account for up to one quarter of geothermal power station operational cost. Removing silica also allows more of the heat in the geothermal fluid to be utilised for geothermal power generation – typically permitting around 10% additional generation. An alternative is to utilise this 'liberated energy' as process heat for heat-intensive industries – for example in wood treatment or hot-house horticulture. Achieving more generation is impossible unless the silica concentration in the fluid is reduced. Removing silica opens up the opportunity to create value from previously-unutilised relatively low-temperature (140^0C to 70^0C) heat (which is often referred to as waste heat) through the sale of this heat to industry. The alternative is to make high-grade heat (straight from a geothermal well, where temperatures can be as high as 350^0C) available for industry. Managing these high temperatures and attendant high pressures for process industry is much more expensive than utilising waste heat – and this high-grade heat should ideally be used for electricity generation instead. Silica removal is the gateway technology here to optimise a geothermal system.

5. The incumbent Geothermal operators often utilise acid as a bandage to mitigate silica scaling issues by lowering the pH of the geothermal fluid. This process is expensive and only effective to a relatively low level. Geo40's process removes the silica, forming a valuable byproduct and significant advantages over and above what can be achieved with acid dosing.

6. Removing silica also allows for lower reinjection temperatures, increasing carbon dioxide solubility, permitting optimal carbon dioxide sequestration, particularly where carbon dioxide emissions are high and where higher levels of carbon dioxide solubility in reinjection fluid are sought.

7. Geo40 owns the only technology that has been proven at scale to extract silica thus eliminating silica scaling whilst making a high-value silica colloid. Geo40 is now working to license its silica recovery technology across the world, and has contracts signed to showcase its abilities.

8. Over the last six years Geo40 has also developed a proprietary direct lithium extraction technology. This has been widely tested on geothermal fluids across the world where lithium concentrations tend to be low (typically under 80ppm lithium). Geo40 has successfully extracted lithium at pilot scale from Ohaaki geothermal fluid, where lithium is present at just 7ppm. Geo40 believes it leads the market in low-grade lithium recovery, where the Company's technology can offer attractive project economics with lithium grades as low as 20ppm.

9. While Geo40 remains motivated by lithium recovery from geothermal fluids, the Company has been very active in piloting lithium recovery from brines produced as a by-product of oil and gas extraction. In 2025 Geo40 completed an extensive North American well-head piloting tour, extracting lithium from most of the principal North American oil and gas basins, working for significant oil-and-gas companies. A number of oil and gas majors have publicly stated their intentions to extract lithium and other strategic metals from subterranean fluids, and this is very much Geo40's target market for its mineral recovery technology suite. Interestingly, the oil and gas sector has been much faster to see the potential for mineral recovery from subterranean fluids than the geothermal sector.

10. Today, Geo40 is commissioning a significant direct lithium extraction demonstration/pre-commercial plant. The plant will process a little over 1,000 tonnes of brine per day and can produce up to 300 tonnes of lithium carbonate equivalent per annum. This asset, alongside the Company's work in silica and boron, puts Geo40 at the forefront of the mineral-recovery-from-brine industry. This asset will showcase direct lithium extraction from a New Zealand fluid by recovering lithium from the Ohaaki geothermal field for some months whilst commissioning and testing takes place. This asset will then be shipped offshore to a higher-grade lithium opportunity.

11. In parallel, Geo40 continues to pilot lithium recovery more widely across the world. It is not an exaggeration to note that the world is very much waking up to the potential to secure new lithium supply alongside the current dominant hard-rock resources. A number of the oil majors have made public commitments to pursuing lithium in produced waters, including Exxon Mobil, Equinor, Chevron and Aramco, alongside a legion of junior explorers. This is creating demand for Geo40's technology and services worldwide.

12. The geothermal sector in New Zealand, despite our work at the forefront of mineral recovery from geothermal fluids and that of others, is yet to widely embrace this opportunity. There are geothermal fluids in New Zealand that offer compelling silica and lithium project economics but resource owners have, with a few exceptions, typically been slow in pursuing these opportunities. This is causing us to prioritise multiple offshore mineral recovery projects over nascent New Zealand opportunities.

13. New Zealand has long held a leadership position in geothermal power exploration and generation, reflecting our love of geothermal as a national taonga, or treasure. This is manifest across key parts of the supply chain, from core exploration and attendant support software, modelling and drilling services through to consulting expertise. With few exceptions, this has been largely confined to the support and realisation of traditional geothermal generation – the process of developing an asset to generate power or to provide process heat. Geo40 is one of those few exceptions.

14. Despite its global geothermal leadership position, New Zealand has been slow to recognise all of the broader opportunities in the sector. The first strategic outcome, "Extend New Zealand's position as a world-leader in geothermal innovation," hints at this opportunity.

15. This hypothesis is extended on Page 7 under the heading, "Unleashing subsurface value," which notes that, "Beneath the surface lies further commercial potential – from extracting valuable minerals dissolved in geothermal fluids to…". We agree, but note that while this statement is correct, and proven by us, this fails to acknowledge the value that silica recovery brings above the surface, as outlined in (4). In the broader narrative the strategy appears to acknowledge this on page 15, under the heading, "Enhancing geothermal energy efficiency and resource recovery through silica capture technology." This section mentions a small company making a calcium silicate product at pilot scale, which we applaud, but fails to mention our work in recovering higher-value colloidal silica at full commercial scale at Ohaaki – work which is being noticed on the global geothermal stage. The strategy should acknowledge both organisations working to recover silica-based products alongside our broader work in lithium, boron and caesium as well as that of several other companies targeting geothermal minerals.

16. Page 14 makes a case for the role the Crown is playing in innovations of this type through the Ministry of Primary Industries' Growth Sector Fund and MBIE's Endeavour Fund, but neglects to mention Kānoa's significant contribution to Geo40 as a debt and equity holder, across our work in both silica and lithium. Early-stage capital is significantly easier to secure than larger-quantum growth capital in New Zealand, and it is our view and experience that it is the lack of this growth capital that is in large part the reason why few companies emerge in the clean-technology sector at Geo40's scale. Kānoa played a very pivotal role here in our growth, providing around 70% of the capital required to build our large commercial silica plant (helpfully structured as a mix of debt and equity, which then supported a private equity raise for the balance of the build cost). We believe Kānoa should be acknowledged in The Strategy for the critically-important part they played in our success – and by extension, for allowing us to demonstrate the potential for mineral recovery from geothermal fluids to a local and global audience.

17. The Strategy mentions, on page 13, an imperative for "targeted investment in demonstration projects." We agree, but reiterate the point that there is also an imperative for investment into first-of-a-kind commercial projects, such as our large silica plant. These investments, given their technical risks, are challenging for investors and can benefit from public funding support. We note the parallels to critical mineral extraction public funding available in many countries worldwide. If New Zealand is to see innovation in the geothermal sector emerge at scale, public support will be required.

18. In response to specific question (1) around whether the three strategic outcomes are suitable, we agree that these broadly capture the opportunities in the sector.

19. In response to specific question (2) around whether the five overarching action plan goals capture the areas that are most important for achieving the vision, strategic outcomes and energy goal, we respond as follows. The key action plan goals that support our objectives are the third goal, "Advancing knowledge and uptake of geothermal technologies" and the fifth goal, "Driving science, research and innovation, including supercritical geothermal technology."

20. In response to specific question (3) around whether the action plan correctly captures necessary government interventions and priorities, we respond as follows. We believe there are two clear opportunities, relevant to our sector, where government can play a meaningful role. The first is to direct some specific funding towards innovation and the scale-up of promising technologies in the geothermal sector – through a vehicle like Kānoa or other regional development facility. We note this has occurred in a handful of cases including in supercritical and that we are a direct beneficiary too, as noted in (15). A structured multi-year sector innovation funding regime would encourage longer-term structured research and start-up activity.

21. The second opportunity for the government, in response to question (3) is to acknowledge geothermal minerals in the government's Critical Minerals List. The Critical Minerals list rightly identifies those minerals, "essential to New Zealand's economy and technological needs, including clean energy and international trade." The latter part of this definition is important; the list endeavours to capture minerals that can be globally traded in support of New Zealand's economy. Geothermally-derived minerals are a very unique proposition in the minerals industry in that they can be sourced in a very light-touch manner. Good technology like ours can very selectively recover a range of minerals dissolved in geothermal fluid, with that fluid returned to the same aquifer so the mineral dissolution process can continue. This is uniquely the most sustainable way to source a wide range of valuable minerals – a kind of sustainable mining that supports our balance of trade. Geothermal minerals should be specifically acknowledged in the government's Critical Minerals List.

22. In response to specific question (4) around the role of the sector, we offer some thoughts. The New Zealand geothermal sector has an opportunity build upon its leadership position in core geothermal generation by more actively embracing the wider geothermal ecosystem opportunities. New Zealand has participated in many parts of this wider ecosystem in only a cautious way – for example, in carbon dioxide sequestration and process heat utilisation, and uptake is not broad. When we move early in these areas we can build knowledge and a leadership position which we can then export offshore.

23. In response to specific question (5) around a potential broader role for tangata whenua in geothermal resources, we are hopeful that The Strategy will clear the way for iwi to achieve wider utilisation of resources in their rohe. We would like to see this strategy broadened to acknowledge the role that tangata whenua is already playing in the geothermal sector. We can offer tangible examples in our relationship with the Ngati Tahu Tribal Lands Trust where they are involved in many facets of our business; they are the landowner under our assets, we remove silica-clouding from a spiritually-important Ngawha or hot spring and we work together around employment and environmental outcomes. The same is true of Ngāti Tūwharetoa, where two Tūwharetoa iwi, Tupu Angitu and the Opepe Farm Trust have invested on behalf of the broader nine Tūwharetoa iwi in Geo40, marking their first investment in a technology company. We feel their expectations of us acutely, and hope our success paves the way for broader iwi investment in the geothermal and clean-tech sectors.

sustainable mineral recovery

24. In response to specific question (6) around opportunities for our geothermal sector that have not been considered, we comment as follows. Removing silica specifically makes more geothermal heat available, for additional generation or industry. This opportunity could yield 10% more electricity generation at every New Zealand geothermal power station – contributing one tenth of the desired additional capacity sought by 2040. Geo40's technology is mature now and can be deployed quickly, eliminating the very significant ubiquitous silica scaling problem that geothermal generators deal with daily, eliminating the need for acid dosing while also generating revenue through silica sales. While we sell much of the silica we extract in our New Zealand plants globally, domestic demand is increasing fast in a range of applications.

25. In further response to question (6), we note also that there are more discrete opportunities for lithium and boron recovery at New Zealand geothermal power generation sites. These warrant immediate study.

26. In response to specific question (7) around the challenges for our geothermal sector that are not covered in The Strategy, we respond as follows. We believe that the overarching opportunity for the New Zealand geothermal sector is to recreate the culture that saw New Zealand emerge as a leader in geothermal from the 1950's. Our industry today was created by the Crown's genuine belief in the potential and their early funding of exploration. We find ourselves at a similar juncture now but within a very different market model. If we don't embrace innovative companies in our sector who can meaningfully create new value in the geothermal ecosystem, they will find more compelling opportunities offshore.

27. In closing, we see that there is real scope for the key actors to find new ways to work together in pursuit of innovation. We believe that this can be done with genuine collaborative spirit with the confidence that there is sufficient value to be captured to ensure that all will do well commercially where this occurs.

Thank you for the opportunity to make a submission in response to the draft strategy. We remain at your disposal to support innovation in our industry where we can.

John Worth
12 September 2025