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Executive interview: NZ Geothermal Association chief executive Kennie Tsui

Steve Rotherham - Mon, 21 Feb 2022

Kennie Tsui sees big opportunities for geothermal energy in this country, and says the New Zealand Geothermal Association can play a key role in facilitating the development of this resource.

Tsui joined the NZGA in July after working as a principal analyst at the Interim Climate Change Committee and the Climate Change Commission.

"I learned a lot at the Commission, but I wanted to play a role in translating the final advice and recommendations into actions," she says.

"I'm really passionate about renewable energy, so when the NZGA position came up I applied."

Tsui has extensive experience in the public and private sectors, including stints with the Ministry of Economic Development in energy information and modelling, where she was seconded to the Ministry for the Environment working on emissions trading scheme regulations. The she went to the Environmental Protection Authority where she worked on ETS compliance.

That was followed by more than five years at the Ministry for Business, Innovation and Employment working on science and technology project investments. Then she went to the ICCC.

She has an honours degree in chemical and process engineering from the University of Canterbury and an MBA from Victoria University.

Since taking on the NZGA role last year, she has written a [submission](#) on the Ministry for the Environment's emissions reduction plan, and [another](#) to the Electricity Authority's consultation on the future security and resilience of the national power system.

In these submissions, she advocates for recognition that geothermal resource has a special role to play as steady-state, non-intermittent low-carbon energy, both for electricity generation and for industrial and household heat.

And she argues that New Zealand's geothermal potential is greatly underestimated.

Tsui cites Contact Energy's submission to the Climate Change Commission, which says New Zealand geothermal generation will grow from 7600 GWh in 2020 to 12,000 GWh by 2030 – an increase of 462 MWe of capacity. This is net of any de-ratings or decommissioning.

This figure is considerably higher than CCC and Transpower projections. But Tsui says geothermal's contribution could grow even more than Contact has forecast because there are several parts of the central North Island where geothermal systems are not well understood. More research could easily open up more potential for development.

Wide range of uses and resources

There is also room to develop geoheat for industrial process heat applications and commercial operations.

"Alternative heating sources such as geothermal can help decarbonise process heat while also relieving pressure on electrical supply," Tsui says.

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The NZGA believes developing more geoheat resources in Northland, Waikato and Bay of Plenty could deliver an additional 7.5 PJ of annual output, equivalent to 2000 GWh.

She also says ground-source heat pumps could be used not just in the Taupō Volcanic Zone but across the country, particularly in the South Island and Taranaki.

Using geothermal heat pumps could dramatically reduce electricity demand for industrial, commercial, and residential installations through efficient heat exchange with the ambient conditions at point of extraction, according to Tsui. The impact would be highest in winter.

"The massive roll-out of these proven technologies can significantly reduce the need for additional electricity generation for space heating and further curtail carbon emissions," she says.

In addition, New Zealand has potential for deep, very high-temperature geothermal resources.

GNS Science began studying these supercritical systems a couple of years ago in a five-year project aimed at assessing the resources and GNS says deep supercritical



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geothermal fluids can carry three times more heat than conventional resources and are lower density.

The research aims to identify the best New Zealand targets by understanding the source, location, and behaviour of supercritical resources, and to reduce deep geothermal projects' exploration and technological risk.

Developing the taonga beneath our feet

Tsui is optimistic about all of these resources. But developing them would require a big national commitment.

The NZGA is advocating about \$50 million in government research and development funding over the next five years for various purposes.

These include accelerating projects; exploring the potential of smaller resources; helping tangata whenua identify barriers to sustainable geothermal development; and industrial geothermal direct use transition and innovation pilots.

It is also seeking another \$5 million to invest in an industrial-scale heat-pump demonstration outside the Taupō Volcanic Zone; \$30 million over five years to drill a test well to appraise supercritical geothermal potential; and another \$100 million over 10 years to assess and establish new geothermal industries.

Proposed industries for investigation include:

- lithium and silica sourced from geothermal fields
- hydrogen
- capturing geothermal carbon dioxide for methanol production
- geothermal carbon capture and storage

Achieving some of these goals would require regulatory changes – for example expanding the Emissions Trading Scheme's definition of carbon sequestration to include not just forestry but also carbon capture and storage.

Tsui says interest is already growing in underused applications for geothermal.

"Aotearoa New Zealand has the highest use of geothermal process heat by industry. At both the resource and technology levels, geothermal process heat is well proven, with additional capacity available right now to be more widely deployed."

She says geoheat is already powering wood processing, food and beverage manufacturing, dairy processing, timber drying, horticulture, aquaculture and biotechnology businesses. It is can be used by any industry that uses heat from chilled temperatures (4°C) up to 220°C.

"All of Aotearoa has a high subsurface geothermal potential, but the strongest potential for low-to-medium-temperature heat is in the South Island and Taranaki," she says.

Sweden lacks New Zealand's high-heat geothermal resources, but about 20 per cent of Swedish homes now use low-temperature groundsource heat pumps. Yet this potential has barely been tapped in New Zealand.

The geothermal sector and the NZGA are now trying to identify potential demand for groundsource heat pumps.

"Several different organisations have asked me about ground-heating for apartment blocks and housing developments," she says.

Tsui is keen to see New Zealand develop these low-to-medium-heat resources, which can be exploited with existing technologies.

But she is also excited about the medium-to-long-term potential of research over the next decade to establish a pathway for exploiting deep geothermal resources.

"Deeper, hotter supercritical is a gamechanger," Tsui says.

"Supercritical has 10 times more energy stored than our current subsurface resources."

NZGA's role

The NZGA has big ambitions and since becoming its chief executive, Tsui has spent much of her time meeting and consulting with stakeholders.

She says the NZGA can contribute by coordinating parties across the geothermal sector to facilitate projects and can help make government, other industries and the public more aware of geothermal's potential.

It can also help drive innovation by connecting people, ideas and skills to drive the development of new applications, techniques and technologies; supporting business cases; and identifying and promoting geothermal opportunities to energy-intensive industries.

Education is another key role. The NZGA facilitates Geothermal Institute's annual geothermal workshop and hosts an annual winter seminar, as well as talks and webinars. It also uses networking and mentorship to foster the next generation of geothermal enthusiasts, and provides forums for training and upskilling.

Looking forward

Geothermal is one of the few fields in which New Zealand is truly a world leader, and we have the second-highest installed geothermal energy profile per capita in the world (after Iceland).

Yet Tsui believes most of our geothermal potential has yet to be tapped.

She says the push for decarbonisation and the need to underpin intermittent renewables with clean baseload power and steady heat resources foreshadow an exciting decade to come for New Zealand's geothermal sector.

"Aotearoa New Zealand is a world-leader, with one of the largest developed geothermal industries in the world, with the fifth largest installed generation capacity," she says.

"Geothermal is a crucial energy source today, poised to play an even greater role in our low carbon energy future."

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