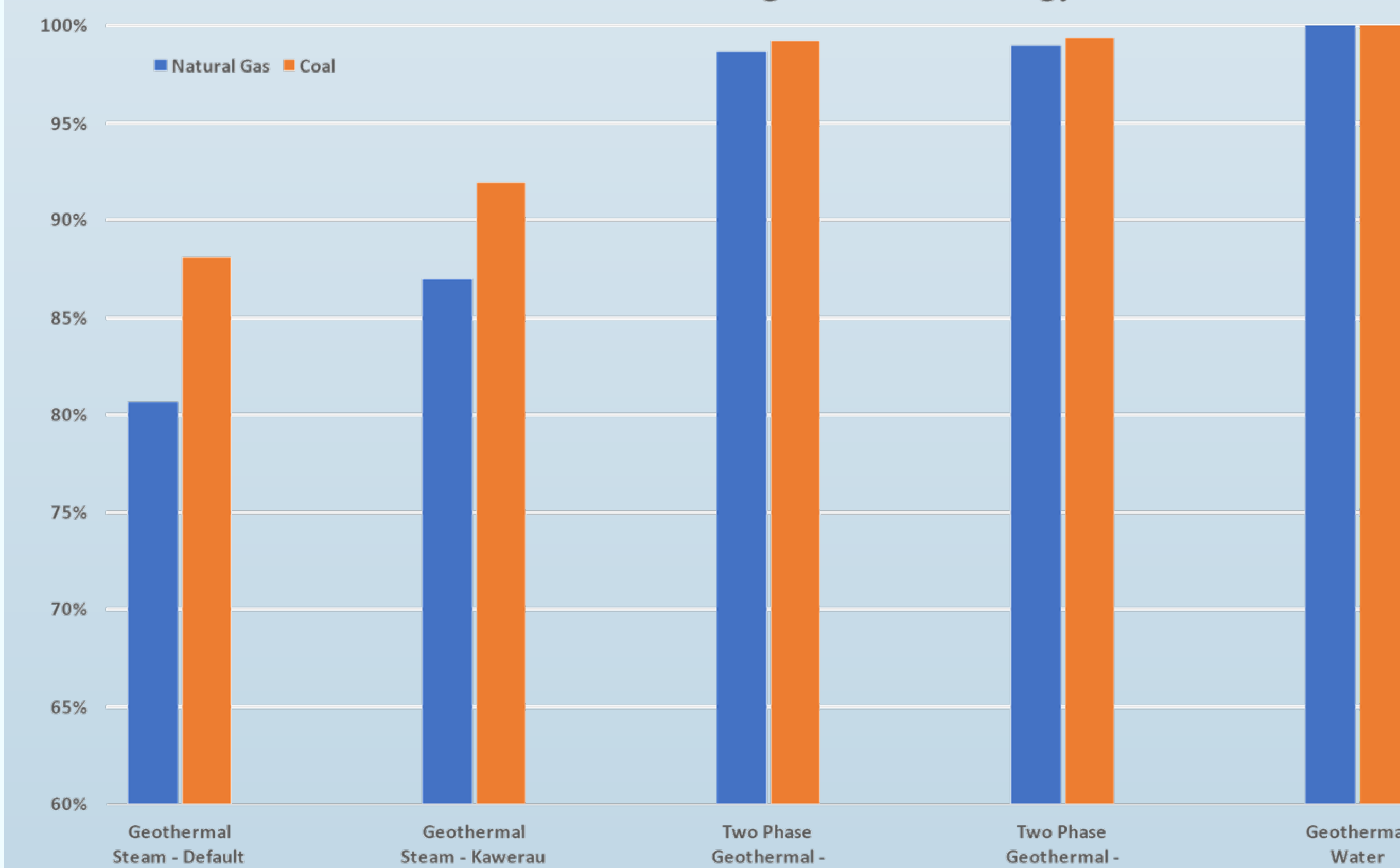


Geoheat Offers Fantastic Potential for Emissions Reductions

With Geoheat meeting the required duty for a given application, and for a given type of Geoheat (ie geothermal steam, two phase or water), emissions reductions of between 80 and 100 percent can be achieved using Geoheat instead of fossil energy (Carey et al 2024a).

Emissions Reductions in Transitioning from Fossil Energy to Geoheat



Geoheat Strategy for Aotearoa NZ 2017 - 2030

In 2015 GNS Science commenced developing a Geoheat Strategy (Climo et al 2017) for New Zealand as it was recognized that much more could be achieved through the use of geothermal energy for process heat than was occurring at that time.

The New Zealand Geothermal Association adopted and launched the strategy in 2017.

2017 – 2030 Geoheat Strategic Goals

- Increase the uptake of Geoheat in New Zealand by 7.5 PJ pa (primary energy) by 2030.
- Create an additional 500 new jobs associated with new Geoheat projects by 2030.

The Strategic Activity is supported by an Action Group that develops two yearly Action Plans.

Initially the work focused on larger industrial / commercial use from the high temperature geothermal resources in the Taupō Volcanic Zone. There were success stories, such as Nature's Flame Taupō, where a biofuel pellet manufacturer adopted a 20 MW_{th} Geoheat supply to replace an aging biomass boiler. The flow on emissions reductions have seen two large dairy factories adopt biofuel wood pellets replacing coal and in doing so reduce annual CO₂e emissions by more than 120,000 tonnes pa (89,000 tonnes pa at Fonterra Te Awa mutu (EECA 2021a) and 35,000 tonnes pa at Open Country Dairy Waharoa (EECA 2021b).



Geoheat has traditionally been a large industrial process heat solution in New Zealand because of the upfront capital-intensive nature of a geothermal process heat supply. This is changing rapidly however, with the establishment of the He Ahi, Eco Industrial Park, in Taupō where small to medium sized enterprises can lease one of 16 sites in the park which are to be serviced with Geoheat supplied by Contact Energy Ltd. The Geoheat is purchased on a utility basis through longer term energy supply contracts. The first business to establish in He Ahi is Tnue, a fertilizer manufacturer who takes up to 1.2 MW_{th} of Geoheat and in so doing offsets 800 tonnes pa of CO₂e emissions that would have otherwise been emitted if natural gas had been used as the process energy source (Carey et al 2024a).

Growing Interest in Geoheat for Covered Crop Heat

Through 2022 – 2023 there has been growing interest in ambient and low temperature geothermal resources that are available widely across New Zealand. Particular interest from the horticultural sector is growing in using geothermal heat pumps and low temperature Geoheat to support growing conditions in covered crop facilities. These facilities have traditionally used coal or natural gas as the fuel to provide the energy.

The Taupo Economic Development Agency (Amplify), the NZGA and GNS Science ran a Geoheat for Horticulture Workshop in July 2023 as part of NZ Geothermal Week. Use the QR to view the presentations.



Action Plan 2024 - 2025

The 2024 – 2025 Geoheat Action Plan was released by NZGA in May 2024. The plan focused on the changing emissions landscape that is occurring in New Zealand and the role that Geoheat can play in moving to Net Zero by 2050. Because of the work that had been going on in 2023 in ambient and low temperature geothermal, with quite some potential right across New Zealand identified, the 2024-2025 plan was purposefully enlarged to include these.

Challenging achievements were targeted for the 2024-2025 period, with at least **seven** new Geoheat ventures or projects announced and / or completed. These ideally will comprise:

- One new major industrial high temperature venture
- 3 new small and medium enterprise high temperature ventures.
- 3 new or fuel-switching low temperature ventures announced

Collectively, these ventures should equate to emission reductions (relative to fossil fuels) of between 25,000 to 40,000 tonnes CO₂e pa.

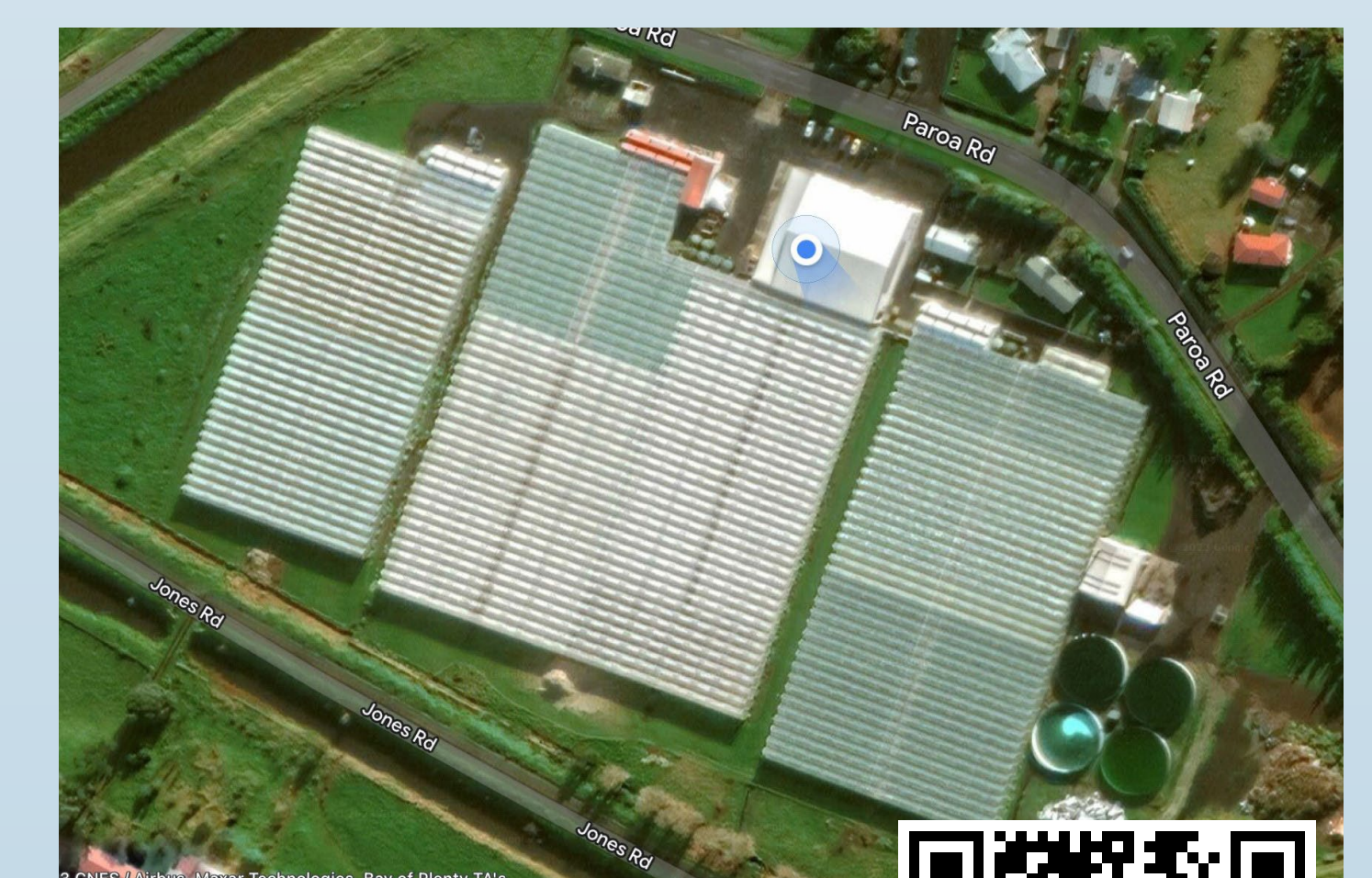
A collaborative Geoheat Action Group meets every two months to workshop and foster the uptake of Geoheat across New Zealand.

EECA – Bay of Plenty - Regional Energy Transition Accelerator

GNS Science contributed a geothermal study to the Energy Efficiency and Conservation Authority (EECA) Bay of Plenty, Regional Energy Transition Accelerator (Carey et al 2024b). The EECA summary report (EECA 2024) identified that using the marginal abatement cost (MAC) methodology geothermal was the optimum fuel for all the sites studied. The material below is summary material from the Whakatane Growers preliminary site analysis by GeoExchange Ltd for transition from fossil energy to Geoheat.

Whakatane Growers - Covered Crop Facility

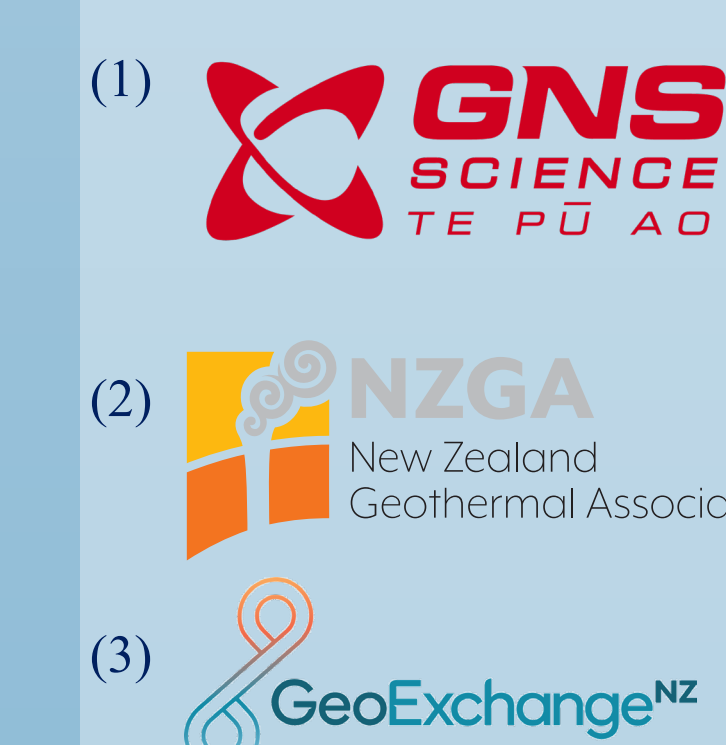
- Size 3.2 Hectares covered
- Maximum heating capacity 4.8 MW
- Geothermal Heat Pumps using ambient 15°C water
- Well depths ~300m
- Replacing fossil energy boilers, a combination of coal and gas
- Annual CO₂e emissions reduction of 3700 tonnes
- Indicative capital required NZD \$6.6 million
- Simple payback of 2.4 years



References

- Carey, B., Miller, F., Howie, D., Wells, C., Carden, Y., Tsui, K., Seward, A., Allen, M., 2024a. Action Plan 2024 – 2025: Geoheat Strategy for Aotearoa NZ., New Zealand Geothermal Association. ISBN 978-0-473-70917-4.
- Carey BS, Alcaraz SA, Wells C, Carden Y, Moore G. 2024b. Regional Energy Transition Accelerator – Bay of Plenty – Geothermal Energy Assessment. Lower Hutt (NZ): GNS Science. 74 p. (GNS Science Report; 2024/02).
- Climo, M., Bendall, S., Carey, B., 2017. Geoheat Strategy for Aotearoa NZ, 2017 – 2030. New Zealand Geothermal Association. ISBN 978-0-473-38263-6.
- EECA, 2021a, Fonterra coal boiler conversion – Case Study. <https://www.eeca.govt.nz/insights/case-studies-and-articles/fuel-switching-captures-economic-and-climate-benefits-for-fonterra/>
- EECA, 2021b, Open Country Dairy converting two coal boilers at Waikato site. <https://www.eeca.govt.nz/about/news-and-corporate/news/open-country-dairy-converting-two-coal-boilers-at-waikato-site/>
- EECA, 2024, Regional Energy Transition Accelerator (RETA) Bay of Plenty Summary Report. <https://www.eeca.govt.nz/assets/EECA-Resources/Co-funding/RETA-Bay-of-Plenty-Summary-Report.pdf>

Connect with the Authors / Organisations



- (1,2) Samantha Alcaraz - s.alcaraz@gns.cri.nz
- (1) Anya Seward - a.seward@gns.cri.nz
- (1) Brian Carey - b.carey@gns.cri.nz
- (2) Mike Allen - mike.allen@xtra.co
- (3) Yale Carden - ycarden@geoexchange.nz