Advancing geothermal development through improved understanding of New Zealand's subsurface

Meeting New Zealand's renewable energy goals will require both new energy sources and optimising existing energy operations. Geothermal energy is expected to play a major role in decarbonising NZ's energy system as the only renewable energy source that does not depend on weather. The Government's recently released *New Zealand Geothermal Strategy* aims to double geothermal energy use by 2040, encompassing both electricity generation and direct heat applications.

Earth Sciences New Zealand is supporting this ambition through two complementary SSIF-funded projects: *Distribution of Earth Materials and Properties Onshore and Offshore*, and *Growing Renewable Energy Supply*. Together, these projects combine fundamental and applied science to understand the subsurface rocks, structures, heat sources, and fluid pathways that control geothermal systems. This research improves the ability to identify and evaluate geothermal systems, inform development opportunities, and support effective management of geothermal resource use.

Drawing on decades of innovative research, Earth Sciences New Zealand has developed advanced ways to image and understand geothermal systems. By combining geophysical surveys, geological mapping, geochemical experiments, and three-dimensional models, researchers can highlight potential heat sources, infer the movement of geothermal fluids underground, and better understand the geological conditions influencing energy potential.

This research led to the discovery of a previously unrecognised heat source beneath the Makatiti rhyolite dome in the Taupō Volcanic Zone, one of New Zealand's most strategically important geothermal regions, revealing new geothermal energy potential.

The discovery marked the beginning of a new phase of investigation. Building on the geophysical surveys that revealed the opportunity, Earth Sciences New Zealand is working with industry partners to understand the system and evaluate its development potential. SSIF investment across both projects has helped leverage industry co-funding, shared datasets, and collaborative partnerships, enabling more detailed investigations and accelerating evaluation of the opportunity. What began as a scientific discovery has evolved into an industry-investigated geothermal opportunity.

Similarly, SSIF research benefits geothermal operators and regional councils by providing information to support well targeting, understanding energy extraction potential, resource management, and environmental protection. For example, the *Rotorua Geothermal System Management Plan*, released by Bay of Plenty Regional Council in 2024, drew on research co-funded by SSIF and the council. This same research capability is helping inform geothermal exploration and management across the Taupō Volcanic Zone.

The impact from this SSIF-funded research extends beyond today's geothermal fields. The geological framework, datasets, and modelling capabilities developed through this research underpin Earth Sciences New Zealand's Endeavour Fund *Deep Heat* programme, which is investigating conditions at depth for the potential of superhot geothermal resources, and *GeoShot*, a government and industry-funded initiative seeking to drill New Zealand's first deep superhot geothermal well.

From discovery through to industry application, this research is demonstrating real-world impact and helping unlock New Zealand's geothermal potential.