



## **Magnetotelluric imaging of the Reporoa geothermal system in New Zealand**

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The Reporoa geothermal area is located in a caldera on the eastern side of the Taupo Volcanic Zone in the North Island of New Zealand. For the last 40 years scientists have argued whether Reporoa is an independent geothermal system or just an outflow structure of the Waiotapu geothermal system to the north. Due to its location and possible connection to the Waiotapu geothermal system, which is a protected system and a big tourist attraction, the Reporoa system needs to be well characterised before commercial exploitation can be considered.

Early DC resistivity surveys yielded information to depths of about 1 km, but were unable to resolve which, if either, of the two competing models was correct. In this project we electrically image much deeper structures beneath the Reporoa geothermal area in order to understand better this system.

MT is a passive geophysical exploration tool that utilises naturally-occurring, time-varying electromagnetic (EM) fields recorded on the surface to determine spatial variations in subsurface electrical resistivity. Temperature, porosity and fluid content, as well as hydrothermal alteration processes, have significant effects on patterns of subsurface electrical resistivity. Therefore, MT is well suited to image the different parts of a geothermal system, and is accordingly the most utilized geophysical imaging technique in geothermal research.

For this study close to 100 broadband Magnetotelluric (MT) measurements, acquired during several separate surveys over a 3 year period, were analysed and modelled. Station spacing varied from 500 m to 2 km forming a grid over the study area. The maximum depth of investigation for this study, which is a function of the subsurface resistivity and the maximum period of measurement (100 s), is of the order of several kilometres.

This paper will describe the data acquired and models derived. Preliminary results from this study indicate both an outflow structure from Waiotapu at shallow depths and an independent geothermal upflow at depth.