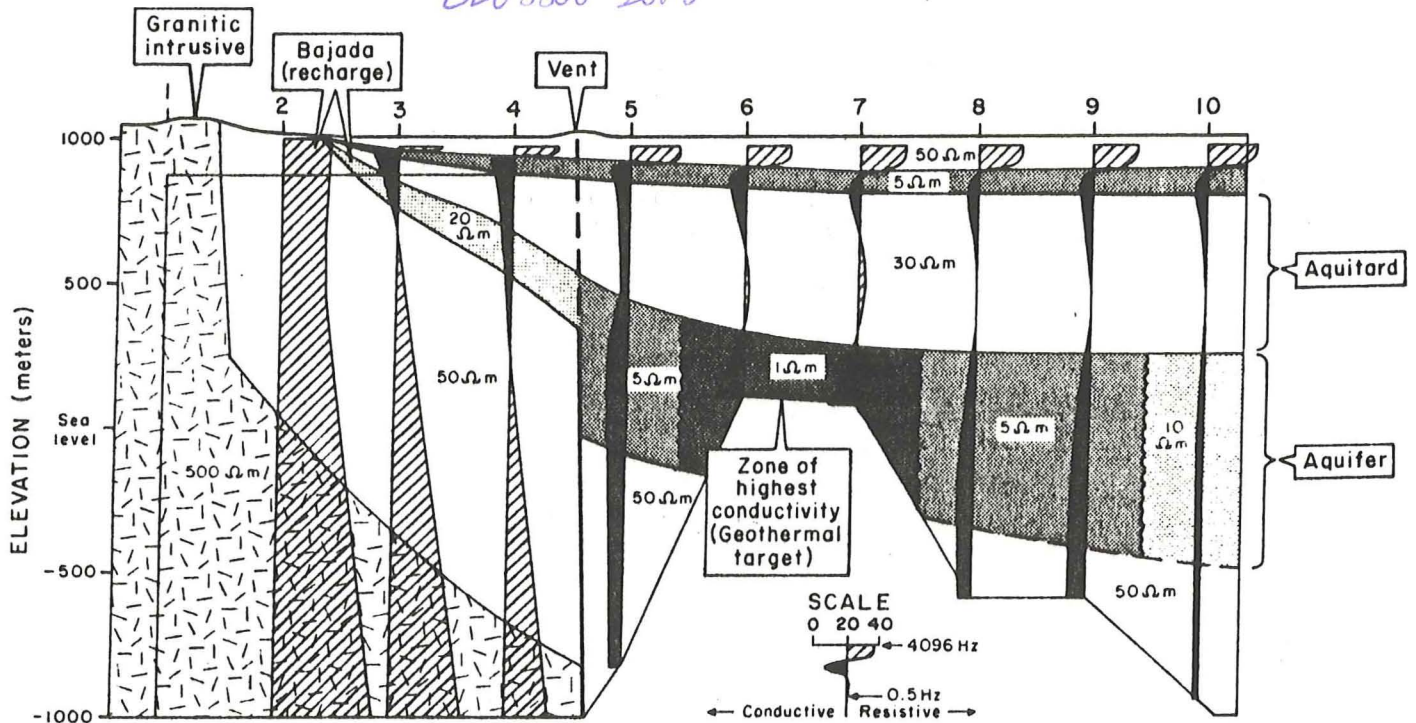


# Geothermal Exploration With Electrical Geophysics

*Efficient, Cost-Effective Applications  
to Geothermal Resource Evaluation*

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**ZONGE ENGINEERING & RESEARCH ORGANIZATION, INC.**

Zonge Engineering offers a number of electrical geophysical techniques which have proven to be extremely effective in locating, evaluating, and monitoring geothermal resources and prospects. Electrical techniques have a number of specific applications in geothermal exploration, including:

- \* Direct detection of reservoir fluids
- \* Indirect detection of geothermal resources by mapping hydro-thermal alteration, faults, fracture zones, and structural/lithologic relationships
- \* Mapping brine concentrations in reservoir fluids
- \* Mapping transport paths for reservoir fluids
- \* Monitoring developing commercial fields for changes in fluid characteristics, fluid migration, steam cap development, etc.
- \* Combined interpretation with geology and drilling results for better definition of reservoir temperature, pressure, porosity, and fluid salinity conditions

Field surveys may be conducted on the surface or in combination with in-hole probes. Applications vary from quick area reconnaissance to highly detailed mapping, depending on the project objectives.

Zonge Engineering employs a number of versatile electrical techniques:

- \* Controlled source audio-frequency magnetotellurics (CSAMT) --- versatile, moderate-cost sounding technique; tensor, vector, or scalar measurements; generally one-fifth to one-tenth the cost of MT; effective at mapping fluid conductivity and geologic/structural relationships
- \* Schlumberger, Wenner, or dipole-dipole array IP --- time or frequency domain; moderate-cost subsurface mapping
- \* Complex resistivity (CR) --- multi-frequency IP for detailed mapping; relatively expensive but effective; discrimination of certain types of minerals and alteration; capabilities involve surface surveys, surface-to-drillhole surveys, downhole logging, and laboratory rock and core measurements
- \* Electromagnetic sounding --- transient electromagnetics (TEM), EM profiling and sounding; moderate-speed, medium-cost mapping of geology and structure
- \* Fast reconnaissance techniques --- VLF, SP, MAX-MIN; Fast, low-cost, reconnaissance techniques for identifying conductive areas
- \* Gravity and magnetics services also available

Zonge Engineering has considerable experience in the use of electrical techniques and their application to geothermal exploration, monitoring, and engineering. Since its founding in 1972, the company has been employed by energy and utility companies for a variety of geothermal and other energy-related and environmental applications. Our state-of-the-art instrumentation and interpretation techniques are oriented toward practical solutions with the geologist and engineer in mind.

We would be happy to assist you in evaluating the application of electrical geophysics to your project. Please write or call for further information.

**SPECIALISTS IN ELECTRICAL GEOPHYSICS**  
*Field Surveys*  
*Geophysical Consulting*  
*Instrumentation Sale and Lease*



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