In the geothermal fields of the Great Basin physiographic province of western North America, drilling success or failure often depends on hitting fault or fracture zones. Advanced seismic reflection imaging has proven to be the only effective geophysical means of accurately targeting geothermal drilling. At target depths of 1 to 2 km, the pay zones are often less than 0.1 km wide. The development of advanced seismic imaging techniques has led to drilling success rates of 80% at some prospects. Advanced imaging is able to focus direct images of steeply dipping faults as seismic reflectors, allowing accurate planning of geothermal drill targets. The technology achieves the focusing and accurate location of structure and stratigraphy through thick piles of heterogeneous Tertiary volcanics, below complex surficial basin structure. This capability is allowing researchers to use these seismic images to carry out advanced seismic attribute analyses, model testing, and verification of tectonic hypotheses. We are further refining the imaging methodologies, conducting joint inversions of seismic along with other geophysical measurements, and inspecting the amplitude-versus-offset (AVO) characteristics of geothermal reservoirs in Nevada.

Dr. John Louie has over twenty years of university teaching and research experience in geophysics. He has published with students several well-cited papers on innovations in seismic imaging of earthquake faults in California, Nevada, and New Zealand. Over the last 15 years, Dr. Louie has developed a faster and more efficient site-assessment survey technique for earthquake-hazard evaluation. The refraction microtremor technique, a Nevada-owned technology, has been successfully commercialized by graduates and has become a standard engineering survey method worldwide. Research on this technology continues, focusing on measuring thousands of sites in California, Nevada, and New Zealand.

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