

Routine Geoelectric Exploration for Shallow Gas and Oil Sands Using Electrical Resistivity Tomography (ERT)

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Electrical resistivity tomography (ERT) surveying is a technique that has taken advantage of solid state relays and modern inversion techniques to make an evolutionary leap from 1-D resistivity soundings, a technique that has changed little after almost 90 years of practice, to rapid and robust 2-D imaging. ERT exploration is being successfully and extensively applied to exploration in the oil sands and for shallow, gas charged Quaternary channels. Other information that can be derived from the ERT data include overburden thickness, continuity of clay or shale cap rock, the location and thickness of granular material for construction, the delineation and relative salinity of basal aquifers, and the delineation of the Cretaceous/Devonian unconformity. The technique is routinely used to delineate bitumen ore bodies up to depths of 300 mbgs. ERT has also proven to be effective in spatially monitoring steam fronts. In addition, while much of present day exploration for new conventional oil and gas resources involves investigating deeper, and in more remote locations, another far less expensive and greatly overlooked play concept exists in reservoirs stranded behind surface casing. For most of these potential zones, even minimal geophysical logging data do not exist. ERT provides explorationists a second chance to definitively, and in a cost-effective fashion, explore for “ultra” shallow oil and gas resources in the upper 400 m.

This presentation will provide many examples of real data sets and the locations of drilled and produced wells, including from gas charged Quaternary channels, conventional gas deposits, and oil sands developments. Examples from exploration programs for oil sands will be provided both from Alberta and outside of Canada.