Formation-Scale Geothermal Favourability Mapping and Resource Quantification in Alberta

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Abstract

Geothermal energy is a largely untapped resource in Alberta. The Alberta portion of the Western Canadian Sedimentary Basin (WCSB), known for hosting world-class hydrocarbon resources, contains numerous sedimentary intervals with high temperature and aquifer characteristics, creating favourable conditions for the existence of geothermal resources. Although several regional studies related to the geothermal potential of the WCSB have been explored, there are limited studies on the formation-scale investigation of Alberta's primary aquifers for geothermal utilization.

Over the last three years, the Alberta Geological Survey (AGS), a branch of the Alberta Energy Regulator (AER), has been conducting significant work to identify, characterize, map, and model the potential geothermal reservoirs in Alberta's subsurface using data available from the extensive hydrocarbon exploration and development activities in the province. The AGS is producing new geothermal favourability maps based on updated subsurface temperature data, prospective aquifers, and models of porosity and thickness using wireline logs and stratigraphic picks. This workflow includes the estimation of volumetric heat-in-place and power generation capacity assessments of favourable target units in selected basins across the province. Lastly, we are developing a comprehensive Geothermal Atlas which will include, but not be limited to, maps of favourable geothermal areas, indications of areas with suitable thermal conditions but lacking aquifers, maps of water chemistry including regions with high precipitation indexes, and the ability to estimate heat-in-place and electrical power capacity for a selected stratigraphic interval or zone.

This work provides the basis for making geoscience-informed decisions to review prospective locations for geothermal development. The AGS Geothermal Atlas product aims to support the government, the public, and industries to encourage the province's exploration and sustainable geothermal energy development.

Biography

Nevenka Nakevska is professional hydrogeologist currently contributing her expertise to the Emerging Resources Group at the Alberta Geological Survey (AGS). She holds B.Sc. in Geology from the University St. Cyril and Methody in Skopje, Republic of Macedonia, and a M.Sc. from the University of Western Ontario in London, Ontario. Throughout her tenure with AGS she has played a pivotal role in conducting crucial geological survey functions, focusing on hydrogeological characterization, mapping and quantification of Alberta's groundwater resources. Her commitment centers on responsible groundwater management and advancing renewable energy, with a keen interest in geothermal resource development. Her involvement in geothermal research traces back to 2010, when she explored the potential of low-temperature geothermal waste heat utilization from cyclic steam stimulation process within the Cold Lake Oil Sands Area. Presently, Nevenka adeptly leads a diverse team of subject matter experts, collectively striving to identify, characterize, and quantify Alberta's geothermal resources. Her focus remains on leveraging analytical reasoning and technical competence to address pressing questions regarding Alberta's energy resources.