

GEOHERMAL POTENTIAL OF ABANDONED MINES IN CANADA

In June 2011, the Geological Survey of Canada released a comprehensive report on the geothermal energy resource potential of Canada.¹ The report was prepared by a team of scientists from five leading Canadian universities as well as from the Geological Survey of Canada.

The report extensively discusses all forms of geothermal energy including electricity production as well as geothermal heat pump and direct use. Of particular interest is an evaluation of the geothermal energy potential in abandoned mines in Canada. Although the inventory of geothermal resources associated with mines is incomplete, the authors carried out an inventory for British Columbia, Alberta, Saskatchewan, Québec and Nova Scotia. In total, 2262 abandoned mines were accounted for. On this total, 1920 presented a geothermal potential. Details are provided in the table below. Of course, low temperature geothermal resources hosted by mines can only be exploited within a few kilometers of mine sites. Potential targets for geothermal operations were identified from coast to coast as follow.

In British Columbia, of the open pit mines, 48% are base-metal, 43% are industrial mineral, and 9% are coal. Underground mines are mostly base-metal, which constitutes 84% of the underground mine sites reported, followed by coal, 13%, and industrial mineral, 3%. Areas of most interest are in southern British Columbia, near Abbotsford, Penticton and Kamloops, and on Vancouver Island, near Nanaimo. These cities have populations ranging from 35,000 to 125,000 inhabitants.

In Alberta, mines located close to important cities are found in Central Alberta near Edmonton and Parkland County and to the south near Medicine Hat. The population of these cities is above 29,000 and Edmonton is the largest with more than 730,000 inhabitants. In the neighbouring province of Saskatchewan, only underground mines with base-metal extraction were available to conduct the inventory in Saskatchewan. The abandoned mines are located in northern Saskatchewan, near small towns with populations under 3,000 inhabitants.

For Québec, the authors found 156 sites which contained enough information to evaluate their geothermal resources. All sites retained in the study are within a 10 km radius from a community. Areas with the highest geothermal potential are located in southern Québec, near Sherbrooke and Thetford Mines, and in western Québec, near Rouyn-Noranda and Val D'Or. The population of each of these four cities is above 25,000, and Sherbrooke is the largest with a population of about 147,000 inhabitants. In addition, there exists in the province 94 exploration sites that contain small excavations. These sites are mostly located in southern Québec, near Sherbrooke and between Montréal and Gatineau.

Finally, a total of 179 base-metal and 213 coal mines with underground excavations that have been abandoned were inventoried in Nova Scotia. Of the base-metal mines, 59 sites showed a geothermal potential and sufficient data to compute the associated geothermal resources. Mines in Nova Scotia, on other hand, are often located within less than 1 or 2 km of a small city. That proximity can promote the development and use of the resources by the communities. The greater Halifax area contains several small mines and represents one of the areas of interest in the province. Additionally, the 213 coal mines are prime targets for geothermal energy because they can contain deep underground seams. For example, underground seams at the Springhill mine reach depth of 1,350 m. Some coal mines are located near the cities of New Glasgow, Sydney and Glace Bay, each having a population greater than 20,000 inhabitants, mines of interest, is attractive due to the proximity of the mine sites to communities. ■

Inventory of geothermal resources on mine sites

Province	Open pit			Underground mine		
	Number	Potential (TJ)	Average (TJ)	Number	Potential (TJ)	Average (TJ)
British Columbia	208	8,075	39	424	4,803	11
Alberta	231	3,819	16.5	818	1,015	1.24
Saskatchewan	-	-	-	24	17.2	0.72
Quebec	-	-	-	156	887	5.86
Nova Scotia	-	-	-	59	24.8	0.42

¹ Grasby, S.E., Allen, D.M., Bell, S., Chen, Z., Ferguson, G., Jessop, A., Kelman, M., Ko, M., Majorowicz, J., Moore, M., Raymond, J, Therrien, R. (2011) Geothermal Energy Resource Potential of Canada, Geological Survey of Canada Open File 6914, 301P.