

## Canada's Geothermal Potential: Learning from the U.S.

Canada has literally been a 'powerhouse' of energy resources for decades with hydroelectricity, natural gas and oil playing a major role in the nation's economy, but only recently has begun paying serious attention to the potential for electrical production from geothermal energy to help meet the demand for "green, renewable" power in the western provinces and western U.S.

Not that geothermal energy is expected to have anywhere near the importance of the traditional fossil fuels, but the Canadian Geothermal Energy Association (CanGEA) believes that British Columbia alone has a geothermal resource potential comparable to that of the western U.S. where mandated Renewable Portfolio Standards (RPS) require utilities to provide a substantial portion of their power from renewable sources. California's RPS, for example, has been increased from 20 percent to a 33 percent standard; and U.S. utilities are looking to Canada's renewables to help meet those goals.

It is interesting to note that while geothermal power has been around since the first generation plant was built in Italy in the early 1900s — and The Geysers Geothermal Field in northern California has been producing geothermal power since the 1960s (it is one of the world's largest dry steam geothermal fields) — Canada does not have a single geothermal plant and has only one geothermal project under development. How come?

In fact, the Geological Survey of Canada and British Columbia Hydro, the provincial government-owned utility that provides most of B.C.'s electrical power, undertook exploration programs in the 1970s and early 1980s that identified 16 potential high temperature geothermal sites in the province, with the South Meager site 175 kilometers north of Vancouver being identified as the best prospect.

CanGEA, referencing a 2007 study by Dr. Mory Ghomshei of the University of British Columbia, estimates the province's geothermal resources at 3,000-5,000 megawatts, compared with the current 3,000 MW produced in the United States. (U.S. geothermal capacity remains concentrated in California which has 2,555 MW of installed capacity.) The Yukon has an estimated potential of 500-1,500 MW and the province of Alberta, 500-1,000 MW.

A private company obtained the geothermal rights at South Meager in 1988. However, with B.C.'s vast hydroelectric potential (B.C. Hydro produces 10,000 MW), there was no market for geothermal power — or small hydro, wind, solar or any other renewable resources for that matter. But the increasing costs of fossil fuels, the California energy crisis in 2000, and the drive to

green power and renewables has created a market both domestically and for potential exports. The B.C. government has mandated that 50 percent of new generation in B.C. come from renewable sources.

Western GeoPower Corp., current holder of the South Meager geothermal lease, initiated a resource confirmation program in 2003-2005, drilling several temperature-testing holes and three production-size wells which recorded temperatures up to 275 degrees Centigrade and indicated a potential for generating 100 megawatts. The company now is planning for the next stage of confirmation drilling.

The early results at South Meager — and the fact that several Canadian companies, including Western GeoPower's Unit 1 project at The Geysers, are actively engaged on geothermal projects in the western U.S. — has now turned attention to other geothermal prospects in British Columbia and in the Yukon Territory, both of which lie on the Pacific Ring of Fire which extends to Alaska. So much attention, in fact, that the British Columbia government last year placed a moratorium on geothermal permitting applications and established a Geothermal Task Force to develop a policy framework to address regulatory and tenure issues. The B.C. government expects to auction exploration permits for four areas of the province in September.

On a regional basis, the City of Whitehorse in the Yukon is partnering with a private company and a research center to determine the Territory's geothermal potential; and CanGEA recently presented a workshop seminar on geothermal resources at the invitation of representatives of municipal and First Nations governments in northern British Columbia.

At the federal level, the Canadian Geothermal Energy Association has been largely responsible for encouraging Natural Resources Canada (NRCan) to recognize there is a potential not only for high temperature geothermal development for electricity, but also for Enhanced Geothermal Systems development (also known as Engineered Geothermal Systems). Where traditional high temperature projects access steam or hot water at depths of up to 3,000 metres, EGS systems access hot rock at 3 to 5 kilometers or more, inject water and recover the heated water to produce power. A recent study by the Massachusetts Institute of Technology estimated the U.S. has the potential to develop 100,000 megawatts from EGS over the next 50 years.

The Geological Survey of Canada (an agency of NRCan) and the B.C. Ministry of Energy recently hosted a workshop with CanGEA that produced

recommendations for a national geothermal resource assessment that would define and inventory resources in western Canada in order to encourage exploration and facilitate the raising of capital. The workshop report noted other topics that need to be addressed include incentives such as tax breaks, risk reduction for drilling and green power pricing incentives.

Alison Thompson, Executive Director of CanGEA, notes there are a number of reasons why geothermal development has not proceeded in Canada, including the remote locations of potential resources, lack of transmission facilities, the low cost of historical energy sources and high front end costs.

"Most importantly, we have not had the government policies or actions needed to support geothermal development and we need to emulate Europe and the U.S. in that regard," Thompson says. "For example, most U.S. states have a Renewable Portfolio Standard under which premium prices are paid for renewable power. There is a federal Production Tax Credit, a federal Investment Tax Credit and federal loans and grants for exploration and development.

"Grants and subsidies also are common in Europe. Germany, for example, supports a feed-in tariff of 250 Euros (\$346 U.S.) per megawatt hour, plus bonuses, for geothermal projects and has jump-started a viable geothermal power industry as a result. By comparison, Canada's federal government offers a renewable power production incentive of \$10 per megawatt hour which is expected to be fully subscribed by September (2009) and there is no follow-up program in the offing despite intense lobbying by CanGEA and other industry associations."

Ken MacLeod, President and CEO of Western GeoPower, notes that the Canadian incentive only applies when a facility is in production and that while there are both federal and provincial incentives to develop "technologies" to deal with greenhouse gas emissions, there is nothing to support exploration for green resources.

"Yes, this is a very capital intensive proposition," MacLeod acknowledges. "Western GeoPower has invested more than \$30 million since acquiring the South Meager lease in 2003 and private investors are reluctant to continue to provide that level of funding without a measure of serious support from our governments. By comparison, our 35 MW Unit 1 project at The Geysers in California has the option of applying for funding under the Obama administration's green energy initiatives."

