

Exploring BC's Geothermal Potential



Alterra Power Corp's Reykjanes geothermal power plant in Iceland.

Suzanne Morphet

People living in the Pacific Northwest are frequently reminded that we live in a geologically unstable part of the world. A place where small, barely perceptible earthquakes happen every day and where the Big One could happen at any time.

But along with the potentially destructive power of the tectonic processes, there's an aspect that we don't hear as much about, one that goes beyond the region's abundant and luxuriant natural hot springs. That is, the potential for generating significant amounts of geothermal power.

Producing power from superheated water two to three kilometers under the earth's surface is being done in other countries with similar geology, notes Mory Ghomshei PEng/PGeo, who came to Canada in 1983 to work on BC Hydro's Meager Creek Geothermal Project and has published many papers on geothermal prospects in BC. Yet today, he says "Canada is the only major country on the Pacific Ring of Fire which has not yet developed geothermal power."

Although the Meager Creek property was determined to have potential for enhanced geothermal systems (injecting fluid into dry hot rock deep underground in order to heat it for extraction), BC Hydro halted the project in 1984 for financial reasons and because of declining energy prices.

Today, Meager Creek is one of two areas in BC being actively investigated for geothermal power production.

While bringing a power plant on-stream still has risks and considerable up-front costs, the timing is looking better than ever.

The Rationale

"The demand for power doesn't go down, it just goes up," says Anders Kruus, Vice-President of Corporate Relations for Alterra Power Corp. He may be stating the obvious, but demand is one part of the equation for any business decision. Increasing demand for power in BC isn't the only thing in geothermal's favour.

It's a clean, renewable energy source, and unlike wind and solar power, it's not affected by weather and climate. Yes, it's more capital intensive than wind and run-of-river hydro, says Tim Thompson, CEO of Borealis GeoPower, but so too are large hydro projects like the proposed Site C dam.

"Geothermal power projects can typically have total capital costs to production on the order of \$5 million per megawatt, with significant economies of scale for larger projects" says Kruus, whose company operates two geothermal plants in Iceland and another one in Nevada. And once developed, he points out, they're inexpensive to operate.

In its 2012 overview, the Canadian Geothermal Energy Association (CanGEA) states "the potential for geothermal energy in Canada is immense—estimated at over 5,000 MW in traditional shallow geothermal resources with currently available technology."

And where in Canada is that potential the greatest? The Canadian Cordillera, which stretches from BC to the Yukon and more specifically, three belts of young volcanic rock: the Garibaldi, the Anahim and the Stikine.

According to Alexander Richter, Director of CanGEA, a geothermal resources report from 2007/2008 identified six geothermal projects in BC with a maximum potential of 1,550 MW. Other studies and other people are more optimistic.

Thompson of Borealis GeoPower says “there’s probably somewhere between 3,000 and 5,000 MW of generating capability which could be brought into the BC system under the current pricing...that would represent roughly 40% of the current generating use of British Columbia.”

If and when developed, power projects “would vary from small scale of 5 MW, 20–100 MW to up to 200 MW” says Richter.

As federal and provincial governments try and reduce greenhouse gas emissions, geothermal power could be an attractive option. “We are excited about BC’s geothermal potential” confirms a spokesperson for the BC Ministry of Energy and Mines.

The Process

In BC, companies nominate particular parcels of land they want to explore. Staff in the Ministry of Energy and Mines review requests and consult with First Nations, local governments and provincial agencies. If a parcel is deemed appropriate for exploration, a public competition is held and tenure awarded through a sealed bid. Geothermal permits have annual work and rent requirements associated with them and must be renewed on a yearly basis. Permits can be converted to leases, which give production rights. Since 2009, seven geothermal permits have been issued.

The Players and Their Properties

Borealis GeoPower – Three permits at Canoe Reach, Valemount.

Borealis conducted soil and biogeochemistry sampling in September 2011 and after 18 months, signed a joint venture agreement with both the Shuswap and the Simpcw First Nations, a significant milestone. “We just blew all the records out of the water; that’s unbelievably fast,” says Tim Thompson, CEO. Borealis is also working with the community on an agreement to sell its waste heat at below-market prices.



Winter geothermal drilling in Iceland.



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Next step: slimhole drilling. Thompson says it's awaiting word on a couple of government funding options before it can start. If money comes through, "we could be up and running in about two-and-a-half to three years."

Ram Power – One lease at Meager Creek, near Pemberton (through Meager Power Development Corporation).

This is where BC Hydro and the Geological Survey of Canada drilled three large-diameter wells in the early 1980s and found abundant hot fluid (270 °C) at depths between 2,500 and 3,000 m. Between 2004 and 2005, Western GeoPower (now part of Ram Power of Reno, Nevada) drilled three wells but none were able to flow. This is currently the only geothermal lease in BC. According to its website, Ram Power is evaluating strategic options.

Tecto Energy – One permit at Pebble Creek, Upper Lillooet River Valley (through a numbered Ontario company).

Past exploration including geochemistry, geophysics and several slimholes (to depth 1,000 m) revealed the presence of a geothermal power potential of about 500 MW, according to Tecto president Mory Ghomshei PEng/PGeo. In the next 12 months Tecto intends to drill to a depth of between 2 and 3 km at a cost of \$14 million, with the hope of confirming 110 MW of power for the first stage of an incremental

development. Tecto paid a record price for its geothermal permit last August—\$65 per hectare—the highest ever paid in Canada. "We had our eye on the property with the Pebble Creek hot springs in it," explains Ghomshei. We therefore offered a high price to be absolutely sure that we [would] get it and we got it."

Alterra Power Corp – Two permits in the Upper Lillooet River Valley (through Salal Geothermal).

Alterra was created last spring with the merger of Magma Energy Corp and Plutonic Power Corp, both green power companies. Although Alterra has experience with geothermal power, making it a reality in BC is still several years out, "even if everything went smoothly all the way," according to Anders Kruus, VP Corporate Relations. This year, Alterra will do field work to better ascertain the structure of the potential resources, as well as resample surface water for fluid chemistry, says Catherine Hickson PGeo, Alterra's VP Exploration and Chief Geologist.

The geothermal industry would like to see easier permitting processes, better geothermal mapping, and a clearer understanding of BC Hydro's standing offer program to purchase electricity from independent power producers. But even with the challenges, the industry is moving ever closer from exploration to production. ☒



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