

# Geothermal energy could meet half of B.C.'s electricity needs, researcher says

No greenhouse gases would result from tapping underground magma-heated water

BY CHAD SKELTON  
VANCOUVER SUN

B.C. is sitting on a potential gold mine of clean energy in the form of superheated water located deep beneath the Earth's surface, says a researcher at the University of B.C.

Indeed, Mory Ghomshei, a professor of energy resources and systems, said such geothermal energy is so plentiful it could meet much of our future energy needs with virtually no greenhouse gas emissions.

What makes B.C. such a promising site for geothermal power is the same thing that puts us at increased risk of earthquakes: our location atop a subduction zone where the Earth's tectonic plates meet.

This instability causes magma to

rise towards the surface, heating up any water it touches.

The most promising geothermal sites, said Ghomshei, are concentrated in a few regions of the province, such as the Garibaldi/Pemberton range and the Queen Charlotte Islands.

The volcanic activity underneath often appears at the surface in the form of hot springs.

But that's nothing compared to the water two to three kilometres down, which can be anywhere from 200 C to 300 C.

Since water at that depth is under extreme pressure, it stays in liquid form.

But when brought to the surface, said Ghomshei, it converts into steam, which can be used to power electrical turbines.

Geothermal power plants are already in use in Iceland, the United States and the Philippines.

Ghomshei said there are enough potential geothermal sites in B.C. to provide anywhere from 3,000 to 5,000 megawatts of constant electricity — enough power to meet roughly half of B.C.'s current energy needs.

And BC Hydro has identified geothermal power as a potential source of clean energy.

But at the moment, B.C. doesn't get any of its electricity from geothermal power.

Ghomshei, who does paid consulting work on geothermal projects, said that's in part because B.C.'s main source of power — hydroelectric dams — is so cheap. Once a geothermal plant is up and running, he said, it produces electricity relatively cheaply.

The problem is the search for geothermal power, like mining, is a high-risk enterprise.

"The first three, four wells that you drill until you confirm the resource might cost you \$20 [million to] \$30 million and small private companies cannot do that," he said. "You need money to take the risks [and] not all the wells will be successful."

He said he'd like to see the government offer subsidies to geothermal power as a way of helping Canada meet its greenhouse gas commitments.

Ghomshei's prediction for the potential of geothermal power is one of several ideas highlighted by UBC in its third annual Next Big Thing survey, which asked 1:5 researchers about the developments they see on the horizon.

Some of the other ideas included in the survey are:

■ How instant HIV tests could help public health authorities to reduce the spread of AIDS by encouraging people to change risky behaviour as soon as they contract the virus, which is when they're most infectious.

■ How Internet security could be improved by having people use a virtual ID card that would permit them access to a variety of different websites, instead of using a different password for each site.

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Vancouver Sun  
Dec 24 2007

"Geothermal energy could meet half of B.C.'s electricity needs, researcher says", by Chad Skelton, Vancouver Sun, Dec. 24, 2007.

This article discusses the research of Dr. Mory Ghomshei, professor of energy resources and systems at the University of British Columbia. According to this article, Dr. Ghomshei states that BC has sufficient access to geothermal energy to meet much of our future energy needs.

Geothermal energy [1] is derived from natural nuclear energy; the radioactive decay of elements such as uranium and radium inside the earth produces heat that diffuses to the earth's surface. The heat usually diffuses to the earth's surface very slowly, but in certain areas, called thermal areas, the rate of heat transfer is much higher. Thermal areas are usually found in seismic zones, such as the along the BC coast.

If the geothermal energy is accessible, it can be utilized either directly as hot water for heating etc or can be used to generate electricity using steam-driven turbines. The global estimate for direct geothermal power is about 15,000 MW. This estimate has doubled in the last 15 years. For comparison, the large hydroelectric projects in BC (GM Shrum dam, Revelstoke dam) generate about 2,000 MW each. [2] Geothermal energy is used to generate electricity in 20 countries including Iceland, USA, Italy, New Zealand. [3] The installed geothermal electrical generating capacity is about 8700 MW.

In the article, Dr. Ghomshei states that there are potential geothermal sites in BC to provide 3000-5000 MW of electricity and that this should meet 50% of our current needs.

One possible project is the South Meager Geothermal Project. Located 55 km northwest of Pemberton, exploration indicates a site with an area of 4.5 to 7.5 km<sup>2</sup> with an average temperature of 220-240°C. The site is being explored by a private company GeothermEx Inc. of Richmond, California, and they predict that the site has the potential to support a 100 MW plant. [4]

Calculation: How many households could this supply with electricity?

To answer this, we need to know the average power consumption of a BC household. From the BC Hydro webpage, the average household in BC Hydro's service area uses about 11,000 kWh per year. This is total energy used per year. What is the rate of electricity consumption?

$$E=11,000 \text{ kW h}$$

$$P = E/t = 11,000 \text{ kW h} / 365 \text{ day} / 24 \text{ h/day} = 1.25 \text{ kW}$$

Thus a 100 MW geothermal plant could supply  $100 \text{ MW} / 1.25 \text{ kW} = 80,000$  homes with electricity.

Total electricity sold by BC Hydro in 2006 was 94,000 GW h i.e. power was generated at a rate of 10,000 MW. If geothermal could supply 3000-5000 MW, this would be roughly 50% of our current needs. This would require development of roughly 50 plants the size of the one proposed for South Meager.

References:

1. "Energy, Physics and the Environment, 3<sup>rd</sup> Ed" by E.L. McFarland, J.L. Hunt and J.L. Campbell, Thomson (2007).
2. BC Hydro [www.bchydro.com](http://www.bchydro.com).
3. Canadian Geothermal Energy Association [www.geothermal.ca](http://www.geothermal.ca).
4. Western GeoPower Corp, South Meager Geothermal Project – Project Summary, December 2007, [www.geopower.ca/factsheets/meagerbackgrounderDec20071pgr.pdf](http://www.geopower.ca/factsheets/meagerbackgrounderDec20071pgr.pdf).