A New Boost for the Geothermal Industry In British Columbia?
- New insights from the past could re-ignite the South Meager Geothermal project

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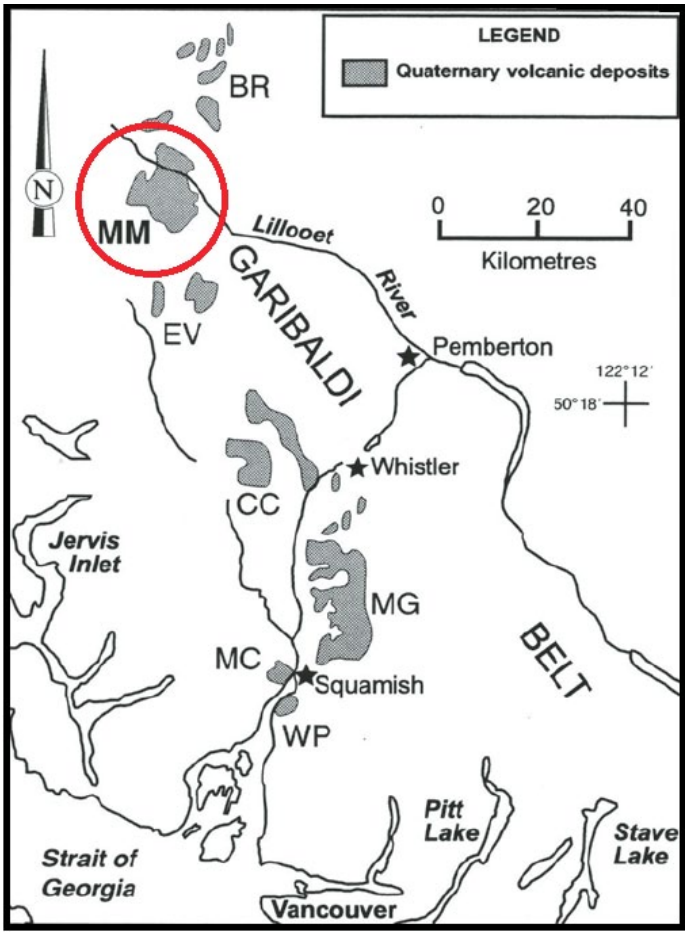
Recently uncovered data by Geoscience BC answers a three decade-old question: Why was a very high temperature geothermal system explored but abandoned multiple times over the years? Dr. Jeff Witter (Innovate Geothermal Ltd. and a GRC Board Member) tells the story to the Geothermal Resources Council student committee.

The province of British Columbia (BC), host to the majority of potentially active volcanic areas in Canada, has been at the forefront of geothermal energy development in the country. According to province utility BC Hydro, 18 prospective geothermal sites have been identified. One particular initiative, the South Meager Geothermal project, has been explored multiple times; first in the early 1980s and later on in 2006. For reasons unknown to the general public at the time, the South Meager Geothermal project came to a halt in 2008 causing it to be labeled as a failure by the energy community. However, proprietary data recently made public by Geoscience BC has helped to shed new light on this story. Dr. Jeff Witter, Principal Geoscientist at Innovate Geothermal Ltd., kindly agreed to shed some light on past, current, and future research and development at the site.

Dr. Witter, you recently wrote a short report for Geoscience BC regarding the Mount Meager project and how it has evolved through time. When and how did you first hear about the project? What did you think about it at the time?

I heard about the Mount Meager project probably for the first time in 2008 when I moved to Canada and started working for a geothermal energy company. I thought it was very exciting, since it is a volcanic hosted geothermal system that is very high temperature. The project is located in the lower mainland of British Columbia near "load centers", which are the parts of the province where most people live and use lots of electricity. Proximity to population centers is really helpful to this sort of project.



The Mount Meager Volcanic Complex (MM) pictured inside the red circle, alongside other features of British Columbia. In the figure BR refers to Bridge River, EV to Elaho Valley, CC to Mount Cayley, MG to Mount Garibaldi, MC to Monmouth Creek, and WP to Watts Point. Modified from Russell et al. (2006).

Did you have any type of expectations for this Project? Did you know if it was going to be profitable or not?

In 2008 and up through 2010, I think all of us in the geothermal community in Vancouver were confident that this project would be successful. Some of the uncertainty with the project was, of course, whether they would be able to build a transmission line that would go from the site at Mount Meager all the way down a valley to connect to the existing transmission line. It was a long distance, tens of kilometers, and running those transmission lines would have been very expensive. That issue was finally not addressed at the time (2008 to 2010), since the project never got to that point.

So the project was abandoned several times since it started in the 80s. How did this affect the geothermal industry at the time, especially in BC?

As is the case in other parts of the world, the geothermal industry in British Columbia has certainly experienced ups and downs: these ups and downs are really controlled by external forces. For example, the availability of fossil fuels and the oil embargo had an immense impact in the 1980s, while the small crisis the geothermal industry experienced in the early 2000s in Canada had more to do with investors' sentiment towards these types of high-risk natural resource projects. When the financial crash of 2008 hit, the investment community had much lower tolerance for these sorts of higher-risk natural resource projects: this led to a lack of investment, which then led to a lack of incentive to move ahead projects like the one at South Mount Meager. Since that time (2010) the geothermal energy industry in British Columbia has really not been moving forward.

Even though the data from the 2008 geothermal project was made public in recent years, it was almost non-discoverable before you wrote the report… What did you think when you first saw the data? What surprised you the most?

What surprised me the most, is that the generally accepted narrative about the Mt Meager geothermal project was incorrect: there were doubts about whether or not the project was viable, whether there was a good resource there or not. I was therefore pleased that when I actually looked at the data, which had been proprietary up until the date it was released by Geoscience BC, I found that there was a lot of evidence for a very good geothermal resource at Mount Meager. This struck me as an important story that needed to be told so that the reality of the Mount Meager project could be understood by other scientists, by people in the geothermal community, and by the public. Having this new information really shed a lot of new light on this project and its viability. The real story could be better understood, rather than the prevailing narrative, which was incorrect because it was based upon old information.

So you just mentioned that the common knowledge about this project was based on old information… Are you referring to the information that came from the 1980s exploration work?

Yes, during that time (the 1980s) they put a lot of good effort into doing good science and doing some exploratory drilling at the South Meager project. That was all very, very good work, but only a limited number of wells were drilled with the

majority of them not being very permeable. Flow rate tests were conducted, but commercial levels were not achieved. That is why in the 1980s, as I understand it, the project did not move forward. In the early 2000s, Western GeoPower had a second attempt at developing the South Meager Geothermal project, and obtained a lot of data from newly drilled wells. This is the data that had been proprietary up until the Geoscience BC data release.

Flow test of well MC-6 at the South Meager geothermal project (Source: Western GeoPower)

Now the project at Mount Meager seems to be starting again: geothermal exploration was carried out in the Mt Meager area during the last summer. What are your expectations for the project? Do you think it is going to jump-start the BC geothermal industry? Do you think the project itself is going to move forward? Are you just waiting for new data?

I am very excited about this new Natural Resources Canada (NRCan), Geological Survey of Canada (GSC), and Geoscience BC project focused on the Garibaldi volcanic belt! I think that in the next year, with all of these new data sets and analysis being conducted in large part focused on the Mount Meager volcanic complex, there is going to be a new and deeper understanding of the geological controls on the geothermal systems in and around Mount Meager. I am hopeful that all of this new information, and the analysis and understanding that comes out of it, will help to spur future efforts by developers and geothermal companies to do more exploration drilling at Mount Meager. Hopefully this will move the [project] forward to develop the geothermal resources into electricity generating power plants.

You mentioned that Western GeoPower drilled a new set of wells in the early 2000's. One of the main hurdles for the project to move forward at the time was the ability to make these wells flow. In your report, you mentioned that one proposed solution would be to drill deep production wells from the valley-floor. Would this increase the costs and eventually make the project prohibitively expensive, or is it still within the limits?

That is a good question, and I cannot really comment much on the costs of the drilling program because all those numbers are outside of my area of expertise. However, in my report about Mount Meager, I referred to an analysis made in 2009 by the consulting firm GeothermEx, in which they did the math to test the idea of drilling a well from the valley floor to a spot that intersects the known location of permeability. This location was discovered in some of the other wells, drilled from much higher up the slope. The calculations showed that a well at that lower elevation on the valley floor should be able to successfully flow the geothermal fluids from the permeable zone deep in the subsurface. Pumping the geothermal fluids up and out of the ground is what they were unable to do from the well that was positioned much higher on the mountain side! So, whether or not a well drilled at that lower elevation will be low-cost enough in order to make the project economic, will likely depend on the costs of a drill rig, of the steel for casing, and all those other factors that will ultimately determine the overall well cost. However, a well drilled from the valley floor appears to be have the highest likelihood of being able to sustain the high flow rates that are needed in order to make the project viable. A large number of wells that can only produce a couple of hundred gallons per minute of geothermal fluid would not get anywhere: the project would not be viable because there are too many wells for too little production. That is why the aim would be to have very high production wells that can produce thousands of gallons per minute from a single well.

We are speaking about the Permeable Zone, its location, and its properties. How does the data point to this Permeable Zone location? Do we know about this permeable zone only from the exploration wells?

Yes, that is correct. One of the wells, MC-8, was drilled through a section very deep inside the Mount Meager complex, and encountered what is called a lost circulation zone: a short interval in the well where the surrounding rocks must be an extremely permeable since all of the drilling mud, which fills the well bore, is lost out into the rock formations. That is the key piece of evidence that tells us the exact location of this permeable zone, […] and that is what was discovered in the subsurface of Mount Meager.

I assume that new data that was collected this summer will relay more information about the lost circulation zone and the permeability of the area?

Well, drilling is ultimately the best way to test whether a specific location in the subsurface is permeable or not, but what the scientific data that was collected this summer can do is hopefully identify more information - obtain a better understanding - about the geologic framework and the structural controls in the region where the drilling showed some zones of very high permeability. If, for example, the scientific studies this last summer conclude that there is a significant fault contact, or a different lithologic contact which spatially agrees with the location of the lost circulation zone in the well, then we are starting to fit together the pieces of the jigsaw puzzle. If the studies suggest multiple lines of evidence all saying that this is a zone of high permeability, then that is what we want to achieve.

Helicopter overflying surveying stations on the Mt Meager Volcanic Complex, July 2019. Geophysical measurements were performed around the Mt. Meager volcanic complex during the summer of 2019, and aim to shed light on the internal structures and geothermal systems around Mt. Meager. Photo courtesy of Dr. Martyn Unsworth, University of Alberta.

It sounds like MC6 and MC8 (the two successful wells of the 2008 project) could be good candidates as injection wells… Is that a long-term hope for the project, or would it be best to just move on and drill new wells from the valley floor, maybe start doing injection there?

That is a really good topic to bring up because injection management in geothermal fields is really important, and it can make or break a project: if you have all kinds of production of geothermal fluids, but you don't have any place to put them (such as in injection wells), then the project is not going to move ahead.

Helicopter view of a fumarole (marked with a red arrow) on Job Glacier, Mount Meager, as seen on July 2019. Photo courtesy of Dr. Martyn Unsworth, University of Alberta.

The challenge of using MC6 and MC8 as injection wells is that the wellheads for both are located very high up on the mountain slope. Therefore, after the cooled geothermal fluids come out of the power plant and heat is extracted from them, you would have to pump those fluids all the way up the mountain side, to the wellhead, to put them back in MC6 and MC8. I think it is unlikely that MC6 and MC8 would be used as injection wells, as you would have to use so much of what is called a parasitic load, all kinds of extra electricity, in order to pump those fluids up the hill.

The geothermal community in Canada will, without any doubt, monitor the information about this project very closely, but only time (and data!) can tell for now if this initiative will move forward. Our gratitude goes to Dr. Witter for the insight given by this interview, and for bringing attention to the potential of this project, up-to now hidden in plain sight.

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