

MMC Geothermal webinar Part 1 – Optimizing Geothermal Installations in Existing Municipal Facilities – Questions and Answers

How important is the commissioning of the system after installation to make sure the system is working as intended? Should I be retro-commissioning the systems and if so, how often? Is this specialized or can a testing and balancing contractor do it?

Commissioning is critical. System performance and operation must be confirmed on startup. There are a lot of moving parts in the system, nothing overly different than conventional systems but geo systems perhaps have less room for error as the energy system is finite, with all loads connected for the long term. So, issues can be exacerbated over time. Next to commissioning is monitoring. Without monitoring we don't know how well the system is performing in the long term, and small issues can perpetuate into larger problems if not addressed. Distribution systems (air hydronic) are typical to conventional systems, so testing and balancing can be handled by balancing contractors.

Dejan, have you had any regulatory issues with approval of vertical systems? I understand that aquifer protection is now limiting the deployment of these systems.

Closed vertical systems deal mainly with heating. Open loop heating systems need permits to bring water in whereas closed do not. Regulatory issues are only applicable in certain municipalities. It is not a straight across the board issue. It can be done in many areas, but certain regions are better. Southern Ontario is pretty good. Southwestern Ontario has challenges but working with hydrogeologists will help with determining this.

What is a reasonable estimate for front end engineering design costs? What is the average percentage budgeted for energy management and design?

A 7 to 9 year payback is typical but it can vary dramatically.

Has City of Toronto implemented any shared geothermal systems yet? So multiple buildings using one geothermal loop with local pumps at each individual building. Are there efficiency gains with this approach? What are practical challenges?

There are not a lot of examples in Canada, but there are a lot of projects in play that are looking at this. One must keep in mind the upfront capital costs and challenges. The redevelopment of Etobicoke Civic Centre is planned with a geothermal district system and U of T also will have district geothermal.

Whitby has just completed pre-feasibility for district energy -

<https://whitby.civicweb.net/FileStorage/9C3F839C1EE94313A2F0294CFBEB9EA4-CAO%2013-21%20District%20Energy%20Report.pdf>

You mentioned the opportunity to implement geothermal when replacing HVAC. What would be the concerns of replacing the HVAC system (water sourced heat pumps) prior to actually designing the geothermal system?

The main concern is that heat pumps have changed from 20 years ago. There is an issue of physical size, so fitting newer heat pumps that are bigger than older ones can be a challenge. There is also the concern of ensuring it is compatible with existing distribution systems, specifically temperature ranges and lowering the lift on temperature. Refer to the Ontario Geothermal Association (OGA) for a list of recommended vendors in this space.

Dejan, is it the war on carbon that has led the City to pursue geothermal today (in contrast to your statement that only 15 systems exist, and most die while still in early design stages)?

Yes, but also the business case is better now and our understanding of geothermal has increased too.

Often times when we bring up geothermal for facilities our PM mentions a high water table as a barrier. How big of an issue is this? Are there any ways to get around this?

The drilling firms run into this all the time. It can be an issue depending on where you are, but there are procedures built in to address things properly. I would not consider this a significant barrier.

A high water table is manageable from a drilling perspective but certainly needs to be done properly including proper grouting of boreholes to ensure they are sealed following completion of heat exchanger construction. If the high water table issue is related to 'bath tubed' parking structures, this can also be handled by a careful approach to sealing of geo exchanger pipe as it enters the building structure. A number of approaches have been considered for this and we think that bringing each geothermal loop through the sealed structure is likely best approach. But other options do exist.

Could you note at a high level what some of the procedures might be to address things properly in a situation like this? I'd like to be able to take back recommendations so geothermal isn't written off right away due to this high water table argument.

Please reach out to Paul Frith who will put you in touch with someone with the relevant technical expertise.

Have you done any projects in Alberta?

There are several thousand installs across the country. Please reach out directly to Paul Frith or Jeff Hunter for some examples from Alberta.

What is a reasonable cost for a bore hole test for a geothermal site?

It depends on geology, but somewhere between \$30,000 and \$40,000 is a safe range.

Do you have a list of experts you would consider qualifies for completing a geological study?

Yes, please connect with the Ontario Geothermal Association (OGA) for a list of qualified experts.

What are considerations for the refrigerant choice for the heat pump for a Net Zero building? Such as selecting natural refrigerants (Ammonia - GWP =0, CO2 GWP=1) vs. synthetic refrigerants (GWP=600+)

We are looking at refrigerants on our projects (City of Toronto), with discussions revolving around CO2 and ammonia for those exact reasons. GWP of the refrigerants is an important consideration.

Should geothermal be considered/implemented in the beginning or should it be postponed for few years as an addition?

You always want to look at geothermal as early as possible in any project – geothermal does have a significant impact on schedule, depending on how it is done.

What absolutely needs to be in the specification of a geothermal system? If I'm going to spend my money wisely, where would I do it? What is the most critical area to get the performance I'm looking for?

Geothermal is specialized and you need people who know what they are doing – even with mechanical engineers, you need to get internal expertise or work with someone who has the expertise. A third-party consultant who can walk through it and a cost consultant who can walk through all the different pieces would be recommended. Drillers that are well qualified are also very important. You can look at the record of the driller through the Ministry of Environment.