

APPrO INTERROGATORY #4

INTERROGATORY

Issue 2

Reference: i) Exhibit B Tab 1 Schedule 1

Preamble: APPrO would like to understand the economics of customers utilizing a geothermal service.

Questions:

- (a) Please explain fully why Enbridge proposes a service fee based on a “per tonne” metric compared to a rate based on the cost of owning and operating the assets.
- (b) Is heating or cooling the determining factor in sizing the geothermal loops?
- (c) Please explain how the average 4 tonnes per customer was derived.
- (d) How will a customer’s natural gas consumption change with the use of a geothermal system and how will this impact other customers’ rates. \
- (e) Please describe the nature of the target residential geothermal customer.
- (f) Please provide a detailed long term economic analysis illustrating (including assumptions) of a typical target customer’s economic incentive to convert to a geothermal system.
- (g) Please provide a detailed side by side long-term economic comparison for a typical target customer illustrating two options:
 - i. A geothermal system as proposed by Enbridge,
 - ii. A customer developing and operating its own geothermal system that is installed by a qualified contractor.
- (h) At paragraph 23, Enbridge notes that “*Homeowners will be eligible for rebates of up to \$20,000 for ENERGY STAR certified ground source heat pumps*” from GreenON. Since the underground geothermal loops are an expensive component, if not the most expensive component of the overall geothermal system, please explain:

- i. If these any of these GreenON funds or other funding opportunities are, or could be eligible to offset the geothermal loop costs either directly or as some form of contribution in aid of construction paid by the homeowner?
- ii. Did Enbridge explicitly seek out GreenON funding or other funding opportunities to offset the construction costs of the geothermal loops? If not, please explain why.
- iii. Please provide the typical cost of installing a residential geothermal loop detailed by cost category.
- iv. Please provide the typical cost of purchasing and installing the balance of the geothermal system that would be the customer's responsibility.

RESPONSE

- (a) The Company is proposing a service fee based on "per Tonne" of heating capacity. The majority of costs of owning an operating a geothermal loop relate to the capital investment which is closely related to the heating capacity tonnage or length and depth of pipe in the ground. Therefore the Company believes it is appropriate to structure the service fee in terms of tonnes of heating capacity.
- (b) Geothermal systems are required to be sized to cover 70% to 80% of the peak heating requirement of a home which usually covers 100% of the cooling capacity required for Ontario's climate.
- (c) Based on current building designs and heating requirements of new homes, it is estimated that the average home size lies between 1800-2400Sq. Ft. with average peak heating requirements of <50,000 btu/h. Using this data, the Company assumed that a 4 tonne system will meet the heating and cooling requirement of the average 1,800 sq ft to 2,400 sq ft home in Ontario.
- (d) It is expected that the geothermal customer will use little to no natural gas in their homes. Over a 10 year period, using Enbridge's customer additions forecast of approximately 18,000 geothermal customers, the impact on Enbridge's 2.2 million current customers will be negligible.
- (e) Please see the response to Board Staff Interrogatory #12 (a), filed at Exhibit I.2.EGDI.STAFF.12.

(f) Please see response to Board Staff Interrogatory #10 (c), filed at Exhibit I.2.EGDI.STAFF.10.

(g) i) and ii) Please see the table below.

Comparison between Enbridge GES and Customer Procured Geothermal System										
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Energy Costs										
From Board Staff 10 c)	837.6	881.1	901.9	927.7	992.0	1055.5	1130.7	1174.1	1204.9	1235.5
Enbridge GES Program										
Geothermal Service fees	1,203.4	1,203.4	1,203.4	1,203.4	1,203.4	1,203.4	1,203.4	1,203.4	1,203.4	1,203.4
Heat Pump Cost	16,000.0									
Provincial rebate	(12,000.0)									
Total Cash flow out \$	6,040.9	2,084.5	2,105.2	2,131.1	2,195.4	2,258.8	2,334.1	2,377.4	2,408.2	2,438.9
NPV	\$20,284.39									
Customer procured geothermal system										
Geothermal loop costs	12,000.0									
Heat Pump Cost	16,000.0									
Provincial rebate	(12,000.0)									
Total energy related costs \$	16,837.6	881.1	901.9	927.7	992.0	1,055.5	1,130.7	1,174.1	1,204.9	1,235.5
NPV	\$22,669.22									
Assumptions										
Energy costs from Board Staff 10 c)										
4 Tonne home										
10 year analysis										

The two options are fundamentally different and a side by side comparison can be misleading. In the Enbridge GES model, the underground loop infrastructure is installed, owned maintained and at the end of its life replaced by Enbridge similar to natural gas lines to homes. In the case of the customer procured option, the customer will pay for the installation and may have to pay for maintenance, repair or replacement. Enbridge's proposed GES program is meant to address the barriers set out in the response to Board Staff Interrogatory #2 (a) filed at Exhibit I.1.EGDI.STAFF.2. Please also see the response to Board Staff Interrogatory #10 (c) filed at Exhibit I.2.EGDI.STAFF.10 for an analysis of the cost-effectiveness of installing a geothermal system in a gas heated home.

- (h)
- i. The GreenON funds are for the full geothermal system, inclusive of an ENERGY STAR certified ground source heat pump. The customer receives the rebate amounts, and allocates as they wish. Under the Enbridge Geothermal Energy Services program, it is assumed that the full rebate will be allocated to the heat pump system because there is no up-front customer cost for the geothermal loop.
 - ii. The GreenON funding is directed at the customers not Enbridge and in the model the Company is proposing, it will be directed to the heat pump system that the customer will be responsible for.
 - iii. Please see response to Board Staff Interrogatory #12 (d) (i) filed at Exhibit I.2.EGDI.STAFF.12.
 - iv. There are a variety of available models in the market for the heat pump system. A typical 4 tonne system can cost between \$10,000 to \$20,000.