

STAFF INTERROGATORY #10

INTERROGATORY

Issue 2 – Cost Consequences

Topic: Geothermal Energy Service (GES) Program

Ref: Exhibit B / Tab 1 / Schedule 1 / pp. 21-22 and p. 25, #74

Preamble:

Enbridge Gas indicates that it plans to implement its GES Program in 2018 as a GHG emission abatement program to offset gas usage.

Enbridge Gas also indicates that geothermal systems provides space heating, water heating and cooling are typically electrically powered.

Enbridge Gas states that it sees geothermal as a key way to abate carbon. Deploying geothermal systems where natural gas would otherwise be consumed will offset natural gas usage.

Questions:

- a) Please explain whether Enbridge Gas' GES Program is to install ground-source heat pumps in natural gas heated homes only?
 - i) Please confirm that Enbridge Gas' GES Program does not include installing ground-source heat pumps in electrically heated homes?
 - ii) Please confirm that Enbridge Gas' GES Program does not include installing ground-source heat pumps in propane-heated home?
- b) Please explain in detail why Enbridge Gas is proposing to implement this Program given that the technology is shown on the OEB's Marginal Abatement Cost Curve⁷ (OEB MACC) to be high cost activity compared to other energy efficiency options for space heating.
- c) Please outline Enbridge Gas' analysis to demonstrate that installing a geothermal energy system in a gas heated home will be cost-effective for a typical residential customer (e.g., when a heat pump is installed in a gas heated home, the net impact of the customer's electricity bill and natural gas bill would be reduced overall for years 1 to 10).
 - i) If Enbridge Gas has not completed this analysis, please conduct this analysis and provide all supporting documentation including data, assumptions and analysis.

RESPONSE

- a) The Board's Regulatory Framework for the Assessment of Costs of Natural Gas Utilities' Cap and Trade Activities encourages the utility to consider abatement of GHG emissions as one tool in meeting its current and future carbon obligations. To that effect, this program will include existing natural gas customers, forecasted natural gas customers or expansion areas and electric, propane or other fuel customers who are in the Company's franchise area could choose to be natural gas customers.

Enbridge has proposed that its Geothermal Energy Service would be provided as part of its regulated utility business such that this service displaces natural gas consumption in existing buildings and newly constructed buildings that would otherwise rely on natural gas for their space and water heating requirements. To the extent that this service is subscribed to by buildings that cannot be practically served by the Company's gas distribution system, this segment of the Geothermal Energy Service may be undertaken by Enbridge on a non-utility basis.

- (i) Not confirmed. Please see the response to part (a) above.
 - (ii) Not confirmed. Please see the response to part (a) above.
- b) In its analysis, the Board's Marginal Abatement Cost Curve study did not take into account funding from the CCAP and in the case of geothermal systems this changes the business case.
- c) and i) Please see table below that shows the 10 year operating cost comparison between a natural gas and a geothermal home

Comparison between a Geothermal Home and Gas Home										
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Energy Costs										
Gas Cost (Per Cubic Meters) in Cents	35.40	36.30	37.79	38.89	39.78	40.49	41.18	41.84	42.09	42.59
Cost of carbon (Per Tonne) in \$	17.00	18.00	18.00	19.00	20.00	21.00	31.00	36.00	43.00	50.00
Electricity Cost (per kWh) in Cents	10.62	11.17	11.43	11.76	12.58	13.38	14.34	14.88	15.28	15.66
Natural Gas Home										
Gas consumption for heating (Cubic meter)	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900
Gas consumption for hot water (Cubic meter)	500	500	500	500	500	500	500	500	500	500
Carbon (Tonnes)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Air conditioner electricity usage (kWh)	2,400.0	2,400.0	2,400.0	2,400.0	2,400.0	2,400.0	2,400.0	2,400.0	2,400.0	2,400.0
Furnace electricity consumption (kWh)	1,100.0	1,100.0	1,100.0	1,100.0	1,100.0	1,100.0	1,100.0	1,100.0	1,100.0	1,100.0
Gas Cost in \$	849.5	871.2	907.0	933.3	954.6	971.8	988.4	1,004.1	1,010.1	1,022.2
Carbon cost in \$	76.5	81.0	81.0	85.5	90.0	94.5	139.5	162.0	193.5	225.0
Electricity costs in \$	371.6	391.0	400.2	411.7	440.2	468.3	501.7	521.0	534.6	548.2
Total energy related costs \$	1,297.7	1,343.2	1,388.1	1,430.4	1,484.8	1,534.7	1,629.6	1,687.0	1,738.2	1,795.4
Geothermal Home										
Cooling electricity consumption (kWh)	1,267.2	1,267.2	1,267.2	1,267.2	1,267.2	1,267.2	1,267.2	1,267.2	1,267.2	1,267.2
Heating electricity consumption (kWh)	4,675.5	4,675.5	4,675.5	4,675.5	4,675.5	4,675.5	4,675.5	4,675.5	4,675.5	4,675.5
Hot water electricity consumption (kWh)	1,945.0	1,945.0	1,945.0	1,945.0	1,945.0	1,945.0	1,945.0	1,945.0	1,945.0	1,945.0
Electricity costs in \$	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
Total energy related costs \$	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
Assumptions										
Gas Furnace efficiency = 0.95										
Gas water heater efficiency = 0.62										
Air conditioner efficiency = 15 SEER										
Ground source heat pump efficiency based on manufacturer specification data: Winter COP = 4; Summer COP = 7.5										
Cooling season from May 15 - Sept 15 (4 months)										
Gas furnace electricity consumption based on 2013 NYSERDA Gas Furnace Electricity Usage Study										
Geothermal water heating consumption pro-rated based on winter/summer months with 50% geothermal and 50% electric coverage										
Carbon cost = 1.875 kg/m3 emission factor										
Electricity rates are based on the Toronto Hydro residential rate effective May 1, 2018 (excludes fixed charges)										
Natural gas current rates are based on the Enbridge Gas Distribution Inc. rate schedule EB-2018-0090, effective Apr 1, 2018										