

Elson Advocacy

May 27, 2020

BY EMAIL AND RESS

Ms. Christine Long

Board Secretary

Ontario Energy Board

2300 Yonge Street, Suite 2700, P.O. Box 2319

Toronto, Ontario M4P 1E4

Dear Ms. Long:

Re: EB-2019-0294 – Enbridge Gas Inc. – Low Carbon Energy Project

Enclosed please find the interrogatories of Environmental Defence in the above matter.

Yours truly,



Kent Elson

EB-2019-0294 – Enbridge Gas Inc. – Low Carbon Energy Project

Environmental Defence Interrogatories

Interrogatory #1

Reference: Exhibit B, Tab 1, Schedule 1

Questions:

- (a) Please elaborate on the purpose and need for this project, and hydrogen injection more generally, as it relates to mitigating the financial risks to fossil fuel consumers associated with climate change and the related shifts in energy use patterns.
- (b) Please provide a copy of all studies that Enbridge has commissioned or possesses that analyze the risk to natural gas consumers and natural gas markets associated with climate change, including the potential shifts in energy use patterns from market forces and/or government policy.
- (c) Please itemize and describe the financial risks to gas customers related to the potential changes in energy use patterns arising from climate change.
- (d) What percent of Ontario's GHG emissions (CO₂e) arise from natural gas? Please provide a response for the latest year available and as a five-year average.
- (e) What are the total annual GHG emissions (CO₂e) arising from the consumption of natural gas in Ontario? Please provide a response for the latest year available and as a five-year average.
- (f) How much natural gas is consumed in Ontario in a year (m³ and GJ)? Please provide a response for the same periods as in (d).
- (g) Please estimate the total annual GHG emissions (CO₂e) arising from the fugitive natural gas in Ontario? Please provide the answer on a best efforts basis with the information available to Enbridge. For example, if Enbridge can only speak to the fugitive emissions arising in its own facilities, please still provide this information. In this question, fugitive natural gas refers to any natural gas that is lost to the environment before reaching the customer's equipment.
- (h) What are Canada's GHG emission reduction targets? Please express the targets as total annual emissions (CO₂e) for each year there is a target.
- (i) Please provide Ontario's portion of Canada's GHG emission reduction targets (CO₂e). For the purpose of this answer, please assume that Ontario's GHG emissions remain the same proportion of Canada's GHG emissions as they are today.
- (j) Please complete the following table and provide a copy in Excel format:

GHG Reduction Targets and Associated Declines in GHGs from Natural Gas				
	2019 (historic levels) ¹	2020	...	2050

¹ If 2019 historic figure are not yet know, please start at 2018.

Canada's GHG Reduction Targets (CO ₂ e) ²				
Ontario's Portion of Canada's GHG Reduction Targets (CO ₂ e) ³				
Ontario GHGs From Natural Gas (business as usual)				
Ontario GHGs From Natural Gas (GHG target reduction scenario) ⁴				

(k) Please provide a line chart illustrating the above table.

Interrogatory #2

Reference: Exhibit B, Tab 1, Schedule 1, Page 3

Preamble: Enbridge states that: "Enbridge Gas estimates that, for the BGA, GHG emission reductions can range from approximately 98 tons carbon dioxide equivalent (tCO₂e) to 117 tCO₂e per year."

Questions:

- Why does Enbridge estimate a *range* of forecast GHG emission reductions?
- Does Enbridge assume that the GHG emissions associated with the hydrogen to be used in this project are zero? If yes, please explain.
- Please provide a table showing the hours during which the power-to-gas facility operated in 2019. For each of those hours, please indicate the percent of Ontario's power generation provided by gas-fired generation. Please provide this information in a table.

² For 2019 please use the actual historic figure. For each year for which there is a targeted level, please bold the figure. For years between figures, please calculate the trajectory of the targets on a straight-line basis.

³ For 2019 please use the actual historic figure. For each year for which there is a targeted level, please bold the figure. For years between figures, please calculate the trajectory of the targets on a straight-line basis. Please assume that Ontario's GHG emissions remain the same proportion of Canada's GHG emissions as they are today.

⁴ For the purpose of this answer, please assume that the GHG emissions from natural gas remain the same proportion of Ontario's total GHG emissions as is the case today.

- (d) Please calculate the carbon intensity of the power consumed in 2562961 Ontario Ltd.'s power-to-gas facility in 2019 and provide a forecast for 2021 to 2025. Please also provide the total GHG emissions associated with that power for each year.

Please answer the questions on a best-efforts basis and with any caveats as necessary. If a portion of the historic data or forecast is impossible to provide, please explain why and answer the question over as long a time period as possible. If certain parts of the answer cannot be estimated, please explain why and provide as much of the table as possible. Please make assumptions as necessary and state all assumptions.

Interrogatory #3

Reference: Exhibit B, Tab 1, Schedule 1, p. 1

Preamble: Enbridge states as follows: "When combusted, hydrogen is a zero carbon emission fuel source."

Questions:

- (a) What is the carbon intensity of electricity generation in Ontario (CO₂e/kWh)? Please provide a forecast of this for each year from now until 2040 (the period covered by the IESO' annual planning outlook).
- (b) Please provide a forecast of the carbon intensity of hydrogen created in Ontario through power-to-gas from now until 2040 based on the forecast carbon intensity of electricity and the amount of electricity required to produce hydrogen. Please make assumptions as necessary and please state all assumptions. Please provide the response separately per GJ and m³ of hydrogen. Please also include a row stating the carbon intensity of hydrogen as a % of the carbon intensity of natural gas of the same heating value.
- (c) How much electricity (kWh) is required to produce (i) a m³ of hydrogen and (ii) a GJ of hydrogen. If they differ, please provide the figures for Enbridge's power-to-gas plant and for the industry average.
- (d) Please provide the following conversion rates and figures: (i) m³ of natural gas to m³ of hydrogen of the same heating value, (ii) m³ of natural gas to GJ of natural gas, (iii) m³ of hydrogen to GJ of hydrogen, (iv) CO₂e per m³ of natural gas, (v) CO₂e per GJ of natural gas, and (iv) kg of hydrogen to GJ of hydrogen.

Interrogatory #4

Reference: Exhibit B, Tab 1, Schedule 1, p. 1

Preamble: Enbridge states as follows: "When combusted, hydrogen is a zero carbon emission fuel source."

Questions:

- (a) What is the carbon intensity of hydrogen created through natural gas reforming? Please make assumptions as necessary and please state all assumptions. Please provide the response separately per GJ and m3 of hydrogen. Please also include a row stating the carbon intensity of hydrogen (from natural gas reforming) as a % of the carbon intensity of natural gas of the same heating value.
- (b) How much natural gas is required to produce (i) a m3 of hydrogen and (ii) a GJ of hydrogen through natural gas reforming.
- (c) Approximately what percent of the hydrogen produced in Canada is created via natural gas reforming?
- (d) Approximately what percent of the hydrogen produced in the United States is created via natural gas reforming?
- (e) Is there an overall GHG reduction benefit associated with injecting hydrogen into the natural gas stream if that hydrogen was created with natural gas reforming? Please explain and quantify the answer.
- (f) Is there an overall GHG reduction benefit associated with injecting hydrogen into the natural gas stream if that hydrogen was created with any method other than power to gas from a low-carbon electricity source? Please explain and quantify the answer.
- (g) If Enbridge were to expand hydrogen injection beyond this pilot project would it consider including hydrogen created via natural gas reforming?

Interrogatory #5

Reference: Exhibit B, Tab 1, Schedule 1

Questions:

- (a) Please explain how Enbridge anticipates the Clean Fuel Standard will apply to its natural gas operations in Ontario and natural gas consumers in Ontario.
- (b) Will the Clean Fuel Standard create a financial incentive to reduce the carbon intensity of natural gas? If yes, will that incentive accrue to consumers, suppliers, both, or other? How much is this incentive expected to be worth per m3 of hydrogen or per avoided carbon emissions (CO2e)?
- (c) Does Enbridge anticipate that the Canada's Clean Fuel Standard will require Enbridge to reduce the carbon intensity of the fuel in its system?
- (d) Please itemize and describe the other measures that Enbridge is considering as a response to the Clean Fuel Standards.

Interrogatory #6

Reference: Exhibit B, Tab 1, Schedule 1, p. 15-18

Preamble: Enbridge states at page 17 of the reference:

“To support this pilot project, Enbridge Gas has arranged to procure hydrogen from 2562961 Ontario Ltd. in a manner that keeps ratepayers cost-neutral. This treatment would apply to the hydrogen supply for the BGA until rebasing or until such earlier time

that a different treatment is appropriate based on future developments; for example, the implementation of a CFS.”

Questions:

- (a) Please estimate the cost per m³ and GJ of hydrogen produced by 2562961 Ontario Ltd.
- (b) Please explain the relationships between 2562961 Ontario Ltd, Hydrogenics Corporation, the IESO, and Enbridge. Please provide all contracts between any of those parties relating to this pilot project or the power-to-gas plant.
- (c) How much does 2562961 Ontario Ltd pay for electricity and how much is it forecast to pay for electricity over the next 10 years?
- (d) Will the provision of hydrogen at the rates proposed by Enbridge result in losses or profits for any of the entities described in (b)? Please explain and estimate the quantum of any losses or profits.
- (e) Please provide a table showing Ontario’s annual surplus electricity (kWh), historic and forecast, from 2010 to 2040.
- (f) Hydrogen is less expensive if generated with surplus power. What is the hydrogen generation potential from surplus power between now and 2040 (m³ and GJ)?
- (g) Please provide a best estimate of the cost at which hydrogen can currently be produced in Ontario (per m³ and GJ) via power-to-gas. Please include and separately itemize the cost of electricity and the cost of converting electricity to hydrogen. Please make all assumptions as necessary and state all assumptions.
- (h) If technological advancements are expected, please provide a best estimate of the cost at which hydrogen could be produced in Ontario in 2030 (per m³ and GJ) via power to gas. Please include and separately itemize the cost of electricity and the cost of converting electricity to hydrogen. Please discuss and provide a qualitative answer if a quantitative one is not possible.
- (i) What is the going market rate for hydrogen in Ontario (per m³ and GJ)? If a single rate cannot be provided, please provide a range and some examples.
- (j) What is the going market rate for hydrogen in Ontario (per m³ and GJ) *created from power-to-gas*? If a single rate cannot be provided, please provide a range and some examples.
- (k) What is the going market rate for hydrogen in California (CAD per m³ and GJ)? If a single rate cannot be provided, please provide a range and some examples.
- (l) What is the going market rate for hydrogen in California (CAD per m³ and GJ) *created from power to gas*? If a single rate cannot be provided, please provide a range and some examples.
- (m) What is Shell Canada charging for hydrogen in its hydrogen refuelling stations in Quebec? An average, approximate, or point-in-time answer is sufficient. Would this hydrogen be mostly from natural gas reforming or power to gas?
- (n) What is the percentage difference between the current cost for hydrogen and natural gas in Ontario of the same heating value (for hydrogen created via power to gas)? Please provide the forecast difference between now and 2040, both annual and average over that period? Please provide the underlying calculations.

Interrogatory #7

Reference: Exhibit A, Tab 2, Schedule 1, p. 1; Exhibit B, Tab 1, Schedule 1, Attachment 1

Preamble: Enbridge states at Exhibit A, Tab 2, Schedule 1, p. 1 that:

“The LCEP is a pilot project that will allow the Company to green a portion of the natural gas grid in Ontario. The experience gained through the implementation of the LCEP will position Enbridge Gas to then expand hydrogen injection into other parts of its gas distribution system, further enhancing reductions to GHG emissions across the province.”

Questions:

- (a) Enbridge is currently planning to inject hydrogen at the rate of 2%. If hydrogen injection is expanded, what is the likelihood that this percentage could be increased? Please discuss.
- (b) Page 19 of attachment 1 (Ex B-1-1) seems to suggest that the 2% limit for this pilot project is based primarily on the end-user equipment. Is that true? Please discuss.
- (c) Are the concerns associated with consumer end-user equipment (e.g. flashback and overheating) mostly associated with stoves, furnaces, or water heaters?
- (d) Are other jurisdictions exploring or implementing mandatory equipment standards (e.g. for new furnaces) that would allow greater percentages of hydrogen injection? Is Enbridge considering advocating for changes in this direction in Canada?
- (e) What is the highest percentage of hydrogen injection in a pilot project known to Enbridge?
- (f) What is the approximate highest percentage of hydrogen injection that Enbridge believes could be technically feasible?

Interrogatory #8

Reference: Exhibit A, Tab 2, Schedule 1, p. 1

Preamble: Enbridge states that:

“The LCEP is a pilot project that will allow the Company to green a portion of the natural gas grid in Ontario. The experience gained through the implementation of the LCEP will position Enbridge Gas to then expand hydrogen injection into other parts of its gas distribution system, further enhancing reductions to GHG emissions across the province.”

Questions:

- (a) What was Ontario’s natural gas consumption (m3 and GJ) (i) in 2019 and (ii) on average over the past 5 years?
- (b) Please estimate the incremental annual commodity cost (\$) of replacing 2% of Ontario’s natural gas consumption with hydrogen created via power-to-gas.

- (c) Please estimate the incremental annual commodity cost (\$) of replacing 20% of Ontario's natural gas consumption with hydrogen created via power-to-gas.
- (d) Please provide any studies or documentation Enbridge has prepared on the possibility of expanding hydrogen injection in its distribution system. Please include any estimates of the feasibility, physical requirements, and costs.
- (e) How much natural gas was exported from Ontario in the most recent year for which data is available (m3 and GJ)?
- (f) If Enbridge were to expand hydrogen injection what steps would be needed in relation to exports to other jurisdictions? Would Enbridge also inject hydrogen into gas that would be exported? Would Enbridge need to isolate and separate the gas for Ontarians versus the gas to be exported? Would that be physically and financially feasible?
- (g) If Enbridge were to expand hydrogen injection throughout the province, would this require a parallel hydrogen pipeline system throughout the province? Could the hydrogen be injected in only a few locations near where it was produced?
- (h) Please provide a rough range or order of magnitude of the cost to build the necessary pipeline facilities to inject hydrogen throughout Ontario's natural gas system.

Interrogatory #9

Reference: Exhibit A, Tab 2, Schedule 1, p. 1

Questions:

- (a) Would the expansion of hydrogen injection require changes to the OEB's regulatory guidelines or tests?
- (b) Please file a copy of the relevant documentation detailing Enbridge's allowed business activities.

Interrogatory #10

Reference: Exhibit B, Tab 1, Schedule 1 Page 1

Questions:

- (a) In support of this application, Enbridge notes that it is "consistent with the environmental goals of public policy provincially and federally." Please list these and include copies of the relevant policy documents.
- (b) Please elaborate on how public policy consistency is relevant for the criteria for approval under the sections of the OEB Act at issue (s. 90 and 36) and the associated OEB rules and guidelines. Please specifically identify the pertinent criteria, its source, and how public policy factors in.

Interrogatory #11

Reference: Exhibit A, Tab 2, Schedule 1, p. 1

Preamble: Enbridge states that:

“The LCEP is a pilot project that will allow the Company to green a portion of the natural gas grid in Ontario. The experience gained through the implementation of the LCEP will position Enbridge Gas to then expand hydrogen injection into other parts of its gas distribution system, further enhancing reductions to GHG emissions across the province.”

It also states that this project is “consistent with the environmental goals of public policy provincially and federally.”

Questions:

- (a) Please calculate the cost of GHG emissions reductions (\$/CO₂e) from hydrogen injection including only the incremental commodity costs of replacing natural gas with hydrogen created via power-to-gas. Please use Enbridge’s estimate of the cost to produce hydrogen by power-to-gas in Ontario. Please provide a table showing the underlying calculations.
- (b) Please calculate the cost of GHG emissions reductions (\$/CO₂e) from hydrogen injection including both the incremental commodity costs (replacing natural gas with hydrogen created via power-to-gas) and the incremental capital costs (upgrades to gas distribution and transmission). For the incremental commodity costs, please use Enbridge’s estimate of the cost to produce hydrogen by power-to-gas in Ontario. For the incremental capital costs, please use Enbridge’s best estimate of the capital cost per m³ of injecting hydrogen into the gas system. Please provide a table showing the underlying calculations.
- (c) Please recalculate the cost of GHG reductions in (b) but for the incremental capital costs, please use the cost per m³ of hydrogen for this pilot project. Please provide a table showing the underlying calculations.
- (d) Please provide the annual forecast throughput of hydrogen for the proposed pilot project.
- (e) For comparative purposes, please provide the cost of GHG emissions reductions (\$/CO₂e) from natural gas energy efficiency programs. Please provide an explanation if Enbridge’s figures are inconsistent or out of line with those in the OEB’s Marginal Abatement Cost Curve Final Report, EB-2016-0359, July 20, 2017 (which indicates a significant negative cost per CO₂e for energy efficiency).
- (f) For comparative purposes, please provide the cost of GHG emissions reductions (\$/CO₂e) from renewable natural gas. Please provide an explanation if Enbridge’s figures are inconsistent or out of line with those in the OEB’s Marginal Abatement Cost Curve Final Report, EB-2016-0359, July 20, 2017.
- (g) For comparative purposes, please provide the cost of GHG emissions reductions (\$/CO₂e) from converting to geothermal instead of natural gas including only the difference in annual operating costs (i.e. commodity costs). Please base the answer on the evidence prepared by Dr. Stanley Reitsma, P. Eng. in EB-2016-0004 dated March 21, 2016 (p. 35-37) or explain why different figures are used.
- (h) For comparative purposes, please provide the cost of GHG emissions reductions (\$/CO₂e) from converting to geothermal instead of natural gas including the difference in annual operating costs (lifetime) and incremental capital costs (including the capital costs

to expand gas service to the new community). Please base the answer on the evidence prepared by Dr. Stanley Reitsma, P. Eng. in EB-2016-0004 dated March 21, 2016 (p. 35-37) or explain why different figures are used.

For each of the above, please answer the question on a best-efforts basis and with any caveats as necessary. If a portion of the historic data or forecast is impossible to provide, please explain why and answer the question over as long a time period as possible. If certain parts of the answer cannot be estimated, please explain why and provide as much of the table as possible. Please make assumptions as necessary and state all assumptions.