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February 28, 2023

British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, B.C.
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Attention: Sara Hardgrave, Acting Commission Secretary

Dear Sara Hardgrave:

Re: FortisBC Energy Inc. (FEI)
Revised Renewable Gas Program Application – Stage 2 (Application)
FEI Rebuttal Evidence to the Brattle Group (Brattle) Intervener Evidence

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In accordance with the amended regulatory timetable established in British Columbia Utilities Commission Order G-28-23, FEI hereby files its Rebuttal Evidence to Brattle Intervener Evidence in the above referenced proceeding.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Sarah Walsh

Attachments

cc (email only): Registered Parties

Biomethane Energy Recovery Charge Rate Methodology and Comprehensive Review of a Revised Renewable Gas Program

Rebuttal Evidence
of FortisBC Energy Inc.

to the Expert Evidence filed by
the Brattle Group (Brattle)

February 28, 2023

1. REBUTTAL TO BRATTLE GROUP REGARDING SUPPLY OF RNG

Q1: What is the purpose of this Rebuttal Evidence?

A1: The purpose of this Rebuttal Evidence is to provide FEI's rebuttal to the evidence of the Brattle Group (Brattle) related to the short-term supply of RNG. The capitalized terms in this Rebuttal Evidence are defined in the Application. For example, "FEI" or the "Company" refers to FortisBC Energy Inc.

Although FEI has addressed a number of matters in this Rebuttal Evidence, FEI's silence on any particular matter should not be construed as agreement.

Q2: Did Brattle conduct its own research into RNG supply?

A2: No. Brattle does not conduct its own research on the amount of RNG supply, but instead provides a survey of the results of past studies.

Q3: Do you have any general comments on Brattle's conclusions regarding supply?

A3: Generally, Brattle does not account for technology evolution or shifts in policy related to the use of RNG which could increase potential. For example, the 2017 Hallbar Consulting study suggests up to 93.6 PJ of supply from wood if feedstock is available. Brattle does not report on this value even though there is ongoing development work in this area.

Q4: On pages 8 to 10 of its evidence, Brattle distinguishes between RNG supply produced from decaying biological matter (i.e., "traditional" or "conventional" methods) and RNG supply converted from woody biomass using gasification or pyrolysis (i.e., "non-traditional" or "advanced" methods). Brattle states that these "[o]ther advanced conversion technologies can be used to produce RNG, but current technological and cost challenges limit their potential." Is this correct?

A4: While there may be current technological and cost challenges, the *potential* of these resources cannot be discounted. According to the *BC Renewable and Low-Carbon Gas Supply Potential Study*, the technology to produce more RNG with local feedstocks already exists and improved processes are being developed that could ultimately improve efficiencies or lower costs. As these technologies need to be shown to be able to operate cost-effectively at scale, utility and/or government partnerships may be necessary to realize their full potential. However, as the technology matures and, possibly, more advanced technologies with lower capital costs become available after 2030, gas production costs from these pathways are expected to decrease. Ultimately, given that the importance placed on decarbonization by governments across North America continues

to increase, the potential of these sources of supply should not be discounted. Furthermore, the challenge of overcoming barriers to wood-based RNG supply are not unique to this form of energy. To achieve net-zero emissions, sizeable challenges to all low and no-carbon energy carriers exist.

The 2017 Hallbar Consulting study states at page 22:

> The second long-term RNG production potential used estimated feedstock volumes, and assuming a market price of $28/GJ and significant advancements in wood RNG technology. Development of commercially available technologies 31 to convert wood feedstock to RNG will significantly increase B.C.'s RNG production potential. For example, based on available suitable agricultural feedstocks (i.e., horse bedding, broiler litter, and turkey litter) and B.C. Hydro's forestry feedstock estimations, RNG production potential is estimated to be 51.3 PJ/year. If NRCan's forestry feedstock estimations are used, RNG production potential is estimated to be 93.6 PJ/year (Figure 5).

The *BC Renewable and Low-Carbon Gas Supply Potential Study* also finds that the renewable and low carbon gas from woody biomass has a very high technical potential. The Minimum and Maximum Scenario results from the study for woody biomass produced in British Columbia are set out in Table 27 of the study, as reproduced below.

Table 27 Renewable Gas from Woody Biomass Produced in B.C. in Each Scenario (PJ per year, HHV)

Wood Resource	MINIMUM SCENARIO		MAXIMUM SCENARIO	
	2030	2050	2030	2050
Unharvested AAC	-	-	4.6	4.6
Roadside residue related to above	-	-	2.1	4.0
AAC from mill closures	-	-	14	14
Roadside residue related to above	-	-	6.5	11
Unharvested pulp logs	3.6	3.6	4.0	4.0
Roadside residue related to above	0.4	0.6	0.4	0.6
Unused Roadside residue	6.0	10	5.9	10
Mill residue not used	4.8	4.8	4.8	4.8
Conversion of pellet plants	-	-	-	44
Expiring BC Hydro contracts	-	-	47	47
Urban wood waste (CLD)	-	-	-	-
TOTAL	**15**	**19**	**89**	**143**

Note 1: The values in the table includes wood to methane, syngas and hydrogen.

What is feasible and achievable in British Columbia with appropriate policies and investment could lie in between the Minimum and Maximum scenarios, as the supply potential of Renewable Gas that can be produced from woody biomass is constrained by resource availability and its distribution within the province.

Q5: In the response to CEC-Brattle IR1 3.1, Brattle explains that the feasible RNG potential is less than one quarter of the theoretical potential due to "competing

uses of various feedstocks, logistical constraints (including distance between feedstocks and closest gas pipeline), and economic viability". Does FEI agree with Brattle's conclusion?

A5: It is too early to make definitive conclusions regarding the feasible potential for RNG. As the demand for RNG grows, it will stimulate technological developments and growth in supply. The approach in the *BC Renewable and Low-Carbon Gas Supply Potential Study* of developing minimum and maximum potential scenarios is the more helpful and accurate approach to assessing the potential for RNG supply.

Q6: Brattle concludes that the findings in the *BC Renewable and Low-Carbon Gas Supply Potential Study* are "broadly consistent" with those of the 2017 Hallbar Consulting study. Is this accurate?

A6: The two studies are "broadly consistent" with respect to the estimated amount of traditional RNG feedstocks in BC. However, the two studies are different in their scope and their findings. The 2017 Hallbar Consulting study is limited to RNG, whereas the scope of the more recent *BC Renewable and Low-Carbon Gas Supply Potential Study* is much broader, as indicated in Table 1 of the report, reproduced below. As shown in the table, the scope of the *BC Renewable and Low-Carbon Gas Supply Potential Study* includes RNG produced using anaerobic digestion, woody biomass and hydrogen from non-biomass resources. Given the pace of change in the industry, the more recent *BC Renewable and Low-Carbon Gas Supply Potential Study* is a more accurate source than the 2017 Hallbar Consulting study.

Table 1 Pathways for low carbon gas considered in this report

Organic Residue* (Anaerobic treatment)	Woody Biomass (Thermochemical pathways)	Non-Biomass Resources (Electrolysis and SMR)
Agricultural RNG: Digestion and gas conditioning using agricultural waste.	Syngas: Wood gasification to produce a gas used in lime kilns of kraft pulp mills.	Green hydrogen: Electrolytic production of hydrogen from water and clean electricity.
Municipal RNG: Digestion of source-separated organics (green bin) and industrial food waste.	Hydrogen from syngas: Syngas processed with water-shift reaction.	Blue hydrogen: Steam methane reforming of fossil methane with CO_2 capture and storage.
RNG from wastewater treatment plants: Digestion of water treatment sludge to produce RNG.	Methane from syngas: Syngas processed with water-shift and methanation step.	Turquoise hydrogen: 'Pyrolysis' of fossil methane, producing carbon black and hydrogen.
Landfill gas: Gas captured at landfills and conditioned to produce RNG.	Lignin as a replacement for natural gas in the pulp industry: Lignin extracted from black liquor to produce a dry lignin fuel.	Waste hydrogen: Hydrogen produced as a by-product in industrial processes.

* In reality, some of these feedstock types can be combined at any given plant; a strict separation is not possible but is used in the report to derive estimates for the potential of each waste type

Q7: Based on the findings of the 2017 Hallbar Consulting study, Brattle suggests that the short-term "theoretical" potential RNG supply in British Columbia from "conventional" methods is 7.6 PJ per year and the short-term "achievable" potential RNG supply is 4.4 PJ per year." How does compare to the *BC Renewable and Low-Carbon Gas Supply Potential Study*?

A7: The *BC Renewable and Low-Carbon Gas Supply Potential Study* projects and analyzes the technical supply potentials for each supply resource and then develops 'Minimum' and 'Maximum' scenarios to outline a plausible range of supply based on a number of variables, including cost assumptions, carbon taxes, feedstock availability, gas mix eligibility, technological readiness, build-up of new gas facilities, among others. These scenarios reflect both pessimistic and optimistic views based on these variables, as shown in Tables 29 and 30 of the study, reproduced below.

Table 29 Assumptions for Gas Production in 2030 and 2050, in PJ/yr (Minimum Scenario)

Gas Type	2030	2050	Rationale
Green hydrogen (large on-grid)	0.0	8.3	Slower ramp-up than Maximum scenario
Green hydrogen (small on-grid)	0.8	1.9	Slower ramp-up than Maximum scenario
Green hydrogen (large off-grid)	0.0	2.4	A single 300 MW off-grid wind farm after 2030
Blue hydrogen	14.2	46.8	Limited by permitting and regulatory restraints
Turquoise hydrogen	1.5	15.4	Slower ramp-up than Maximum scenario
Waste hydrogen	0.9	0.9	Identical to Maximum scenario
Syngas in lime kilns	1.4	5.9	Identical to Maximum scenario
Lignin in lime kilns	0.0	0.0	Lignin a more expensive fuel than syngas
Syngas to hydrogen	0.3	13.4	No change to forestry practices. BC Hydro PPAs are extended. No use of wood pellet feedstock. Only low-cost residue used.
Syngas to RNG	0.0	0.0	Technology not advancing as expected
Agricultural RNG	0.9	1.2	Potential for production cost below $31/GJ; 70% of 2030 technical potential (90% of 2050 potential).
Municipal RNG	2.3	4.0	
Waste water treatment gas	0.4	0.6	
Landfill gas	2.1	2.7	
TOTAL	**24.7**	**103.8**	

Table 30 Assumptions for Gas Production in 2030 and 2050, in PJ/yr (Maximum Scenario)

Gas Type	2030	2050	Rationale
Green hydrogen (large on-grid)	8.4	21.0	Converted to petajoules from Table 18
Green hydrogen (small on-grid)	0.8	6.3	Converted to petajoules from Table 18
Green hydrogen (large off-grid)	1.7	12.6	Converted to petajoules from Table 18
Blue hydrogen	14.2	156	From ZEN (2019) report, Figure 28 (in 2050)
Turquoise hydrogen	15.4	92.2	From ZEN (2019) report, Figure 28 (in 2050)
Waste hydrogen	0.9	0.9	From ZEN (2019) report, Figure 28
Syngas in lime kilns	1.4	5.9	100% of lime kilns are converted to syngas by 2050. BC Hydro contracts are not extended.
Lignin in lime kilns	0.0	0.0	Lignin a more expensive fuel than syngas
Syngas to hydrogen	0.3	64.9	Increased forest residue recovery. BC Hydro contracts are not extended. Pellet feedstock transitions towards gas production. 36 plants (or less if larger plant size), also using standing trees
Syngas to RNG	0.3	74.2	One demo by 2030. 26 full-size plants by 2050. Use of some roundwood
Agricultural RNG	1.4	2.0	Potential for production cost below $50/GJ. 70% of 2030 technical potential (90% of 2050 potential).
Municipal RNG	2.4	4.2	
Waste water treatment gas	0.4	0.6	
Landfill gas	2.1	2.8	
TOTAL	**49.7**	**444**	

As shown in the tables above, the *BC Renewable and Low-Carbon Gas Supply Potential Study* estimated that, when only considering supply resources from within BC, between 24.7 PJ (Minimum Scenario) and 49.7 PJ (Maximum Scenario) of renewable and low carbon gases could be produced by 2030. This amount of supply would be sufficient to meet the 15 percent Renewable Gas target set by the 2018 CleanBC Plan and a significant portion of the proposed GHG emissions cap for natural gas utilities in the CleanBC Roadmap. By 2050, the study projects supply increasing to between 103.8 PJ (Minimum Scenario) and 444 PJ (Maximum Scenario).

In addition to the estimated amounts within British Columbia, as Brattle recognizes, these supply resources would be supported by resources from across North America – which Brattle concludes could provide hundreds of PJ of renewable gases available in Canada,[1][2] depending on the study, and thousands of PJ in the US based on one study by the American Gas Foundation.[3]

Q8: Citing page 29 of FEI's Application, Brattle states on pages 11 to 12 of its report: "To achieve the company's goal of displacing 15% of natural gas supply with RNG by 2030, FEI estimates that it will need approximately 30 PJ of RNG per year. Similarly, the company expects it will need 45 and 65 PJ per year of RNG by 2030 to meet the Roadmap to 2030 emissions cap." Is this accurate?

A8: No. For clarity, as stated in FEI's Application, FEI's goal is to acquire "Renewable Gas" to meet the referenced targets. As acknowledged by Brattle in footnote 19 of their report, FEI uses Renewable Gas to refer to RNG, hydrogen, lignin and synthesis gas which are the four low carbon gases or fuels that FEI is enabled to acquire under the GGRR.

Q9: Brattle concludes on page 59 of its report: "Currently, FEI procures over 70% of its current RNG supplies outside of British Columbia. We find that this strategy will likely provide FEI with access to sufficient notional supplies to achieve its goal of procuring an additional 26 PJ to 61 PJ by 2030." Brattle goes on to state: "However, FEI will need to compete for these RNG volumes with other North American natural gas utilities with similar RNG ambitions." Has FEI considered the potential for such competition in estimating the available RNG supply?

A9: Yes. As explained on page 81 of the Application, FEI has mitigated this risk to an extent by being a "first-mover" in the market and has an established regulatory path with known guidelines for supply agreements, particularly with respect to RNG. This established

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[1] TorchLight BioResources, "Renewable Natural Gas (Biomethane) Feedstock Potential in Canada," https://www.enbridge.com/~/media/Enb/Documents/Media%20Center/RNG-Canadian-Feedstock-Potential-2020%20(1).pdf.

[2] Canadian Gas Association. "Potential Production of Methane from Canadian Wastes," October 2010, https://www.researchgate.net/publication/268341359_Potential_Production_of_Methane_from_Canadian_Wastes.

[3] American Gas Foundation, "Renewable Sources of Natural Gas: Supply and Emission Reduction Assessment," December 2019, https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf.

history in the RNG market is attractive to suppliers who are interested in long-term offtake agreements with a high degree of certainty of regulatory approval. FEI is seen as a buyer with a known and transparent process for contracting for RNG and has demonstrated that the regulatory process is relatively quick and known. This is desirable for sellers who perceive any regulatory process as a hurdle and timeline risk.

As discussed in the response to BCUC IR1 2.1.1 (Exhibit B-17), the duration of FEI's existing RNG import contracts is also a supply risk mitigation strategy whereby off-take agreements secure project financing and allow FEI to lock-in RNG across North America for long periods (i.e., generally for 20 years).

As other Canadian and U.S. gas utilities start offering offtake agreements similar to those offered by FEI, FEI expects that its "first-mover" advantage will decline. However, it is also likely that the increased demand will stimulate development and investment in additional supply. Furthermore, the *Inflation Reduction Act* (IRA), passed by Congress and President Biden in August of 2022, will spur development of low carbon energy supply due to an expected $370 billion per year in new funding. Within the IRA, there is a specific focus on investment tax credits and production tax credits for varying forms of renewable energy including biodiesel, renewable diesel, alternative fuels, clean hydrogen production, landfill gas and biomass.

Ultimately, FEI is confident it will be able to achieve its goal of procuring an additional 26 PJ to 61 PJ by 2030. As of February 2023, and based upon its existing accepted BPAs, FEI's total amount of expected supply is already just over 19.5 PJ. This is equivalent to over 8 percent of total system throughput and more than half of the amount allowed currently to meet the 15 percent Renewable Gas target set by CleanBC.

Q10: Brattle also adds on page 59 of its report: "Alternatively, FEI can meet its climate commitments by procuring carbon offsets, an inexpensive but sometimes dubious way to achieve climate benefits." Does this fairly represent FEI's alternatives to achieving climate benefits?

A10: No. Brattle's consideration of FEI's alternatives to achieve climate targets appears to be limited by the scope of its report (i.e., RNG and carbon offsets), which does not reflect all of FEI's alternatives to meet GHG reductions targets.

As discussed in the response to BCUC IR1 1.1 (Exhibit B-17), the proposed GHG emissions cap for natural gas utilities in the CleanBC Roadmap remains under development and there remain many uncertainties, including allowed abatement pathways. For example, there is currently no clarity on the position of the provincial government on whether carbon offsets are a recognized compliance pathway for the stated goals of the CleanBC Roadmap and, as such, FEI would only do so if and when the Province provides guidance.

FEI is, however, currently enabled to acquire RNG, hydrogen, syngas and lignin under the GGRR. FEI anticipates that these renewable gases or fuels will form a material component of its actions to meet the CleanBC target of 15 percent Renewable Gas by 2030 and the proposed GHG emissions cap for natural gas utilities in the CleanBC Roadmap.

FEI is also investing in DSM programs in support of energy efficiency and conservation measures to reduce energy use among residential, commercial and industrial customers as another approach to achieving climate benefits. This and other approaches to achieving GHG reductions are more fully discussed in FEI's Long-Term Gas Resource Plan which is currently before the BCUC.

Q11: Does this conclude your rebuttal evidence in respect of Brattle?

A11: Yes.