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May 16, 2022

Commercial Energy Consumers Association of British Columbia
c/o Owen Bird Law Corporation
P.O. Box 49130
Three Bentall Centre
2900 – 595 Burrard Street
Vancouver, BC
V7X 1J5

Attention: Mr. Christopher P. Weafer

Dear Mr. Weafer

Re: FortisBC Energy Inc. (FEI)

Revised Renewable Gas Program Application – Stage 2 (Application)

Response to the Commercial Energy Consumers Association of British Columbia (CEC) Information Request (IR) No. 1

On December 17, 2021, FEI filed the Application referenced above. In accordance with the amended regulatory timetable established in British Columbia Utilities Commission Order G-103-22, FEI respectfully submits the attached response to CEC IR No. 1.

For convenience and efficiency, FEI has occasionally provided an internet address for referenced reports instead of attaching lengthy documents to its IR responses. FEI intends for the referenced documents to form part of its IR responses and the evidentiary record in this proceeding.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email only): Commission Secretary
Registered Parties

1. Reference: Exhibit B-11, page 5

Table 1-1: Proposed Regulatory Timetable

Action	Dates (2022)
BCUC Issues Procedural Order	Thursday January 6
FEI Publishes Notice	Week of January 17
Intervener Registration	Thursday, January 27
Workshop	Thursday, February 3
BCUC IR No. 1	Thursday, February 10
Intervener IR No. 1	Thursday, February 17
FEI Response to IRs No. 1	Monday, April 4
Written Submissions on Further Process	Thursday, April 14

FEI has proposed a Workshop as part of the regulatory process to review key elements of the Application and answer questions. FEI has provided a draft procedural order in Appendix G-1. FEI notes that the draft procedural order also includes the permanent approval sought with respect to the new RS 7B as discussed in Section 1.3 above.

1.1 FEI proposed a Workshop ahead of the IR 1 round of questions. Does FEI still believe a Workshop would be beneficial following this round of IRs? Please explain why or why not.

Response:

No. FEI considered that it would assist interveners to have an introductory workshop prior to the first round of IRs given that the proposed Renewable Gas Program is complex and designed to meet a complex operating and policy environment. However, FEI considers that there is no longer a need for such a workshop as interveners will have had the opportunity to review the Application and review FEI's responses to over 900 IRs. Given this process and the breadth of the evidentiary record, there is no longer any need for an introductory workshop.

1.2 What are the key elements that FEI intended to review in the Workshop?

Response:

FEI had intended to use the workshop to explain:

- The evolution of the operating and policy environment driving the need for the revised Renewable Gas Program;

- The various forms of Renewable Gas addressed in the Application and how these energy solutions fit within a diversified energy pathway; and
- The proposed regulatory and accounting mechanisms underlying FEI's Renewable Gas offerings.

Holding a workshop prior to the first round of information requests would have allowed FEI to expand on these key topics and respond to questions, thus focusing subsequent phases of the proceeding with the benefit of additional information.

2. Reference: Exhibit B-11, page 9

> The CEA was introduced by the provincial government in 2010 to address a number of government policies, including the reduction of GHG emissions in BC. Specifically, in 2010 the CEA included the following objectives:[5]
>
> (d) to use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources;

2.1 Would FEI describe the RNG as a clean resource, a renewable resource, or both? Please explain.

Response:

FEI would describe RNG as a both a clean and renewable resource. Clean energy and renewable energy are often used interchangeably and can be defined as energy that does not pollute the atmosphere when used. As explained in the response to CEC IR1 3.2, RNG is derived from organic matter, through a process that captures methane that otherwise would vent to the atmosphere. RNG is one of the low carbon gases or fuels that FEI can acquire under the GGRR, along with hydrogen, synthesis gas and lignin. As such, the provincial government has recognized RNG to be a clean energy source to reduce GHG emissions.

2.2 If FEI views RNG more as a clean resource than as a 'renewable' resource, does FEI consider the name RNG to be a misnomer?

Response:

Please refer to the response to CEC IR1 2.1.

2.2.1 Does FEI believe that customers have a clear understanding of the value of RNG in reducing carbon emissions based on its description as RNG? Please explain.

Response:

FEI's has found that customers' understanding of the value of RNG in reducing carbon emissions varies depending on the customer type. FEI continues to work on educating its customer base on the value of RNG, along with other low carbon gases, and the important role they play in reducing GHG emissions.

2.2.2 Please confirm that use of RNG reduces the Carbon Tax by 100% for the volumes of RNG used.

Response:

Confirmed. The carbon tax is reduced (credited back to customers) by 100 percent for the associated volume of RNG used. Therefore, from a customer's perspective, they are charged but do not pay a carbon tax on RNG volumes consumed after the above credit is applied.

3. Reference: Exhibit B-11, page 12

> 1. Biogas is a renewable energy resource, and upgrading Biogas to produce Biomethane for direct consumption in heating appliances is the most efficient use of that renewable resource.
> 2. The production and use of Biomethane is carbon neutral because producing and consuming Biomethane will not add to the amount of Carbon released into circulation.
> 3. The use of Biomethane in place of a GHG-positive energy source (such as natural gas) results, all else equal, in a net reduction in GHGs.

3.1 Please confirm that the combustion of biogas emits greenhouse gases.

Response:

Confirmed. However, as noted in the preamble, the production of biogas is considered carbon neutral as it does not add to the carbon released into the environment.

3.2 Please elaborate on why biomethane is considered to be carbon neutral, and consider the impacts of production from start to finish.

Response:

Biomethane or RNG is derived from organic sources (i.e., biomass) and, therefore, uses carbon that already exists within the ecosystem. As noted in the BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions:[1] "The CO_2 released to the atmosphere during combustion of biomass is assumed to be the same quantity that had been absorbed from the atmosphere during plant growth." As the combustion of RNG does not contribute any net new carbon dioxide into the atmosphere, it is considered carbon neutral.

To further elaborate, the resources used to create RNG, such as organic food waste, landfill gas, wastewater from treatment facilities and farm waste (manure) are broken down naturally by bacteria, producing methane along with other gases. This occurs naturally in the environment already, and as such, the methane from these sources is considered part of the biogenic cycle. If this methane were not captured, it would end up in the atmosphere.

To create RNG, this gas is captured and purified, leaving only methane, which is then injected into the existing natural gas system. RNG mixes seamlessly into the existing natural gas infrastructure, displacing equivalent volumes of conventional natural gas. Because the RNG is naturally occurring, and its use displaces the need for an equivalent supply of conventional natural gas, there is no net increase in methane in the biologic system (i.e., carbon neutrality).

[1] https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/methodology/2020-pso-methodology.pdf.

FEI has previously engaged a third party to review the RNG portfolio acquired by FEI as a carbon neutral source of energy. The third party, Offsetters (now Ostrom Climate), reviewed FEI's program and confirmed that RNG is carbon neutral.[2]

There are still some greenhouse gases produced either directly (e.g., methane escaping) or indirectly (emissions based on electricity use) from the production of RNG and these will vary depending on the production system. The carbon intensity of any source of RNG can be determined through a life cycle assessment. FEI uses the provincial standard lifecycle analysis model, GHGenius to determine the lifecycle carbon intensity of Renewable Gas from its different supply projects. This model includes the methane emissions mentioned here in the calculation of carbon intensity.

FEI's lifecycle analysis in 2020 and 2021 demonstrates that the carbon intensity (emissions) from RNG is negative. On a lifecycle basis, RNG can have a negative carbon intensity by preventing methane emissions. RNG does this by capturing methane that would otherwise be released into the atmosphere, e.g., from manure in open lagoons, and turning it into carbon dioxide through combustion. As carbon dioxide is a much less potent GHG than methane, RNG is credited with the avoided methane emissions.

Please refer to the response to the City of Richmond IR1 12.4, where FEI provides the total life cycle emissions for RNG from source to burner tip, including production, processing, transport (including compression), storage (i.e., compression), fugitive emissions, operations, and maintenance of the pipeline.

[2] Offsetters, Report Update: Biomethane Greenhouse Gas Emissions Review, March 31, 2017. Available online: https://www.cdn.fortisbc.com/libraries/docs/default-source/services-documents/offsetters-biomethane_greenhouse_gas_emissions_reviewe6fecb594de843768ae02951f4b8d3eb.pdf?sfvrsn=821688c4_2.

4. Reference: Exhibit B-11, page 14

> During the period following the 2013 Decision until January 2015, the BERC rate increased from $11.696 per GJ to $14.414 per GJ by the end of 2014. By this time, it was apparent to FEI that the BERC rate had increased to a level that discouraged enrollment in the program and had the potential to result in costs from unsold biomethane not being recovered from the voluntary program participants. In response to this market signal, FEI concluded that the price setting mechanism of the program needed to be adapted to suit market conditions. More specifically, RNG had to be sold at a price customers were willing to pay, otherwise much of the volume of RNG purchased by FEI would go unsold, and therefore, the reduction in GHG emissions enabled by the program would go unfulfilled.

4.1 Please confirm that the RNG has been placed into a natural gas supply, regardless of whether or not it was purchased, and where it was physically placed into supply for end users.

4.1.1 If yes, please confirm that the reduction in GHG emissions enabled by the program were achieved whether or not the RNG supply was purchased and/or physically used within a particular jurisdiction, provided it is used and achieves its GHG emissions reduction values.

Response:

Confirmed. RNG is placed into natural gas supply at the point of injection, which is either FEI's gas distribution system, or the supplier's local gas distribution system. Once the RNG enters a gas distribution system, its molecules are indistinguishable from conventional natural gas.

The premise of the statement above was that without voluntary customers, due to the structure of the program at the time, FEI would not have been able to justify purchases of supply and the GHG emissions reductions associated with them. Once biomethane is produced and displaces conventional natural gas, GHG emissions are reduced. Please refer to the response to BCOAPO IR1 10.1 for a further discussion on the displacement model for transportation of Renewable Gas in North America.

5. Reference: Exhibit B-11, page 16

> **Phase 5: Further Amendment to the GGRR and Renewable Gas Program Review (2021)**
>
> In May 2021, the provincial government amended the GGRR further, increasing acquisition cost cap and volumes and expanding acquisition opportunities:[16]
>
> 1. Enabling utilities to acquire and supply green and waste hydrogen, synthesis gas and lignin, in addition to RNG.
> 2. Increasing the amount of RNG, green and waste hydrogen, lignin and synthesis gas that utilities (such as FEI and Pacific Northern Gas) can acquire and make available to their customers from five percent to fifteen percent of the total annual supply of natural gas;
> 3. Broadening the methods by which utilities can obtain Renewable Gas to include producing it or upgrading it themselves for injection into the pipeline, paying a third party to produce it or upgrade it for pipeline injection, or purchasing hydrogen, synthesis gas or lignin to displace the use of natural gas at customer facilities; and
> 4. Increasing the price cap utilities can pay to acquire Renewable Gas from $30 to $31 per GJ for contracts for purchase signed after March 31, 2021[17] and increasing the price cap annually by inflation.

5.1 Please provide a brief overview of the green and waste hydrogen, synthesis gas, and lignin opportunities.

Response:

FEI is progressing early-stage project development to produce green hydrogen and also engaging with third parties to potentially procure hydrogen that is currently vented to the atmosphere (waste hydrogen), synthesis gas (syngas), and lignin. The total aggregate potential supply from these opportunities exceeds 10 PJ per year of supply; however, at this early stage FEI is unable to provide more specific details regarding these opportunities.

Please also refer to the *BC Renewable and Low-Carbon Gas Supply Potential Study*[3] which outlines the overall potential supply of Renewable Gas in BC, including the following sections:

- Section 4.1 regarding green and waste hydrogen
- Section 3.3 regarding syngas
- Section 3.6 regarding lignin

[3] https://www.cdn.fortisbc.com/libraries/docs/default-source/news-events/bc-renewable-and-low-carbon-gas-supply-potential-study-2022-03-11.pdf.

5.2 Please compare each of the above items to RNG in terms of energy efficiency, GHG emissions, price, availability, and capability to place in the existing natural gas system.

Response:

FEI provides a high-level comparison to RNG below.

Energy Efficiency

At a high level, energy efficiency refers to the ratio of total energy expended to do useful work, such as heat a home or move a vehicle, measured against the total energy required to make the fuel from a primary resource and deliver it to the end user.

Hydrogen, synthesis gas (syngas) and lignin are generally comparable to RNG; however, comparing the efficiency of these fuels is a complex analysis with many variables to consider that cannot be fully represented in this response.

Availability and GHG Emissions

Like RNG, hydrogen, syngas and lignin can be produced from a range of resources in British Columbia. Each fuel can also be produced and imported from outside BC in a similar manner to conventional methane or RNG, and therefore, could be moved (currently by displacement) across large geographic distances from where the resources are located to where the energy is used by customers. The *BC Renewable and Low-Carbon Gas Supply Potential Study* provides an in-depth analysis of resource availability to produce RNG, hydrogen, syngas and lignin and the GHG emissions associated with the different methods to produce these energy gases from a range of resources.[4]

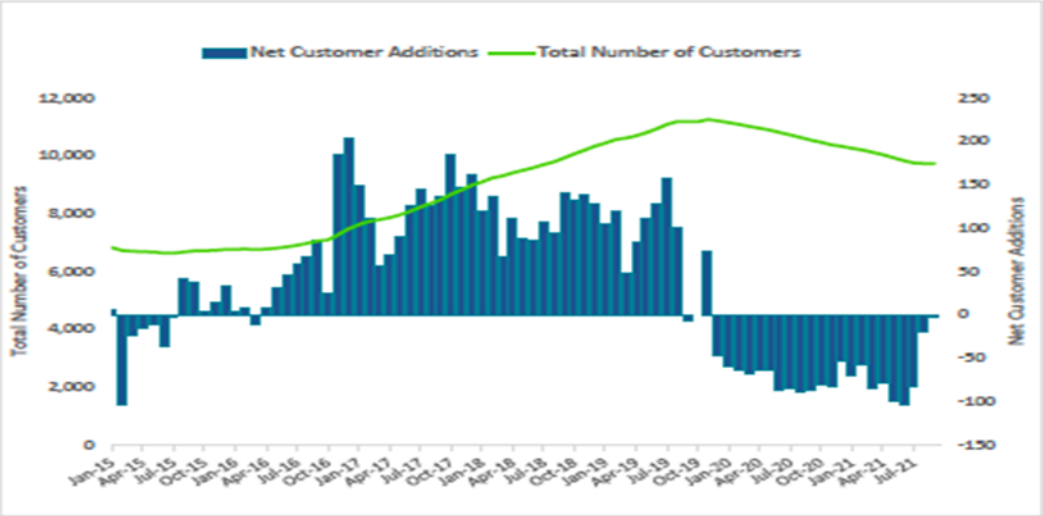
Capability to be Placed in the Existing Gas System

Syngas and lignin are not intended to be physically distributed in the gas system. Hydrogen is compatible with the existing gas distribution system today up to certain concentrations, as described further in response to CEC IR1 13.1. FEI expects over time, as hydrogen develops as a mass market fuel, the gas system will be adapted to meet the market demand and develop capacity to deliver ever greater shares of hydrogen.

[4] https://www.cdn.fortisbc.com/libraries/docs/default-source/news-events/bc-renewable-and-low-carbon-gas-supply-potential-study-2022-03-11.pdf.

6. Reference: Exhibit B-11, page 19

Figure 2-2: Renewable Gas Program Monthly Net Customer Additions and Total Customers

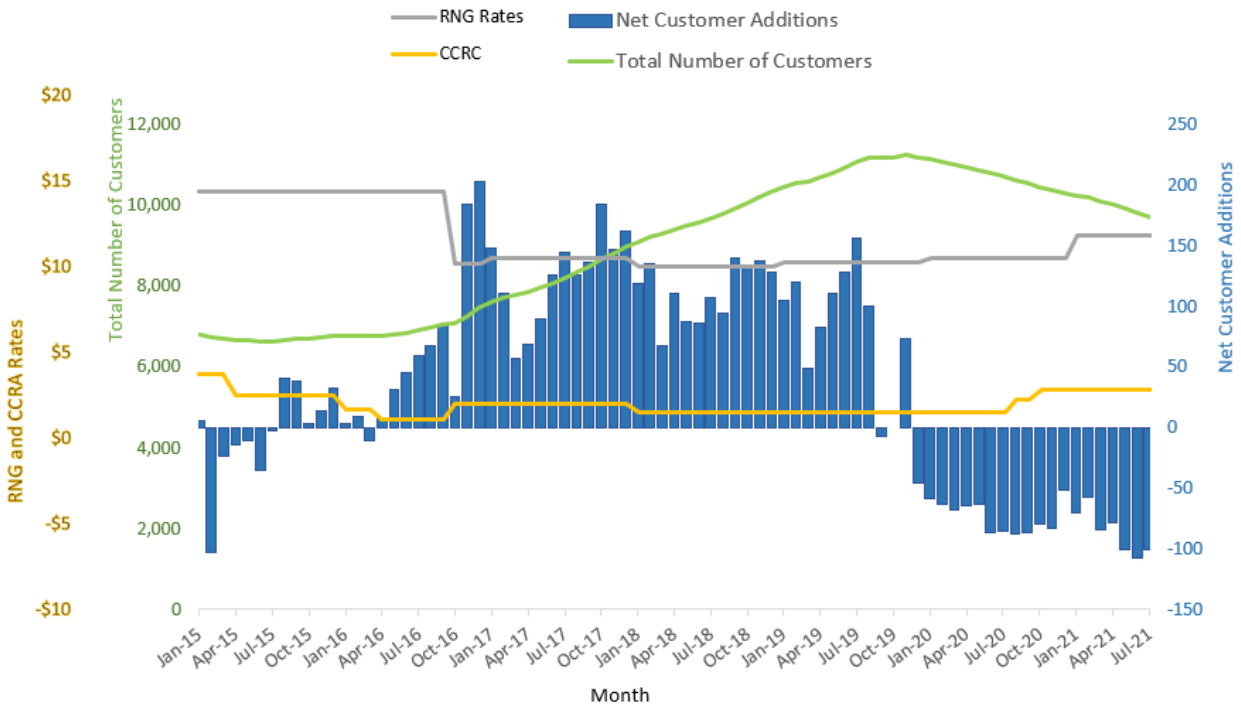


6.1 Please overlay the price of RNG and the price of natural gas on the above graph.

Response:

Please refer to the graph below for the price of RNG with the price of natural gas (CCRC) added.

Revised Figure 2-2: Renewable Gas Program Monthly Net Customer Additions and Total Customers



6.2 Please describe the influences FEI assesses as causing the net attrition from 2020 on.

Response:

The reduction in customer additions towards the end of 2019 to mid-2021, as shown in Figure 2-2 above, was due to a temporary closure of the existing RNG Program to new participants because RNG supply did not materialize as anticipated and fell short of demand.

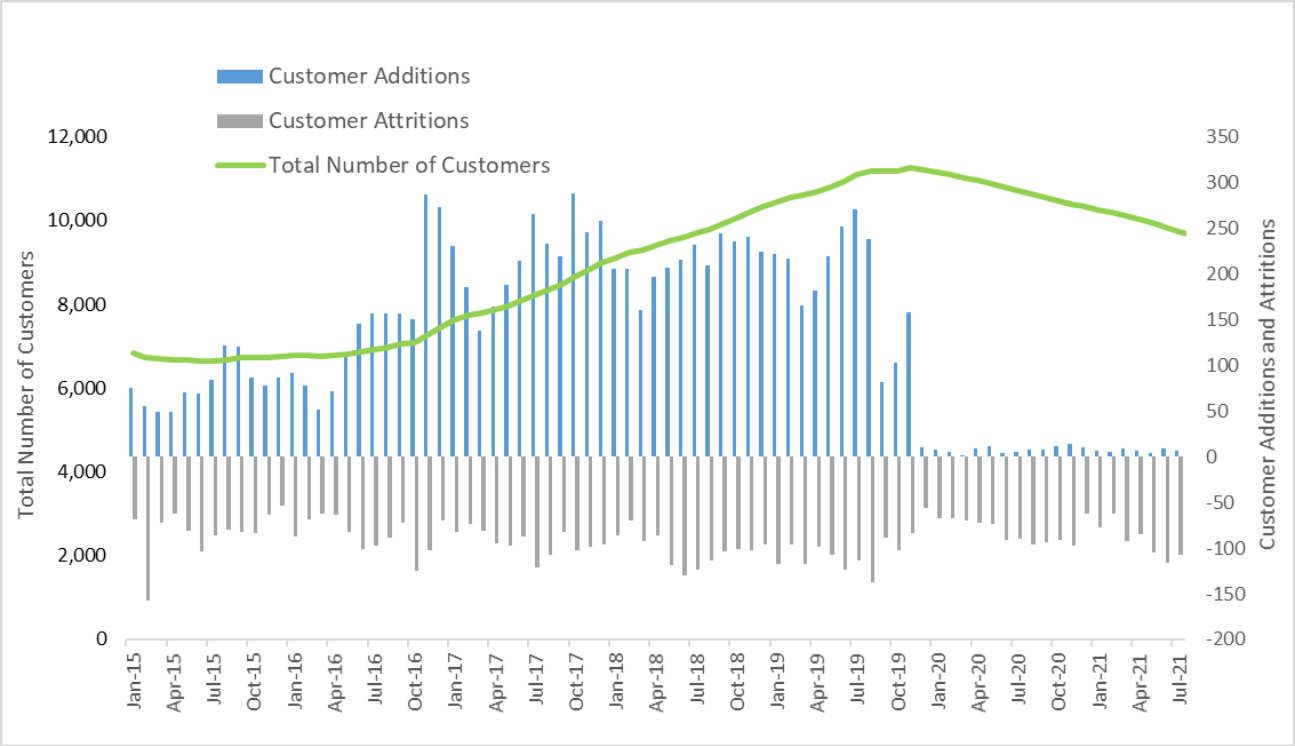
The temporary closure of the RNG Program led to the steady erosion of the total number of customers enrolled, due to the natural exiting of customers from the Program over time which were not replaced by new participants.

6.3 Please describe the Additions and Attrition quantities of customers for each of the above periods in a separate graphic showing the additions above zero and the attritions below zero.

Response:

Please refer to the requested graph below.

Figure 1: Customer Additions, Attrition and Total



As explained in the response to CEC IR1 6.2, FEI closed the RNG Program to new enrollments. There were no new enrollments in the RNG Program from the time it was closed in August 2019 until it re-opened in October 2021. FEI explains below why a small number of additions are reflected in the above graph despite the RNG Program being closed.

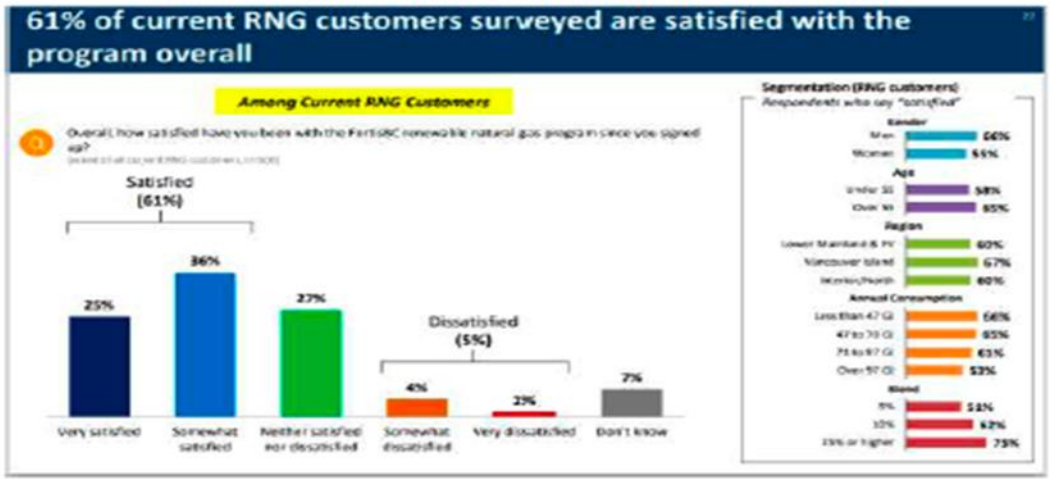
First, due to the time needed to remove the enrollment option from FEI's online customer account system, a small number of new enrollments occurred after the RNG Program was closed until approximately November 2019. FEI contacted these customers directly to inform them that the RNG Program was closed, and that they would be manually unenrolled.

Second, a small number of monthly enrollments that occurred after the RNG Program was closed are attributable to how FEI's information system tracks when a customer moves address or makes changes to their selected blend of RNG. When a customer moves, or changes their RNG blend, FEI's system first tracks their action as an unenrolment from their *existing* address or blend, and then as a new enrollment at their *new* address or blend. The net effect does not change the customer additions or the total customer count for the RNG Program.

7. Reference: Exhibit B-11, page 22

further 27 percent indicated they were neither satisfied nor dissatisfied. Only 5 percent of respondents indicated they were dissatisfied.

Figure 2-5: Current Renewable Gas Program Participant Satisfaction



Moreover, customers who opted for RNG proportions of 25 percent or higher reported even greater satisfaction than other participants. For this group, the customers that reported being satisfied was 75 percent.

7.1 Please provide a summary of any information FEI has as to why 5% of customers are dissatisfied with the program.

Response:

Of the five percent of customers who indicated that they were dissatisfied with the existing RNG Program, the substantial majority said it was because the cost of RNG was more expensive than conventional natural gas.

8. Reference: Exhibit B-11, page 29

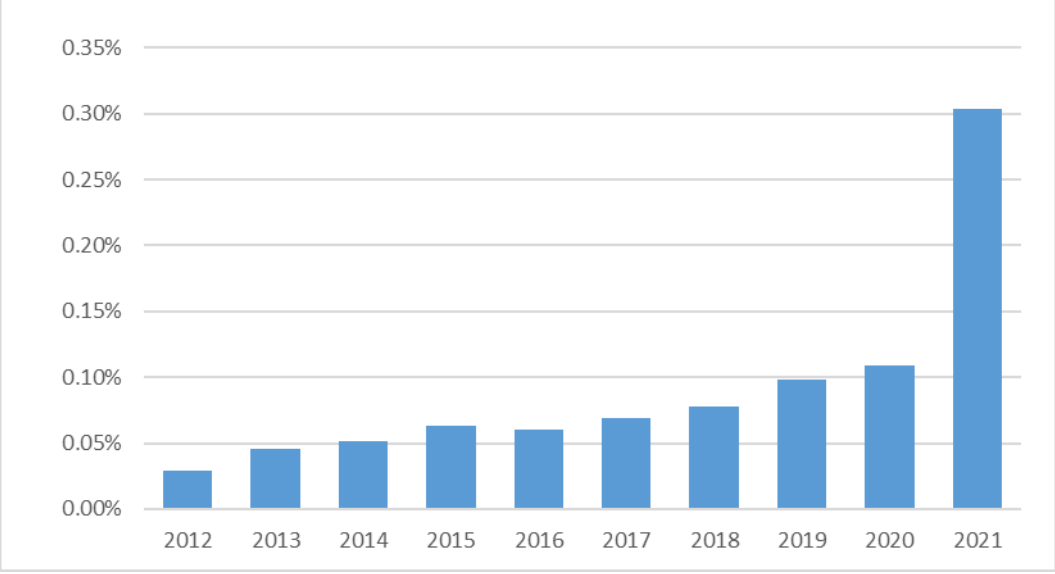
> ***3.4.1.1 CleanBC Roadmap - GHG Reduction Standard: Emissions Cap for Natural Gas Utilities***
>
> The 2018 CleanBC Plan enabled gas utilities to reduce emissions by increasing the renewable content of their gas stream to 15 percent renewable content by 2030. Displacing 15 percent of the gas supply with Renewable Gas would increase the annual supply of Renewable Gas in FEI's system to approximately 30 PJs.
>
> The provincial government's approach with respect to the emissions of natural gas utilities was recently updated in the CleanBC Roadmap with the introduction of a GHG emissions cap. The cap, if introduced into legislation, will limit the overall emissions from the gas used by all customers of gas utilities including residential, commercial and industrial sectors. This is the first policy of this kind in Canada which places an obligation on gas utilities to reduce emissions on behalf of their customers. The cap, as laid out in the CleanBC Roadmap, is set at 6.11 Mt of CO_2e per year at 2030. This represents a 47 percent reduction in GHG emissions from 2007 levels, and will require utilities to increase Renewable Gas content, increase investments in energy efficiency and employ other mechanisms to lower emissions. FEI expects that Renewable Gas content exceeding 15 percent will be required to meet this lower emission threshold by 2030. Details on the cap are under development; however, FEI sees the potential Renewable Gas supply requirements being between 45 and 65 PJs by 2030.

8.1 Please provide the percentage of content that is RNG, over the last 10 years, in graph form.

Response:

The chart below represents the percentage of FEI's total gas throughput, including gas for T-Service customers, that was composed of RNG over the last 10 years.

Figure 1: Renewable Natural Gas as a Percentage of Total Gas Throughput



8.2 Please provide an estimate of the % content of Renewable Gas that would likely be required to meet the lower emission threshold of 6.11 Mt of CO2e.

Response:

Please refer to the response to BCUC IR1 1.1.

8.3 Please extend the graph provided in CEC 1.8.1 to 2030 to illustrate how FEI might reasonably expect to reach the % content required to meet the lower emission threshold.

Response:

Please see Figure 6-3 from the Application which shows FEI's projected supply of Renewable Gas to 2032. Please also refer to the response to BCUC IR1 1.1 which discusses how FEI can reach the target for gas utilities set out in the CleanBC Roadmap and the critical role Renewable Gas will play. Finally, future pathways of Renewable Gas supply are covered in more detail in FEI's 2022 Long Term Gas Resource Plan (LTGRP) which was filed with the BCUC on May 9, 2022.

9. Reference: Exhibit B-11, page 34 and Creative Energy Decarbonization CPCN Appendix B

> **3.5.2 Incentives to Encourage GHG Emissions Reduction in New Construction**
>
> In addition to the variety of GHGi targets being applied to buildings, local governments also rely on incentives for builders to reduce emissions in new construction projects. Similar to GHGi targets, the approaches taken by local governments often differ and may only apply to specific projects rather than the entire geographic scope of the municipality or local government.
>
> FEI provides two public examples of local governments incentivizing developers to use a renewable energy (rather than natural gas) below; however, there are many more instances where a developer, through the zoning negotiation process, has been deterred from installing natural gas service.

Appendix B

City of Vancouver Confirmation - Decarbonization Project LCES

9.1 Creative Energy has referenced the City of Vancouver's Low Carbon Energy System requirements (LCES) requirements when applying for its Decarbonization Project. Please explain whether or not the use of FEI's RNG would be expected to qualify under the CoV's bylaws, and if so, what % of RNG would reasonably be expected to be required.

Response:

Creative Energy discusses Renewable Gas, and whether it would be expected to qualify under the City of Vancouver's bylaws, as part of the Decarbonization Project. In particular, Creative Energy explains that, within their 2021 Long Term Resource Plan, one potential option to reduce the carbon intensity of the steam energy it produces is to purchase Renewable Gas from FEI, thus displacing the conventional natural gas it uses in its steam plant. Within their filing Creative Energy also indicates that they had recently engaged with City of Vancouver staff to seek clarity on the City's view of Renewable Gas under the LCES framework. City of Vancouver staff confirmed that Renewable Gas would not meet the definition of an LCES as it is not a "permanent solution" as written in their policy:

> Type 4: Existing Utility-Owned District Energy System", refers to an existing utility-owned district energy system that is not yet a permanent LCES. As a temporary bridging measure before such a utility builds or connects to a permanent low carbon energy plant and becomes a permanent LCES, the utility must be able to obtain a reliable source of low-carbon energy. Such utility must also have a plan and commitment to build or connect to a permanent low-carbon energy plant in order to provide permanent low-carbon energy to the developments served by it…during the interim period before the utility becomes a permanent LCES, the

> utility must be able to obtain a reliable source of low carbon energy (which could include, without limitation, **renewable natural gas**,… [emphasis added]

Despite the above, FEI considers that Renewable Gas is a permanent reliable source of low carbon energy given its low carbon attributes. The transition in gas utilities towards cleaner sources of energy is no different than the transition that electric grids are undertaking, including in BC and across Canada, towards cleaner sources of electricity. Moreover, Renewable Gas does not change the efficiency of the plant or its operating costs. FEI is hopeful that with further discussions with the City of Vancouver, which remain ongoing, Renewable Gas will ultimately be recognized as a potential permanent solution.

9.2 If RNG is adequate for the provincial government low carbon purposes to achieve necessary GHG reduction targets and is not accepted by the City of Vancouver bylaws, what would be possible to align the Province and the City of Vancouver?

Response:

The provincial government considers Renewable Gas to be a viable solution for decarbonization, as evidenced by its inclusion in the CleanBC Roadmap and the GGRR, as well as by the recognition of RNG as a low-carbon fuel in the BC-LCFS and the exemption for biomethane from the carbon tax in the *Carbon Tax Regulation*. Moreover, the implementation of the CleanBC Roadmap's emissions cap on natural gas utilities through the Green House Gas Reduction Standard (GHGRS) will compel FEI to reduce GHG emissions from its gas stream to approximately 6 Mt, thus reducing GHG emissions for all local governments (including the City of Vancouver).

The City of Vancouver (City) is assessing how the 6 Mt cap will result in emission reductions for it. For example, the City is currently in consultations with the public on its building emission standards for existing buildings. The City's proposal suggests that additional measures by the City are required to meet their targets above and beyond what FEI's proposed Renewable Gas Program will provide, or what the provincial government is contemplating. FEI disagrees with this conclusion. In particular, FEI is proposing to deliver Renewable Gas to all sales customers, and in doing so, the City will see GHG emission reductions that align with the CleanBC Roadmap and also meet the City's 2030 climate targets, which are in line with the CleanBC Roadmap.

Nonetheless, the City is seeking feedback on a proposal where **existing** residential customers wishing to replace gas equipment must sign up for 100 percent Renewable Gas through FEI's Voluntary Renewable Gas service, pay the $7 premium, and then through data sharing between FEI and the City, annually confirm that the customer consumed 100 percent Renewable Gas. This would be additive Renewable Gas and the associated emissions to that resulting from the Renewable Gas Blend proposed in this Application.

FEI sees three ways to align the provincial government and the City of Vancouver.

- First, FEI views the City's participation in the regulatory process as an intervener in this proceeding as a positive development towards reaching alignment, as the City will have access to more information regarding the proposed Renewable Gas Program and its merits.
- Second, as discussed in the response to CEC IR1 53.1, FEI has recommended to the provincial government that it needs to conduct broad and early consultation around the GHGRS, including with local governments like the City. FEI has proposed to the City that it pause changes to its building decarbonization code until after the completion of this proceeding and the completion of the GHGRS; however, the City is moving forward with its decarbonization code slated to go before council on May 17, 2022.
- Finally, FEI continues to be actively engaged with City staff and elected officials in policy development, especially as it relates to the building sector. This includes, for example, execution of a Memorandum of Understanding between FEI and the City,[5] workshops with City staff, and written submissions by FEI in the City's building-related consultation processes.

Ultimately, FEI considers alignment between the provincial government and local governments (including the City) to be an important means of developing a unified approach to achieving GHG emission reductions. In particular, the alignment of policies would result in a clear signal to the public and will reduce costs and increase the likelihood of meeting GHG reduction targets. FEI sees the need for the provincial government to take a leadership role in creating this alignment.

Please also refer to the response to CEC IR1 53.1 which provides further discussion regarding provincial GHG emission targets and their relation to this Application and the City of Vancouver's approach to carbon reduction.

[5] https://vancouver.ca/files/cov/fortisbc-and-city-of-vancouver-memorandum-of-understanding.pdf.

10. Reference: Exhibit B-11, page 35

> In addition to this direct financial impact on developers, city planners exert influence on builders to conform to local government policies that reduce emissions, whether adopted in a bylaw or other policy. Further, city planners currently favour electricity-based solutions, often reflecting a lack of understanding at the planning level or a concern about the existing program's lack of permanence as discussed in Section 3.5.1 above. As a result, city planners are often resistant to builders or developers proposing Renewable Gas solutions for their buildings. From a practical perspective, builders and developers are reticent to unnecessarily add to their project costs (direct financial impact) or cause delay to the approval of permits (indirect financial impact), and therefore, conform to local government policies as implemented by city planners. Ultimately, narrowing the available low-carbon energy solutions to electricity alone impedes the ability of customers to choose gas as their preferred energy source and prohibits FEI from connecting new customers in this sector.

10.1 Please provide a brief description of the 'lack of understanding' that occurs at the planning level. For instance, what concepts do the planners fail to understand?

Response:

Please refer to Section 10.3.4.1 of the Application where FEI explains that, despite the different approaches between local governments, its proposed Renewable Gas Program is designed to address decarbonization of the building sector.

FEI has observed a general "lack of understanding" regarding Renewable Gas which extends beyond the planning level of a local government to the general population. In particular, questions generally relate to: (1) what Renewable Gas is and its emissions factor (a component to calculating greenhouse gas intensity); (2) the infrastructure required to deliver Renewable Gas; and (3) Renewable Gas supply and the long-term viability of this supply.

The above uncertainty reinforces FEI's concerns that its existing RNG Program, which is voluntary only, does not provide adequate assurance of long-term emissions reductions in the operation of a building.

10.2 What activities does FEI undertake to provide education to City planners?

Response:

FEI typically educates and informs city staff on a project-specific or initiative-specific basis. One example of a project-specific initiative is where FEI worked with planners and city staff on retrofitting a municipal facility to improve the facility's energy footprint. The conversation with the city included a combination of technology, energy efficiency programs, and Renewable Gas.

There has also been an increase in education on Renewable Gas itself and its relationship to a GHG intensity (GHGi). Since Renewable Gas and GHGi are relatively new considerations in the energy sector, FEI has begun to describe the role of Renewable Gas in achieving GHG targets. Through these conversations, local governments have raised questions regarding the permanence of Renewable Gas and the associated assurance of emissions reductions for the life of the building.

FEI notes, however, that education and sharing of information with city staff and planners is challenging due to the number of local governments in the Province, the size of their associated staff teams, and the technical nature of energy and the energy transition, given that most city staffs, and specifically city planners, generally do not have backgrounds in energy production, procurement or delivery. The relatively rapid expansion of, and need for, low carbon fuels such as Renewable Gas further complicates the education process around them. As a result, city staff are increasingly being asked to become *de facto* energy regulators making their job exceedingly complex, while their role has traditionally been reviewing building plans and understanding building codes.

Please refer to Section 10.3.4.1 of the Application for additional information regarding FEI's engagement with local governments.

10.3 Could District Energy systems using RNG be made cost effective relative to the use of electricity and still retain an equivalently low carbon footprint? Please explain why or why not.

Response:

Yes. While individual business models within District Energy Systems (DES) vary, they could use Renewable Gas for a cost-effective system that would have an equally low or lower carbon footprint than a system using electricity. A DES owner would have to compare the cost of gas infrastructure and the associated costs of Renewable Gas to alternatives such as electrical infrastructure (heat pumps) and the associated variable costs of electricity. As a drop-in fuel, existing gas-based DES can easily transition to Renewable Gas supply.

Depending upon the DES design and rate recovery mechanisms, a DES can be more expensive and have higher energy costs due to the added costs of hot water piping infrastructure between the energy plant and the customer's building. Therefore, it may ultimately be more cost-effective for a customer to use Renewable Gas directly through discrete in-building systems.

11. Reference: Exhibit B-11, page 36

> **3.5.3 Local Governments to be Granted Greater Autonomy to set GHGi Targets**
>
> The Premier's mandate letter to the Attorney General and Minister responsible for Housing indicates that local governments will be granted greater autonomy to set building policies and emissions reduction targets at their discretion:
>
> > Build on our government's work to require new buildings and retrofits to be more energy efficient and cleaner by supporting local governments to set their own carbon pollution performance standards for new buildings. [47]
>
> Increasing the autonomy of local governments to set emissions reduction targets could further limit energy choices for customers and create unequal access to gas service in FEI's service territory without a viable Renewable Gas solution. A new building in a municipality with a strict building GHGi target will not have access to FEI's gas system and service, while another new building across the street without a GHGi target will be able to continue to use the gas system.

11.1 Is it fair to expect that reduced energy choices will likely result in higher end user costs? Please explain why or why not.

Response:

Yes, it is fair to expect that reduced energy choice will likely result in higher end user costs. When energy choices are limited in sectors such as new buildings, the ability of market participants including energy providers, homebuilders, appliance manufacturers and renewable and low carbon gas suppliers to innovate and offer the most competitive and cost-effective options are restricted.

Furthermore, as discussed in Guidehouse's report titled *Pathways for British Columbia to Achieve its GHG Reduction Goals* (Pathways Report),[6] limiting choice creates significant costs in the aggregate as it would drive peak demand across the electricity system which would lead to high costs for new electric generating, transmission and distribution resources. In contrast, a diversified approach that maintains choice for customers will moderate the growth in electric peak demand and associated infrastructure costs. Even though more higher-cost renewable and low-carbon gases would be needed, the costs of these are significantly less than new electric infrastructure.

[6] https://www.cdn.fortisbc.com/libraries/docs/default-source/about-us-documents/guidehouse-report.pdf?sfvrsn=dbb70958_0.

12. Reference: Exhibit B-11, page 38

> This GGRR amendment has facilitated the growth in RNG supply projects over the last four years by allowing FEI to acquire RNG up to a maximum price of $30 per GJ (supply volumes and projects are further described in Section 6).

12.1 Please provide a graph and table showing the average supply price/GJ that FEI has been paying annually since the commencement of the Program.

Response:

Historically, FEI has not publicly disclosed the average supply price because the average price could have led to discovery of individual contract pricing which would have hampered FEI's ability to negotiate competitive pricing. Specifically, in the first three years of the program FEI was only sourcing RNG from one supplier and it was not until 2015 that there were four sources of RNG. As of 2021, FEI was receiving RNG from more than five sources and it is therefore reasonable to provide an average price with little risk of determining individual contract pricing.

Today, the average weighted portfolio price of RNG is $22.13 per GJ. This number is derived from current pricing of active projects combined with starting prices of agreements that have not yet begun supplying RNG and the respective expected annual volumes.

FEI has provided the forward looking price forecasts for its portfolio of Renewable Gas used in the development of this Application in the response to BCUC IR1 7.2.

13. Reference: Exhibit B-11, page 40

> The provincial government's hydrogen strategy includes 63 actions the province intends to pursue over short, medium and long term durations. The BC Hydrogen Strategy is meant to "accelerate the production and use of renewable and low-carbon hydrogen and be a world leader in the growing hydrogen economy." The Hydrogen Strategy includes:[54]
>
> - Support for blending hydrogen with natural gas 2020-2025:
> - Establish a regulatory framework for injecting hydrogen into the natural gas and propane distribution systems
> - Include hydrogen as a prescribed undertaking under the GGRR
> - Partner with a utility to review the infrastructure requirements to accommodate up to 100 percent hydrogen in the distribution system55
> - Support hydrogen injection trials into natural gas and/or propane distribution systems 2025-2030:
> - Mandate that new or modified natural gas or propane pipelines be hydrogen compatible
> - Support the introduction of hydrogen-tolerant equipment
> - Explore the role of hydrogen in meeting the CleanBC 15 percent renewable gas target
>
> - 2030-beyond:
> - Support large-scale hydrogen injection into the natural gas and propane distribution systems

13.1 Please provide the maximum hydrogen content that FEI's existing pipes could safely transport.

Response:

Based on current industry research and consideration of initial hydrogen blending limitations across FEI's high-pressure and low-pressure gas pipelines and appliances in BC, FEI considers that hydrogen could be blended with methane and safely delivered in the existing gas network pipelines at hydrogen blend concentrations up to 20 percent by volume, and potentially up to 30 percent.

FEI has also completed initial desktop based technical reviews that indicates it may be feasible to transport up to 100 percent hydrogen in select segments of the existing high-pressure and low-pressure gas system pipeline. However, further work will be required to confirm any upgrades to pipeline station facilities and other suitable mitigation measures to ensure security of gas supply and the safe operation of the gas system is not negatively impacted.

Starting in 2022, FEI will progress asset-specific engineering assessments, field testing, and technical verification, with guidance from the BC Oil and Gas Commission and from Technical Safety BC, to investigate hydrogen blending targets across the entire gas system pipeline assets. This work will allow FEI to confirm the optimum hydrogen blend concentration levels in the current gas system and prepare plans to increase the blend concentration levels over time.

13.2 Please identify what, if any, upgrades would be required to permit the distribution of 100% hydrogen through the natural gas pipeline system.

Response:

Please refer to the response to CEC IR1 13.1.

13.3 What is the expected cost of upgrading FEI's distribution system if upgrades are required?

13.3.1 How would FEI expect to recover these costs from customers?

Response:

As costs become known, FEI expects that they could be recovered in a number of ways depending on the type of project and category of costs.

For example, FEI could: (1) include these costs in the total cost of service for individual hydrogen supply projects and recover these costs through the cost recovery mechanisms of the Renewable Gas Program; (2) incorporate the costs in FEI's revenue requirement; or (3) use some other mechanism.

13.4 Can the existing base of customer end-use equipment generally work efficiently with hydrogen content? Please comment and explain if there are expected thresholds at which appliances and other end-use equipment would need to be changed out.

Response:

Yes, the existing base of customer end-use equipment can work efficiently when hydrogen is blended at low levels into the gas supply. Generally end-use equipment is expected to need to be changed out for hydrogen ready appliances when the hydrogen blend concentration in the gas supply exceeds approximately 20 to 30 percent by volume.

14. Reference: Exhibit B-11, page 44 and page 48

> As society contemplates the optimal pathways and investments needed to achieve BC's low carbon energy future, it is clear that leveraging the existing gas and electricity energy delivery systems is critical. High performing electric and gas delivery systems provides BC with greater flexibility in its energy options, greater affordability for its residents, greater system reliability and resiliency, and allows the optimal energy source to be used for a given application. FEI has more than 50,000 kilometres of existing piped energy delivery infrastructure located throughout the province and significant energy storage capacity, which are assets that can be leveraged and are needed to meet peak day and seasonal energy demand.

> **4.3.2 Maintains the Resiliency of the Province's Energy System**
>
> Maintaining the reliability and resiliency of the province's energy delivery system benefits all British Columbians who, as noted above, depend on the natural gas system for a number of essential functions. When energy systems are disrupted, it can cause significant hardship for those affected – as evidenced by the extreme weather-related disruptions in November 2021 caused by heavy rainfall and flooding. Having multiple forms of energy delivery provides for greater resiliency and minimizes the impact to customers when service is disrupted. Currently energy in BC is delivered via three main streams:
>
> 1. **Electricity:** Electricity makes up approximately 20 percent of the energy delivered in BC;
> 2. **Natural and Renewable Gas:** The gas system delivers approximately 23 percent of the energy delivered in BC;
> 3. **Liquid and Solid Fossil Fuels:** These fuels make up the remaining 55 percent of the energy delivered in the province.
>
> This composition serves to provide greater resiliency to the energy delivery system should one source of energy be compromised. For example, in the event of a power outage, many consumers can still run a gas fireplace or cooktop. Diversification is beneficial to all energy consumers, avoids over-reliance on one energy stream, and ultimately prevents the risk or inconvenience created when a customer is left without energy to heat their home or operate their business. The importance of energy resiliency is magnified in the face of extreme climate-driven weather events.

14.1 Please confirm that 100% dependence on a single energy system, such as the electric grid, could create a serious vulnerability to society in the event of a large and extended outage or threat of such.

Response:

Confirmed. The importance of resiliency and a diversified approach to decarbonization that uses multiple existing energy delivery systems is discussed in detail in Guidehouse's Pathways Report.[7]

FEI is working to ensure that its infrastructure investments and decarbonization strategy consider energy system resiliency as a core and common objective. A diversified approach ensures that there is redundancy to deliver energy to BC's main load centres, particularly in the Lower Mainland. FEI recognizes that BC will need to replace conventional natural gas with Renewable

[7] https://www.cdn.fortisbc.com/libraries/docs/default-source/about-us-documents/guidehouse-report.pdf?sfvrsn=dbb70958_0.

Gas over the next 30 years in order to align with decarbonization objectives internally, nationally, provincially and locally.

Since the release of the Pathways Report, a number of events have occurred in BC and more broadly that highlight the importance of energy system resiliency. Notably, and as discussed in the response to CEC IR1 15.3, the gas system is relied upon to shoulder significant winter heating load in the province. On December 27, 2021, FEI's system serviced almost double the energy load as BC Hydro's system during the peak hour. As climate change continues to evolve, increasingly disruptive weather events are likely to impact BC's energy infrastructure. For example, the June 2021 "heat dome" damaged electrical infrastructure and brought on significant summer peak loads, while the atmospheric river in the fall of 2021 disrupted both gas and electrical infrastructure. This speaks to ensuring that both systems are at the ready in case energy delivery is disrupted. These events underscore the need for both infrastructure systems working together to deliver energy loads of British Columbians and reinforces that this approach is ultimately more resilient.

Further, weather events in other jurisdictions foretell what the future may hold for British Columbia if resiliency is not considered in developing the province's energy infrastructure. For example, in March 2021, Texas was unable to meet energy demand during a peak cold weather event. First, the electricity and gas systems in Texas were not built to the resiliency required to meet such large heating loads. Second, energy supply infrastructure that was not hardened to withstand cold weather was impacted by the cold, including natural gas gathering lines which led to an energy supply shortage at a time of peak demand. The result was cascading failures of the gas and electric systems due to an under-investment in resiliency measures and lack of planning for resources to meet peak cold events.

Forward-looking infrastructure, which takes into consideration the energy transition, will be developed such that the gas supply is geographically diversified and designed for a decarbonized future of gaseous low-carbon fuels.

14.2 Is it reasonable for the Commission to factor in overall energy reliability and resiliency (i.e. the value of having differing energy sources) when making decisions?

14.2.1 If yes, please explain in which forums the Commission should consider the value of having more than one energy system for society.

14.2.2 If no, please explain why not.

Response:

Yes, it is reasonable for the BCUC to factor in overall reliability and resiliency of the provision of energy by public utilities in British Columbia, including the value of having differing energy sources, where relevant to setting rates or making determinations in respect to the public interest

under the *Utilities Commission Act* (UCA). Moreover, the BCUC *must* consider these factors where relevant to the decision before it, as in the present Application.

In providing this response, FEI has not endeavoured to provide a comprehensive review of the BCUC's jurisdiction to consider these matters, but has instead focused on the BCUC's ratemaking powers under sections 58 to 61 of the UCA, as this is what is relevant to this proceeding. FEI has also commented on the BCUC's jurisdiction under sections 45 and 46 with respect to the issuance of a certificate of public convenience and necessity (CPCN).

When setting rates, subsection 60(1) of the UCA states that the BCUC "must consider all matters it considers proper and relevant":

> 60(1) In setting a rate under this Act
>
> (a) the commission must consider all matters that it considers proper and relevant affecting the rate

Section 60(1)(a) confers on the BCUC a discretion to determine the matters which it deems proper for consideration and it requires the BCUC to consider such matters. The considerations of the BCUC when setting rates must therefore adapt to what is proper and relevant to the specific circumstances before it.

The matters that may be considered by the BCUC when making a public interest determination (e.g., deciding whether to grant a CPCN for a project), are similarly flexible and broad. The BCUC's Decision and Order G-55-3 regarding the Vancouver Island Generation Project discussed how what constitutes the "public convenience and necessity" is a flexible test. THe BCUC endorsed the submission that the BCUC may "draw its conclusion from the infinite variety of circumstances which may occur in specific instances":[8]

> The UCA does not define public convenience and necessity. However, the Commission Panel has been referred to several court cases which discuss the phrase. In the case of *Memorial Gardens v. Colwood Cemetary (sub nom Colwood Cemetary v. Public Utilities Commission)*, [1958] SCR 353, 13 D.L.R. (2d) 97 (S.C.C.) at D.L.R. 101 Abbott J. states the following:
>
> > As the Court held in the Union Gas case the question whether public convenience and necessity requires a certain action is not one of fact. It is predominantly the formulation of an opinion. Facts must, of course, be established to justify a decision by the Commission but that decision is one which cannot be made without a substantial exercise of administrative discretion. In delegating this administrative discretion to the Commission the Legislature has delegated to that body the responsibility of deciding in the public interest, the need and desirability of additional cemetery facilities,

[8] Online: https://www.ordersdecisions.bcuc.com/bcuc/decisions/en/111684/1/document.do.

> and in reaching that decision the degree of need and of desirability is left to the discretion of the Commission.
>
> The passage was considered at paragraph 48 of the *BC Hydro Court of Appeal* case in reference to the certification process under the UCA.
>
> In the *Memorial Gardens* case, the Court also commented that it would be both impracticable and undesirable to attempt a precise definition of general application of what constitutes public convenience and necessity and that a meaning in a given case should be ascertained by reference to the context and to the objects and purposes of the statute in which it is found. (*Memorial Gardens* at pp. 100, 101) Accordingly, the test of what constitutes public convenience and necessity is a flexible test. As stated at page 2 of the Final Argument of CBT in referring to Interstate Commerce Commission v. Parker, 326 U.S. 60(1945), at p. 65 the Commission may 'draw its conclusion from the infinite variety of circumstances which may occur in specific instances'. [Emphasis added.]

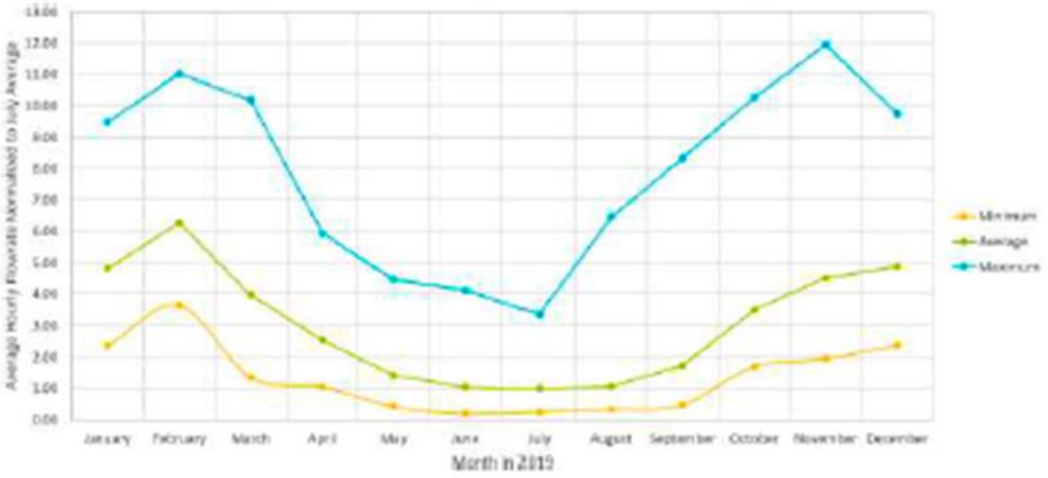
The concepts of reliability and resiliency are foundational matters that may be considered by the BCUC. This is supported by the Supreme Court of Canada's decision in *Atco Gas and Pipelines v. Alberta (Utilities Commission)*, 2006 SCC 4, which identified (at para. 7) that the core jurisdiction of the regulator included "protecting the integrity and dependability of the supply system."[9] The BCUC has in recent decisions exercised its discretion to consider reliability and resiliency matters. For example, in the BCUC's Decision on the FEI's Application for a CPCN for the Patullo Gas Line Replacement Project, the BCUC specifically directed FEI to "address resiliency in a more comprehensive and holistic manner".[10]

Just as the reliability and resiliency of service of a single public utility may be relevant to a particular decision, so may the overall reliability and resiliency of energy delivery. In the present Application, the overall reliability and resiliency of the provision of energy by public utilities in the province is a proper and relevant consideration affecting the proposed rates for Renewable Gas service. As discussed in Section 4 of the Application, maintaining a diversified pathway to decarbonization that includes the gas system will be critical to achieving GHG emission targets and will provide significant energy resiliency, amongst other benefits. Therefore, by virtue of the legislative imperative to consider all matters that are proper and relevant to the rate, where overall energy reliability and resiliency are proper and relevant to setting rates, as they are in the present case, then the BCUC must consider these factors.

[9] Online: https://www.canlii.org/en/ca/scc/doc/2006/2006scc4/2006scc4.html.

[10] BCUC Decision and Order C-2-21, June 30, 2021, at p. 9. Online: https://docs.bcuc.com/Documents/Orders/2021/DOC_63276_C-2-21-FEI-Pattullo-Gas-Line-Replacement-CPCN-Decision-Final-Order.pdf.

15. Reference: Exhibit B-11, page 46 and 47

> **4.3.1 Effectively and Efficiently Serves Peak Demand**
>
> One of the gas delivery system's unique characteristics and primary strengths is its ability to meet extreme peaks in demand, primarily driven by the heating needs of its customers during the winter months. Seasonal changes in heat demand (referred to as "peak load" or "peak demand") can be up to 400 to 500 percent greater than the utility's average demand. FEI's system can store, ramp up, and deliver high volumes of energy on short notice and can handle large changes in volumes over time without operational, reliability, or financial strain. In particular, the gas delivery system is designed to deliver significant volumes of energy in order to meet demand on very cold days.[57] This is demonstrated by the following graphic that shows the variance between summer low delivery volumes and winter high delivery volumes on the FEI gas system.
>
> **Figure 4-2: 2019 Delivery Volumes on FEI's Gas System**
>
> 
>
>
> Electricity systems are designed to deliver for peaks as well but the differences between low volume deliveries and peak deliveries are much smaller than the gas system. The following chart shows gas and electricity deliveries over a 24 hour period on summer day, a winter day, the coldest day in 2019 and the coldest day in 2020. As the graph demonstrates, the gas system is able to deliver nearly six times the capacity on the coldest day compared to an average summer day. In addition the gas system delivers twice the capacity of the electricity system on the coldest day.

15.1 Please comment on whether the specific capabilities of natural gas (such as peaking capabilities) are of particular value to any particular customer groups for their end-uses, or other reasons, and please explain how this manifests in terms of customer choices now.

Response:

One of the gas delivery system's unique characteristics and primary strengths is its ability to meet extreme peaks in demand, primarily driven by the heating needs of its customers during the winter months. FEI's system can store, ramp up, and deliver high volumes of energy on short notice and can handle large changes in volumes over time without operational, reliability, or financial strain.

In particular, the gas delivery system is designed to deliver significant volumes of energy in order to meet demand on very cold days. While electricity systems are designed to deliver for peaks as well, the differences between low volume deliveries and peak deliveries are much smaller than the gas system. The gas system is able to deliver nearly six times the capacity on the coldest day compared to an average summer day. In addition, the gas system delivers twice the capacity of the electricity system on the coldest day. FEI's gas delivery system:

- Has been designed to effectively and efficiently meet peak demand – serving customers when they need it most;
- Maintains energy redundancy in conjunction with other low carbon energy solutions; and
- Keeps energy costs affordable for customers by leveraging existing system benefits in the face of a period of increased investment due to the energy transition.

The peaking capability of the gas system, the limited outages, and the ability to deliver energy reliably are key features of the gas system that are of great value to residential, commercial and industrial customers alike.

In addition, residential customers surveyed in the 2020 Energy Preferences Study showed a preference for an energy source that:

- Costs less to heat a home in the colder months;
- Produces heat that increases the comfort of a home; and
- Provides a home with a reliable supply of energy with limited disruption through the year.

Commercial customers showed a similar preference for these capabilities. Commercial customers that serve particularly vulnerable sectors of the population (e.g., hospitals and care facilities) value the reliability of gas service throughout the year, but in particular during times of peak use.

As mentioned in the response to CEC IR1 26.2, FEI's industrial customer group represents a wide range of industries and end uses including pulp and paper, forest products, mining, refineries, chemical, cement, various manufacturing industries, greenhouses, agriculture, and food and beverage processors. These customers use natural gas equipment that differs from residential and some commercial customers, since they use natural gas as the primary means of generating heat for manufacturing processes, including product drying, process heating, and industrial processes, in addition to space heating. For many of these processes there is a requirement for thermal heat produced from combustion that electrical equipment is not able to meet. Natural gas is often the best alternative for this customer group as it has the lowest emissions of the fossil fuels, is reliable and is low cost.

The industrial sector is generally focused on managing their costs and the competiveness of their business, potentially both locally and internationally. Decisions related to energy are based on a variety of factors such as safety, reliability, resiliency, profitability, diversity, and their corporate sustainability and ESG plans as a tool to help them meet their corporate sustainability goals.

Managing operating costs will be a key driver of this customer segment. Alignment of policy to enable cost effective Renewable Gas would benefit this customer group.

Lastly, NGV customers benefit from natural gas as a lower cost and as a lower carbon alternative fuel where their only viable alternative is moving back to diesel.

15.2 Please identify the customer groups and/or end-uses which benefit from natural gas versus other energy sources.

Response:

FEI believes that all customers benefit from natural gas versus other energy sources. Natural gas provides a safe, reliable, and low cost energy solution for all customers.

Please also refer to the response to CEC IR1 15.1.

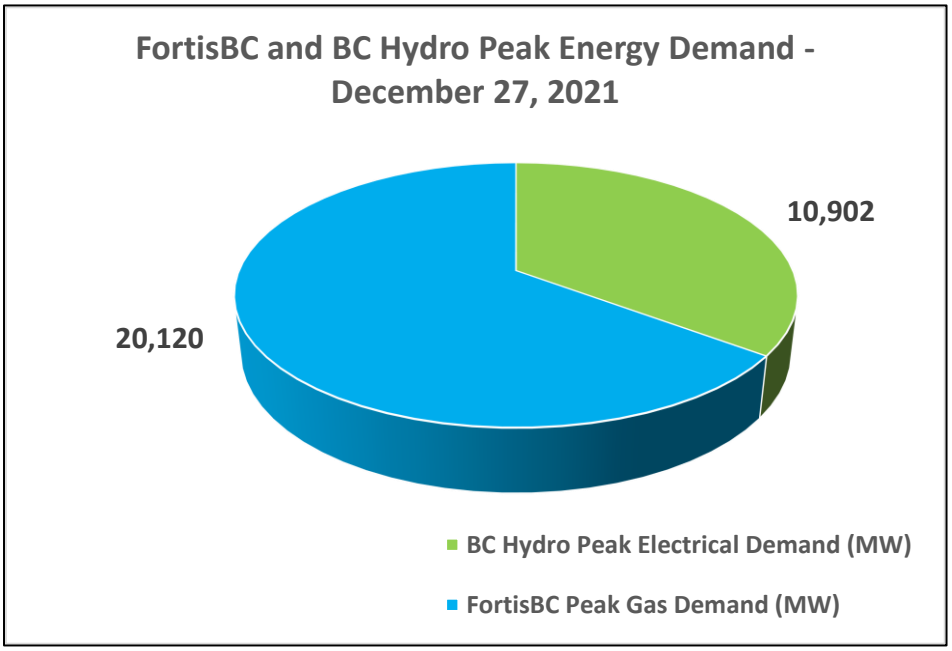
15.3 Please comment on the potential that other technologies may be cost effective at some level of use but would not be effective for handling peak requirements, and where those crossover points might be.

Response:

December 27, 2021 was a very cold day on the gas and electric systems in both BC and Alberta. During that day, BC Hydro reached a peak delivery of electricity.[11] FEI also saw very high throughput. However, as shown in the figure below, the delivery of energy through the gas system was nearly double that of the electricity system.

[11] See BC Hydro news release: Provincial electricity demand breaks records (bchydro.com).

Figure 1: FEI and BC Hydro Peak Energy Demand December 27, 2021



Increasing heating load on the electric system, all things equal, will result in a greater peak, and will require additional generation and capacity. It is difficult to increase peak supply of electricity without investing in associated electric infrastructure. Further, as discussed in the response to CEC IR1 15.1, the gas system provides more flexibility when responding to peak load periods, as FEI can increase the pressure in the system, add LNG downstream or take other measures to increase capacity.

With respect to how different equipment affects capacity requirements, if heating equipment becomes less efficient as it gets colder, this will result in a greater peak. For example, air source heat pumps become less efficient as outdoor air temperatures decline. This is because air source heat pumps take heat out of the ambient air, which requires the heat pump to work harder to remove a given amount of heat from the air. As such, heat pumps will place pressure on system peak energy use during cold temperatures.

15.4 Please also comment on what would happen if the FEI customer base moves significantly toward using natural gas for peak heat use requirements, and whether or not FEI's AMI project would be able to support costing and pricing for heavy dependence on the natural gas system's peak servicing capabilities.

Response:

FEI assumes customers that use natural gas for heating are already using natural gas for their peak heat use requirements. This impact is outlined in Figure 4-2 above. However, in the case where gas equipment is used as a *secondary* source of heating, the peak would remain, but the non-peak usage would drop. In the longer term, this might require a change to existing pricing or tariffs to allow FEI to continue to recover the costs of operating and maintaining this system.

FEI's proposed AMI project will collect hourly consumption data from all customer groups. This improved granularity will be helpful in both cost of service analysis (COSA) and rate design. AMI's hourly interval data can provide a near-real time communications link between customers and FEI. This will eliminate the current sampling error associated with basing COSA inputs on information estimated without full population data, and provide better insight into customer usage patterns. AMI will also allow FEI to explore more advanced rate designs based on actual utilization information (including consumption during peak demand periods) and better customer segmentation. The effectiveness of such rate designs would depend on FEI's ability to model future anticipated consumption characteristics for various groups of customers, and the ability to send timely price signals to customers.

16. Reference: Exhibit B-11, page 48

> **4.3.3 Keeping Energy Bills Affordable for Customers**
>
> FEI's assets will play a critical role in the transition towards a lower carbon economy. Given the critical role of the gas system in transitioning to a lower-carbon economy, FEI has recognized the need for alternative energy products and services, such as the Renewable Gas Program, which leverage its existing assets while also reducing GHG emissions. Transitioning to a lower-carbon future will nonetheless come with increased costs, and FEI remains mindful of the need to continue servicing its customers while expanding its lower-carbon energy solutions to a broader customer base now and in the future. While FEI's need to invest in load growth opportunities in both the traditional and non-traditional parts of its business, investments in the gas system will benefit ratepayers in the long term.
>
> Maintaining or increasing throughput on the system benefits all customers in mitigating increased energy bills. Typically customers that switch to alternative energy sources are those that can most afford to do so, as we have seen with the adoption of electric vehicles, which then leaves those remaining, who are not in a financial position to switch, bearing the increased costs. Furthermore, FEI's Demand-side Management programs, while having the effect of increasing rates, enable customers to invest in energy efficiency upgrades that in-turn decrease energy bills for consumers as their energy use declines.

16.1 Do certain customer groups or rate classes typically have natural gas use requirements that amount to very significant components of their cost structures, and rely on the cost effectiveness of the natural gas for the competitiveness of their industry in the markets for their products? Please explain.

Response:

Yes, many customer groups, especially Industrial customer groups, can have energy costs that amount to very significant components of their cost structures, and therefore, they rely on the cost effectiveness of natural gas for the competitiveness of their industry in the markets for their products. Any trade-exposed industry can be extremely sensitive to regionalized differences in energy costs compared to their competitors from other jurisdictions. If regionalized costs get too high, businesses may get priced out when compared to their competitors' goods from other jurisdictions which could lead to businesses and jobs shutting down and/or leaving British Columbia.

16.2 Do certain customer groups or rate classes typically have a competitive marketplace in which they are price takers, rely on natural gas for heating and compete against producers from out of province that do not have the same GHG reduction commitments including carbon taxes that can make it problematic for them to compete in their markets? Please explain.

Response:

Please refer to the response to CEC IR1 16.1.

16.3 Do certain customer groups or rate classes operate and compete primarily within the BC economy, without out of province competition such that they are able to use natural gas for heating and pass on the carbon taxes to their customers until such time as they can implement decarbonized solutions from FEI or other sources? Please explain.

Response:

FEI does not have insight into the degree that an organization would choose to absorb or pass on carbon taxes or the future cost of decarbonized solutions onto their customers. Furthermore, FEI does not have knowledge regarding whether businesses compete primarily within the BC economy without out-of-province competition. However, costs and affordability need to remain a key consideration, including the potential for customers to experience regionalized differences in energy costs compared to their competitors from other jurisdictions. Commercial groups whose competition is primarily within BC will likely be providing goods and services to other companies who are exposed to out-of-province competition. If regionalized costs get too high, businesses may get priced out when compared to their competitors' goods from other jurisdictions which could lead to businesses and jobs shutting down and/or leaving British Columbia.

16.4 Do certain customers rely on natural gas for its physical characteristics and differences from other energy sources, and compete against international suppliers without the same GHG reduction targets and carbon taxing regimes such that they cannot easily pass on carbon pricing to their customers? Please explain.

Response:

Yes, FEI is aware of some customer groups that rely on natural gas for its physical characteristics and differences from other energy sources. Many of these customers compete against international suppliers without the same GHG reduction targets and carbon taxing regimes such that they cannot easily pass carbon pricing to their customers. The greenhouse sector for example uses natural gas for both heating and for the CO2 requirements of the crops through low emission end use equipment. Please also refer to the response to CEC IR1 16.1 regarding how customers also rely on the cost-effectiveness of natural gas for the competitiveness of their industry or business in the markets for their products. Once again, if regionalized costs get too high,

1 businesses may get priced out when compared to their competitors' goods from other jurisdictions
2 which could lead to businesses and jobs shutting down and/or leaving British Columbia.

3

17. Reference: Exhibit B-11, page 49

> **4.4 GAS DELIVERY SYSTEM CAN DELIVER RAPID AND LONG-TERM GHG REDUCTIONS**
>
> The gas delivery system is capable of contributing the largest and most rapid GHG emissions reductions across various sectors of the economy, including the building, transportation and industrial sectors. This can be achieved through the continued use the province's gas infrastructure in conjunction with "drop-in" fuels such as RNG and hydrogen, improvements in energy efficiency, along with other key mitigation options like carbon capture and storage. For example, FEI's contributions towards the achievement of the provincial government's 2018 CleanBC Plan, using Renewable Gas delivered through FEI's existing distribution system, will provide 75 percent of the plan's total emissions reductions in the built environment. The emission reductions under the CleanBC Roadmap will be even greater. The magnitude of these reductions support FEI's view that the provincial government expects the gas system will continue to play a central role in its strategy to reduce GHG emissions in this sector.
>
> FEI's response to government policy has appropriately focussed on developing alternative energy products and services that leverage its existing assets while reducing their lifecycle carbon intensity. As this Application demonstrates, the growth of Renewable Gas as part of FEI's energy portfolio is essential to reducing GHG emissions in the province. As a "drop-in" fuel, Renewable Gas does not require significant expansion in energy delivery and end use infrastructure, meaning the displacement of conventional natural gas can be undertaken in an expedient and cost-effective manner as compared to other energy solutions.
>
> Importantly, FEI's existing gas delivery system will continue to be used and useful, allowing FEI to continue to affordably deliver lower-carbon energy to its customers when they need it most.

17.1 Please confirm that there would be significant end-of-life costs, plus potentially GHG emissions, if the existing gas delivery system were to be no longer used and useful, but instead terminated and decommissioned.

Response:

Confirmed. The costs of decommissioning the gas system and/or under-utilizing the gas system would be significant. Analysis conducted by Guidehouse for the Pathways Report[12] outlined that the additional costs of an under-utilized gas system in the electrification scenario could be $27 billion by 2050. This assumes that the system as it is built today will continue to be maintained to service a declining customer base to 2050. Excess costs in such a scenario would add an additional $27 billion that would need to be recovered from a smaller customer base. This only accounts for the costs of managing a system that is being underutilized. It does not account for decommissioning costs which would likely be significant. It also excludes the significant additional costs to build out the electric system.

[12] https://www.cdn.fortisbc.com/libraries/docs/default-source/about-us-documents/guidehouse-report.pdf?sfvrsn=dbb70958_0.

17.2 Please provide the total FEI load that would need to transition to other sources of energy if natural gas were to become no longer used and useful, and please convert to GWhs of electrification replacement for natural gas of the total amount transitioning from natural gas.

Response:

On an annual basis, FEI currently delivers approximately 220 PJ of energy to its customers. On an equivalent energy basis, 220 PJ is equal to 61 TWh13 of electricity load, which is 47 percent greater than the 43 TWh currently generated annually by BC Hydro.

In practical terms, the end-use efficiency of electrical and gas equipment needs to be considered when comparing across systems. While FEI has not conducted in-depth analyses of the load impacts of a full transition from natural gas as asked in the question, the Pathways Report provides insight on the impacts of a decarbonization strategy on the electricity system where the gas load is fully replaced by electricity.

The hypothetical impact of transitioning the total FEI load to electricity only describes a part of the challenge of electrification. In particular, the Pathways Report estimates that if significant shares of gas heating, industrial heating and road transport were electrified then the provincial electrical load would increase by over 30 TWh (a 69 percent increase from today's load).

17.3 Please provide the total FEI capacity that would need to transition to other sources of energy if natural gas were to be no longer used and useful, and please convert to GW of peak capacity electrification replacement for natural gas of the total amount transitioning from natural gas.

Response:

The electrical system would have to, at a minimum, provide enough capacity for the replacement of the potential peak demand scenario which materializes in winter. As seen in the two examples below, this could range from approximately 18,000 MW to over 20,000 MW of additional electric capacity to replace peak energy demand on a winter day.

On an average winter day, when most homes are using their gas heating system, hourly throughput on FEI's system can approach the equivalent of 10,000 MW of demand. This is equivalent to the load currently served by the existing electrical system on a cold day and would

[13] 1 petajoule (PJ) equals 277.78 gigawatt hours (GWh).

be impossible[14] to meet in addition to serving regular electric loads. However, on the coldest day in 2019, the volume of gas delivered can be 40 percent higher than the average winter day and over three times higher than the energy delivered on an average summer day. On the very cold days, such as January 14, 2020 or December 27, 2021, the peak volume of gas delivered was equivalent to over 18,000 MW and 20,120 MW, respectively. This is significantly larger than BC Hydro's current hydroelectric generating capacity.

The cold snap event on December 27, 2021 illustrates the magnitude of the challenge to transition from natural gas to electrification driven by thermal requirements. FEI delivered the equivalent of over 20,000 MW of electricity generation during the peak hour at 8:00 AM on December 27, 2021, which is nearly double BC Hydro's load of just under 11,000 MW on the same day. BC Hydro nonetheless reached a new peak and neared its maximum system capacity. Please see Figure 1 in response to CEC IR1 15.3 for a figure showing FEI and BC Hydro's energy demand on December 27, 2021.

The Pathways Report estimates that if significant shares of gas heating, industrial heating and road transport were electrified then the provincial electrical peak would increase by approximately 9,000 MW. This electrical peak would require 66 percent more firm, clean peak generating resources than is installed today.

17.4 Please confirm that no longer having the natural gas system being used and useful would likely result in additional construction and new infrastructure to support the electricity delivery system for the transition via electrification of the natural gas load, and would in and of itself result in additional costs and GHG emissions from the construction.

Response:

Confirmed. Please refer to the response to BCUC IR1 23.3 for a discussion of new infrastructure required to electrify natural gas loads.

[14] Impossible to meet today or in foreseeable future without new electrical transmission and distribution infrastructure and clean generation capacity.

18. Reference: Exhibit B-11, page 50

> FEI anticipates that the province can achieve substantial emissions reductions by increasing its efforts to displace higher carbon fuels in the medium and heavy duty vehicle and marine transport sectors. First, by converting medium and heavy duty truck fleets and transit vehicles to liquefied natural gas (LNG) or compressed natural gas (CNG), the utility is helping the province meet its carbon emission reduction goals while helping operators save on fuel costs. Second, BC has had early success in advancing LNG in the domestic marine sector, which represents a foundation to build upon for other marine markets. For example, BC Ferries launched their fifth LNG vessel in 2019 and Seaspan Ferries operates two LNG vessels in BC waters since 2017. Both BC Ferries and Seaspan have plans to add more LNG vessels in 2022.

18.1 Please discuss and explain whether or not electrification of the transport sector is a feasible alternative.

Response:

The future of electrification of the transportation sector is uncertain. As such, electrification is not possible in the short-term, but remains possible in the long-term, once electricity supply becomes more widely available and technology advances further.

In the light duty transportation sector, electrification is currently possible as light duty vehicles and infrastructure are readily available, proven, and expanding. In the medium and heavy-duty vehicle sector, the associated technology remains in its infancy such that commercially available vehicles are limited and vehicle requirements vary by organization. Further, in order to fully electrify the transportation sector, adequate electricity supply is also required. As load increases on the system, electricity may or may not be available and will drive increased costs.

Finally, for fleet owners and commercial applications, FEI understands that organizations have various objectives and business requirements, including differences in transportation requirements (short-haul, long haul, etc.) and one solution may not be feasible for all. As such, FEI believes that a mix of alternative low carbon technologies will be necessary in the transportation market over the long term, including electric, hydrogen, and natural gas-driven solutions.

18.2 Please confirm that LNG and CNG can be neutral as to whether or not the source is natural gas, renewable natural gas, or synthetic natural gas, but would have to treat hydrogen differently.

Response:

Confirmed. Renewable natural gas and synthetic natural gas are both drop-in fuels for CNG and LNG technologies. Hydrogen would need a different vehicle technology – fuel cells – to be a viable transportation technology. Hydrogen fuel cell technology is not commercially available in the medium and heavy duty transportation sectors at this time.

19. Reference: Exhibit B-11, page 50

> The gas delivery system will also lead to significant GHG reductions in industry by delivering renewable gas to industrial customers and harnessing the ability of industry to produce and consume renewable energy on-site. Many industrial energy consumers have significant potential to produce and/or consume synthesis gas, lignin and hydrogen that will displace natural gas consumption. These are important opportunities for BC as they will provide sources of Renewable Gas supply as well as providing economic opportunities for BC industries. There are also important opportunities to continue to invest in industrial energy efficiency improvements and other carbon reducing activities such as carbon capture, utilization and storage.

19.1 Please discuss and explain whether or not electrification of the industrial sector is a feasible alternative and, if so, how this might be done.

Response:

FEI does not believe the electrification of the industrial sector is a feasible alternative.

First, many industrial customers require high heat for industrial processes that must be reliable, low cost and dispatchable (on demand). There are currently very few electric appliances that are capable of providing this heat, in terms of size, BTU output, speed/ramp up, and those that may be available are much more expensive than their gas counterparts.

Second, variable electric costs are much higher than existing gas costs.

Finally, it can be logistically and cost-prohibitive for industrial customers to electricity their facilities. The use of Renewable Gas does not require customers to change their existing equipment and, from a GHG reduction standpoint, Renewable Gas can be purchased in quantities to meet GHG reduction targets while remaining within more acceptable cost parameters.

Please also refer to the response to CEC IR1 26.2.

20. Reference: Exhibit B-11, page 54

> Based on knowledge and discussions with customers some of the broad themes that emerge are:
>
> 1. **Customers Value Multiple Attributes of Gas Service:** Customers want gas service to be affordable, reliable, provide comfort and convenience, and to be efficient and have low emissions. These attributes are present in all customer classes, with the weight of each attribute varying between the circumstances of each customer class.
> 2. **Need to Balance Affordability and Emission Reductions:** Many customers want to reduce emissions, but also want the source of their energy to be affordable.
> 3. **Natural Gas is Preferred More Than Other Energy Sources:** Feedback from customers indicate they would rather have a home with natural gas over other energy forms. This is corroborated in Section 5.2.2.2 below from FEI's Renewable Gas Surveys.
> 4. **Customers Value the Benefits of Natural Gas:** For many years, FEI's customers have indicated that they want natural gas and the benefits it provides them in their home or business. In recent years, customers have increasingly sought to reduce their emissions and energy usage, and are looking to FEI to provide solutions that do not compromise the affordability, comfort, convenience and reliability of conventional natural gas.
> 5. **Customers Are Not Always Aware of Emissions Reduction Policies:** There is often a knowledge gap between FEI and its customers regarding the governmental policies that have been or are being implemented to reduce GHG emissions in BC and what these policies might mean to the energy services they currently receive.

20.1 Please provide the weighting for the multiple attributes of gas service noted in item 1 by each customer class, if there are any significant differences.

Response:

The broad themes outlined in Section 5.2.1 of the Application are based on feedback gathered through one-on-one and/or small group interactions. The attributes were consistent across various customer classes. However, individual customers often had or represented association members who had buildings and/or business that spanned multiple rate classes. During these interactions, customers and stakeholders were not asked to contemplate a specific type of building or business that aligned with FEI's rate schedules (classes) in order to segregate their views and provide weighting. The broad themes are the common views that emerged, but the weighting of importance between rate classes was not quantified.

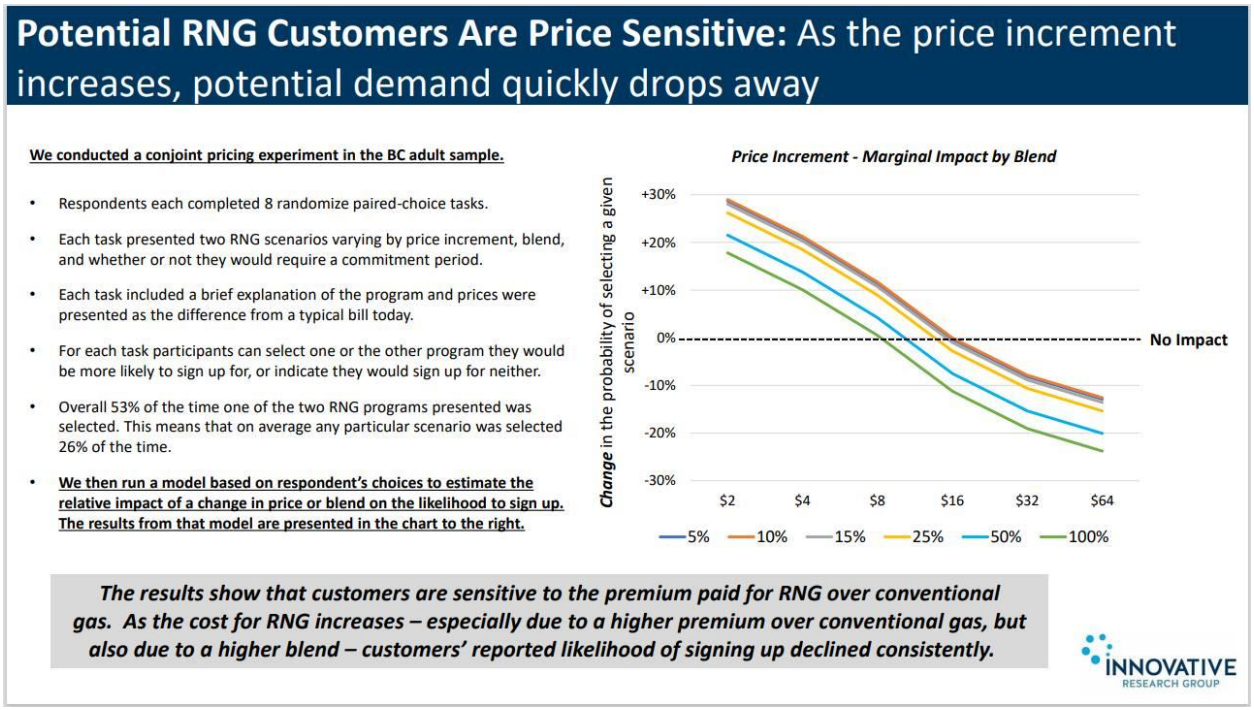
Moreover, FEI does not consider such a weighting would be illustrative as the weighting could vary with the same customer or stakeholder based on the conditions of the particular project. For example, the proponent of a project subject to a mandated emission reduction target will prioritize emission reductions, while the same proponent may prioritize affordability for another project that is not subject to an emission reduction target. Even so, as noted above, customers consistently raised the same or similar themes.

20.2 Please provide the evidence regarding the need to balance affordability with emission reductions, or indicate where it is contained in the application.

Response:

Please refer to Appendix B of the Application. In particular, the June 2021 RNG Program Design Survey which is included in Appendix B-1 (Residential Small Business Survey Results), describes customers' willingness to participate in an emissions reducing RNG scenario relative to cost (see Slide 28). The results show that customers are sensitive to the premium paid for RNG over conventional natural gas, as well as sensitive to the increase in overall costs from higher blends of Renewable Gas.

Figure 1: Customer Participation in Relation to Price



20.2.1 Is the statement that customers need to balance affordability and emission reductions referring to natural gas customers, or all energy customers?

Response:

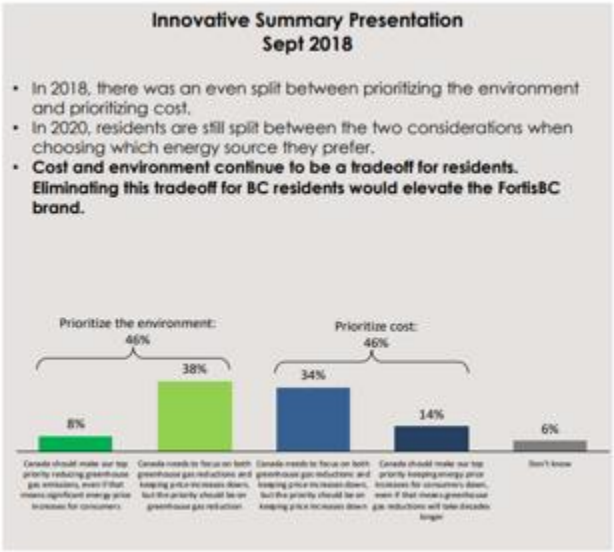
The context of the statement of balancing affordability and emissions reduction is based on feedback received from FEI customers and industry stakeholders on FEI's products and services. The products and services discussed included natural gas and Renewable Gas. This is consistent with previous feedback provided by customers and stakeholders. However, reaching universal agreement regarding the appropriate balance between affordability and emission reductions presents significant challenges. Customer attitudes can be impacted by geography, age, concern

about climate change, and familiarity with heating options. More specifically, in 2020 FEI conducted an Energy Preferences survey asking customers to prioritize attributes of their energy choice. Customers were evenly split with 46 percent prioritizing the environment and 46 percent prioritizing cost – and this was consistent with a similar study that was conducted in 2018 (referenced below).

FEI's ability to provide a comprehensive Renewable Gas Program, as outlined in the Application, helps alleviate the turmoil currently confronting customers of having to choose affordability or emissions reduction while at the same time ensuring customers in all municipalities have equal access to FEI's services and infrastructure.

Table 1: Main Reasons for Choosing Energy Source

Reasons for Choice	Heat Home (n=1,107)	Heat Water (n=1,082)
Affordable, Save Money	37%	34%
Environmental	34%	30%
Efficient	12%	13%
Reliable	12%	11%
Easy, Simple	9%	10%
Used to it	7%	5%



20.2.2 Please confirm that most customers typically have few opportunities to significantly change their energy sources such as by changing out their end-use equipment, and that such opportunities frequently present with significant expense.

Response:

Confirmed. The ability to change energy source or reduce GHG emissions is affected by the ability to absorb the costs of undertaking potentially costly mechanical or building alterations, the availability and cost of equipment, and the impact to the customer or the operations of the business. As such, so long as equipment is working efficiently and effectively there is generally no desire to change out equipment.

Where it is feasible for a customer to change equipment they will generally look at many potential options, including both gas and electric solutions. Replacing gas equipment with gas equipment (i.e., like-for-like) would be relatively simple both with respect to the equipment itself and any configuration that may be necessary in the building or operation. In contrast, changing out gas for electrical equipment can require additional downstream alterations to distribution and controls of thermal space and water heating. Moreover, significant alterations to a building's envelope may require some or all of the building to temporarily halt occupancy or operations. Expenses of this kind can be beyond a customer's capital and operational cost and can be exacerbated by a loss of productivity. Further, while a change in energy source may be technically possible, it may nonetheless present significant expense or loss of other aspects of the value of gas service outlined above.

In particular, FEI's industrial customer group represents a wide range of industries and end-uses, including pulp and paper, forest products, mining, refineries, chemical, cement, various manufacturing industries, greenhouses, agriculture and food and beverage processors. These customers' energy use case is different and it may not be easy or cost-effective to electrify. Gas will often be the best and only alternative for this customer group, as it has the lowest emissions of the fossil fuels, is reliable and low cost. Adding Renewable Gas to the customers' portfolio can further reduce emissions.

20.3 Please describe the benefits cited by those who prefer natural gas in their homes.

Response:

In the feedback provided to FEI, customers have expressed their appreciation for several different attributes of gas service. These include:

- **Energy affordability:** Gas is generally considered to have an operating cost advantage versus other common energy sources for home heating needs.
- **Ambience and convenience:** Gas indoor and outdoor fireplaces, patio heaters and barbecues are considered more attractive and/or convenient than those powered by alternative sources.
- **Powerful, instant heating ability:** Gas fired domestic hot water and space heating appliances can deliver large amounts of heat, rapidly. Gas fired domestic hot water can provide instantaneous, on demand hot water heating. Gas cooktops can similarly change their heat output from a low simmer to a high flame at the turn of a button.
- **Marketability:** When included in a home, the features described above are thought to enhance the marketability of the home on resale.

Furthermore, FEI frequently receives feedback on the ease of bringing natural gas infrastructure to customer locations, affordably, and in a timely manner compared to electricity.

FEI has also seen similar and additional feedback in research studies and in the letters of support provided with the Application. For example, in 2020, FEI conducted an Energy Preference Study in which participants identified the following primary strengths of natural gas:

- Lower cost to heat a home during colder months;
- Increased home comfort;
- Reliability of energy supply with limited disruption; and
- Heating system costs less to maintain and lasts longer.

Further, through Letters of Support, stakeholders have emphasized the importance of energy choice in the marketplace, and that leveraging the existing energy system provides efficiency and resiliency benefits. For example, one Letter of Support describes "RNG as a key ingredient to a clean energy mix and a carbon neutral future in residential living."[15]

The key themes from these Letters of Support are included in Section 10 of the Application (p. 145), as reproduced below:

- Stakeholders are seeking energy choice, including Renewable Gas.
- Stakeholders support providing 100 percent Renewable Gas for new residential service connections.
- Stakeholders support leveraging the existing energy system, reflecting the associated efficiency and resiliency benefits.
- Stakeholders are conscious of affordability of energy alternatives and value the choice of Renewable Gas.
- Stakeholders are seeking access to energy choices that meet their needs and those of their customers.
- Stakeholders value environmental stewardship and sustainability.
- Stakeholders are seeking offerings that enable and encourage innovation.

[15] Wilden Construction Corp Letter of support.

21. Reference: Exhibit B-11, page 64

> Small commercial customers also value ease of use and reliability when selecting an energy source. Gas equipment is easy to use, extremely reliable, can last many years, and be repaired rather than replaced in many cases, making it desirable for small commercial customers. Further, in general, gas transmission and distribution systems experience significantly fewer outages than electric networks. This is a desirable trait of gas systems as the more frequent disruptions of the electric system can have a substantial effect on small businesses. In many cases, buildings can still be heated with gas boilers during a power outage, which would not be possible if heating was provided by electricity. In addition, more customers are installing back-up gas generators to provide added reliability.

21.1 Please provide evidence to support FEI's statement that its gas and distribution system experience significantly fewer outages than electric networks.

Response:

In general, gas transmission and distribution systems experience significantly fewer outages than electric networks. Industry surveys and studies conducted by the US Gas Technology Institute have demonstrated gas customer average reliability/availability levels (due to unplanned causes) of 0.9999978.[16] This is consistent with the service availability levels of the Canadian Gas Association when comparing outage incidents. In contrast, the comparable average availability for most electric customers in BC is approximately 0.99959. In other words, on average the gas system is 186 times more reliable than the electric system.

The vast majority of electric transmission in North America is via overhead power lines, which are more exposed to disruptive events including lightning and fire, wind, ice, trees and third-party contacts. Consequently, electric power lines have considerably higher outage rates than underground gas lines.

Based on industry experience, on average, a typical 80 km overhead electric transmission circuit is expected to experience one unplanned outage event per year.[17] Since circuit outages are an expected occurrence in electric networks, asset redundancy is commonly employed to ensure compliance with minimum standards of reliability. The BC Mandatory Reliability Standards (MRS) require that the bulk electric system be planned and operated to withstand an unexpected outage of the single most critical system element, coincident with the forecast system peak load, while not experiencing any firm customer outages.[18] This is referred to as the N-1 reliability criterion and is based on North American industry standards. These industry standards were developed and mandated following two major Northeast blackouts, one in 1965 and one in 2003. In other

[16] Gas Technology Institute, Topical Report (July 19, 2018) "Assessment of Natural Gas and Electric Distribution Service Reliability," p. 10.

[17] North American Electric Reliability Corporation (NERC). "Outage Metrics, 2019 WECC AC Circuit." Total Circuit Outage Frequency of 1.97 per 100 mi·yr (for 200-299kV circuits). https://www.nerc.com/pa/RAPA/tads/Pages/OutageMetrics.aspx

[18] BCUC Order R-27-18 (June 28, 2018). "British Columbia Hydro and Power Authority Mandatory Reliability Standard TPL-001-4 Assessment Report." P. 8, Attachment D.

words, the cost of this necessary system redundancy is broadly accepted by electric operators and regulators in order to ensure adequate levels of customer service.

In contrast, large-diameter, high-pressure pipelines may operate for long periods without experiencing any unplanned outage events. As such, regional gas transmission systems are typically designed and operated to transport a contracted quantity of gas, as opposed to being explicitly planned to achieve an expected level of reliability. A consequential outcome of interconnected gas networks with numerous supply points interspersed with multiple delivery points, is a reliable network. Thus, in many areas of North America, the redundancy afforded by multiple gas supplies, storage, and transportation paths results in an inherently resilient system.

The rates of reliability would suggest that, on average, a typical natural gas customer would expect 69 seconds of service outage per year,[19] compared to almost four hours per year for a typical electric customer in BC (even with the high standards of redundancy on the electric system).[20] In practice, the vast majority of FEI's customers have never experienced a single natural gas outage, other than for planned reasons such as a meter exchange.

[19] Gas Technology Institute, Topical Report (July 19, 2018), "Assessment of Natural Gas and Electric Distribution Service Reliability." Online: https://www.gti.energy/wp-content/uploads/2018/11/Assessment-of-Natural-Gas-Electric-Distribution-Service-Reliability-TopicalReport-Jul2018.pdf.

[20] "BC Hydro F2020 Annual Reporting of Reliability Indices", p. 3, https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/revenue-requirements/2020-05-04-f05-f06-directive-26-f20120.pdf.

22. Reference: Exhibit B-11, page 65

> ### 5.5 *LARGE COMMERCIAL CUSTOMERS*
>
> Similar to the residential and commercial sectors, FEI's Key Account Managers have thousands of interactions with Large Commercial Customers annually. Through these interactions, FEI has gained valuable insight into how this customer segment is addressing emission reduction.
>
> FEI's large commercial customer segment covers a diverse group of customers with unique drivers when it comes to their desire to purchase Renewable Gas. The segment includes institutional customers such as schools, universities and hospitals, public sector customers such as municipal, provincial and federal government customers, and various commercial establishments encompasses retail, office, hotels, property management and manufacturing, etc.
>
> When it comes to reducing their GHG emissions, these customers have a range of alternatives available to achieve their internally or externally mandated emissions reduction targets. The available alternatives include purchased carbon offsets, investments in energy efficiency, fuel switching to electricity or opting into Renewable Gas service. Moreover, all of these alternatives can be combined in ways to suit their buildings or their budgets. For example, a customer could choose to electrify their domestic hot water heating, while replacing their conventional space heating boiler with a high efficiency model, and subscribing to 100 percent Renewable Gas.
>
> As the size and complexity of the building system increases, so do the possible permutations for achieving reduced GHG emissions using the available alternatives. Large commercial customers are sensitive to the price of Renewable Gas and, if they believe the price is too high to suit the specific context of their building, they will use other alternatives to meet their energy needs and emissions obligations.

22.1 Please confirm that a District Energy System would be considered to be a large commercial customer.

Response:

Confirmed. However, it is also possible that a large enough District Energy System could be considered an industrial customer.

23. Reference: Exhibit B-11, page 66

> **5.5.1 Customers with Mandated Emission Reduction Targets**
>
> Public sector organizations in BC, such as hospitals, universities, schools and other provincial government entities must comply with BC's Carbon Neutral Government requirements. Introduced under the *Climate Change Accountability Act* in 2007, the Carbon Neutral Government Program requires these customers to achieve carbon neutrality via a number of means, including purchasing Renewable Gas. The Carbon Neutral Government Program creates a willingness amongst these customers to participate in the Renewable Gas Program as a means of achieving carbon neutrality; however, given the available alternatives to reduce emissions (e.g., electrification and/or energy efficiency), the economics of Renewable Gas are an important consideration driving this category of customers.
>
> The energy choices of municipalities are driven by emission reduction targets that are largely self-adopted and have a strong motivation to purchase Renewable Gas if it is competitive and feasible when compared to the other alternatives. Climate change policies and GHG emission targets are a recent development at the municipal level and represent a change in these customers' expectations relative to the energy they consume.

23.1 Please identify and provide an approximate comparison of the total cost of energy of the major energy options typically facing large commercial customers with mandated emission reduction targets.

Response:

The energy options for large commercial customers with mandated emission reduction targets have significant variability. The two primary energy options are electricity and Renewable Gas; however, there are other mechanisms large commercial customers can also use to reduce emissions including:

- Conventional natural gas (if switching from a higher carbon fuel);
- On-site electricity generation;
- Purchase of carbon credits;
- Energy efficiency measures; and
- Penalty fees for non-compliance.

The variability is impacted by the degree of uptake of a given option. For example, depending on the needs of the large commercial customer, several of the options could be implemented (as opposed to one single measure) to achieve an emission reduction target. The decision to implement several options to reduce emissions is not necessarily only financial, as technological requirements based on the pre-existing systems may make a single option not feasible. Each commercial customer also has a different outlook on cost of capital versus operating costs.

Finally, the degree that each customer chooses various energies and upgrade equipment is also site-specific. For each building or facility it would be likely that the customer would engage a consultant to perform a distinct analysis and report appropriate measures specific to the needs of the customer and the technical capabilities of the site. Consequently, FEI cannot provide a

comparison of costs since each commercial customer will prioritize capital costs and technical upgrades versus operating costs differently. As far as the cost of energy itself, FEI provides the following comparison.

BC Hydro's Large General Service rate outlines the following costs:

- Basic Charge: $0.2672 per day plus;
- Demand Charge: $12.34 per kW of Billing Demand plus; and
- Energy Charge $0.0606 per kWh.

By comparison, FEI's Rate Schedule 3 customers are charged:

- Basic Charge $4.8026 per day;
- Delivery Charge per GJ $3.653;
- Storage and Transport charge per GJ $1.177;
- Cost of gas per GJ $4.503;
- Carbon Tax $2.31 per GJ; and
- For a total variable charge of $0.0419/kWh.

These rates are available to business and commercial customers. Eligible customers for BC Hydro's Large General Service rate are those with an annual peak demand of at least 150 kW, or that use more than 550,000 kWh of electricity per year; and for FEI eligible commercial customers are those that use more than 2,000 GJ annually.

24. Reference: Exhibit B-11, page 66 and 67

> **5.6 *INDUSTRIAL CUSTOMERS***
>
> FEI's industrial customer group represents a wide range of industries and end uses including pulp and paper, forest products, mining, refineries, chemical, cement, various manufacturing industries, greenhouses, agriculture and food and beverage processors. Natural gas equipment is the primary means of generating heat for manufacturing processes, including product drying, process heating, and industrial processes, in addition to space heating. For many of these process there is a requirement for thermal heat produced from combustion that electrical appliances are not able to meet. Natural gas is often the best alternative for this customer group as it has the lowest emissions of the fossil fuels, is reliable and low cost.
>
> Managing operating costs will be a key driver of this customer segment. As many of these customers compete internationally, and are energy intensive and trade-exposed industries, increased costs for energy can drive them to move to different jurisdictions. In other words, carbon policies that are too stringent or result in increased costs can lead to "carbon leakage" - the movement of a business to a jurisdiction that has less stringent policies. FEI expects that the ability to use Renewable Gas with their existing natural gas equipment to meet their sustainability goals could be an important factor for the industrial sector to manage the overall capital and operating costs.

24.1 Please confirm that industrial customers cannot readily change out their natural gas-driven equipment.

24.1.1 Is this because these customers require the benefits of the natural gas properties, or because of the potential cost of the change-out and retraining for their operations? Please explain.

Response:

Yes, generally speaking, industrial customers cannot readily change out all of their natural gas equipment for a variety of reasons. Please refer to the response to CEC IR1 23.1 for further discussion.

25. Reference: Exhibit B-11, page 67

> **5.7 NATURAL GAS VEHICLE CUSTOMERS**
>
> FEI has observed a considerable shift in the thinking of transportation sector customers in recent years. During the first six years of the Renewable Gas Program's operation, this segment of customers, known as NGV[61] customers, expressed only minor interest in purchasing Renewable Gas. During that period, the Program did not have any subscribers from this customer segment. More recently however, NGV customers have shown increased interest in Renewable Gas.
>
> **5.7.1 Drivers for Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG) and Renewable Gas for NGV Customers**
>
> FEI has observed increased pressure in Canada and globally for the transportation sector to find innovative solutions to reduce its GHG emissions to fight climate change. The transportation industry at large is seeing demand for zero and near-zero emission solutions. While electric vehicles are effective for light duty transportation requirements, there are few credible low carbon alternatives to Renewable Gas today for medium to heavy transportation customers. Moreover, for customers who already use CNG, the switch to Renewable Gas to achieve emission reduction targets is relatively easy as Renewable Gas is a direct substitute for conventional natural gas, requiring no incremental capital investment to the NGVs or infrastructure.

25.1 Does FEI expect to focus on medium and heavy transportation customers when seeking new NGV customers? Please explain.

Response:

FEI will continue to focus on the medium and heavy duty on-road transportation sub-sectors, as well as the marine transportation sub-sector, when considering the acquisition of new NGV customers. Both the on-road and marine transportation sectors are continuing to show interest in adopting natural gas transportation technologies, and both sub-sectors have requested access to Renewable Gas to meet their emission reduction targets while also taking advantage of the financial incentive from sales of the credits generated under the BC-LCFS.

26. Reference: Exhibit B-11, page 69

> For context, for an NGV customer using Renewable Gas instead of diesel, the sale of carbon credits at $400/credit would equate to approximately $25/GJ.[69] While there is no guarantee that these price levels will hold, even at a more modest $180/credit sales price, NGV customers could earn revenue from the sale of credits of approximately $11/GJ consumed.[70] This potential revenue stream has generated increased interest from NGV customers in Renewable Gas[71]. Currently, only in-province Renewable Gas supply is recognized under the BC-LCFS. FEI is working with the province to allow for out-of-province Renewable Gas supply to be recognized and approved under the regulation and therefore allow all Renewable Gas volumes to earn and monetize credits.

> The current BERC was designed as a postage stamp rate applied to all customer segments including NGV customers. However, the nature of the BC-LCFS credits and the benefit NGV customers could derive from the sale of BC-LCFS credits was not well understood. Today, NGV customers can access the BC-LCFS credits, while the building sector customers cannot, suggesting a need to align the offering for NGV customers with existing policy.

26.1 Please elaborate on how FEI might expect to 'align' the offering for NGV customers with existing policy.

Response:

FEI is suggesting that the pricing strategy for Renewable Gas should align with government policy, and in particular, the CleanBC Roadmap. The CleanBC Roadmap contemplates emission reductions from the transportation sector being driven by the BC-LCFS, under which NGV customers are able to monetize credits generated from their use of RNG.

Please also refer to the response to BC Transit IR1 4.a. for a discussion on how the LCFS works for NGV customers.

26.2 Please identify other economic sector customers other than transportation and buildings that may also need to be aligned with policy to enable use of RNG as a viable and cost-effective GHG reduction approach.

Response:

The alignment of policy to ensure Renewable Gas is cost-effective for industrial customers would also ensure it is a viable energy solution for as many customers in this segment as possible.

FEI's industrial customer group represents a wide range of industries and end uses including pulp and paper, forest products, mining, refineries, chemical, cement, various manufacturing

industries, greenhouses, agriculture and food and beverage processors. Natural gas equipment is the primary means of generating heat for manufacturing processes, including product drying, process heating, and industrial processes. For many of these process there is a requirement for thermal heat produced from combustion that electrical equipment is not able to meet. Natural gas is often the best alternative for this customer group as it has the lowest emissions of the fossil fuels, is reliable and low cost.

The industrial sector is generally focused on managing their costs and the competitiveness of their business, both locally and internationally. Decisions related to energy are based on a variety of factors such as safety, reliability, resiliency, profitability, diversity, and their corporate sustainability and ESG plans as a tool to help them meet their corporate sustainability goals.

While the industrial sector has not shown interest in Renewable Gas during the initial ten years of the existing Renewable Gas Program, more recently, inquiries from industrial customers have risen and more industrial customers are adding ESG goals to their corporate objectives. As such, industrial customers are beginning to show interest in Renewable Gas as both a potential Renewable Gas purchaser and/or a Renewable Gas supplier. Managing operating costs will be a key driver of this customer segment.

26.3 Please confirm that FEI will be continuing to develop additional options to reduce GHG emissions which may also need alignment with policy initiatives to support cost-effective GHG emissions reductions.

Response:

Confirmed. As discussed in the response to BCUC IR1 1.1, FEI will need to pursue a number of GHG reduction strategies in order to achieve the proposed targets set out in the CleanBC Roadmap. These initiatives will require alignment with provincial policies.

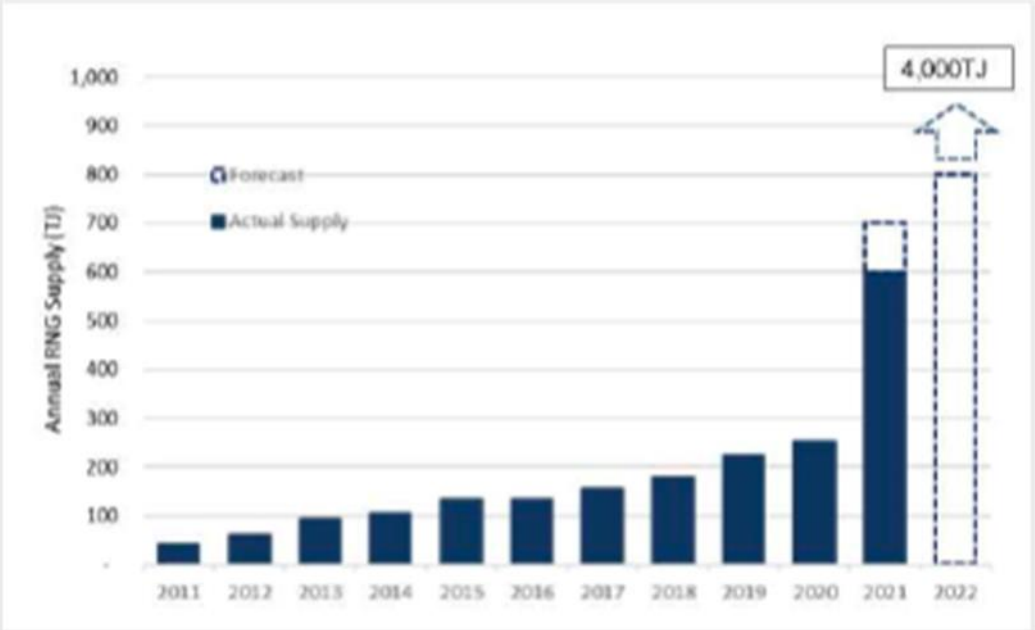
To date, FEI's 30BY30 commitment to reduce our customers' GHG emissions by 30 percent by 2030 has involved advancing cost-effective climate solutions in four key areas requiring alignment with policy initiatives:

- Investing in low carbon transportation infrastructure.
- Supporting the growth of Renewable Gas, including RNG from landfills and farms, and hydrogen and syngas derived from wood biomass.
- Improving energy efficiency and developing innovative energy solutions for homes and businesses.
- Providing LNG to the marine sector to reduce GHG emissions associated with shipping.

27. Reference: Exhibit B-11, page 72 and 73

Figure 6-1: Number of Operating RNG Supply Projects

Figure 6-2: Total RNG Supply History and Short Term Forecast



27.1 The graphic appears to show RNG supply increasing from about 600 TJs per year to 4,000 TJs in 2022, or nearly 7X the existing amount, but a corresponding increase of only 7 RNG supply projects during the same period. Please explain how the forecast increase will be achieved (i.e. larger RNG project for the 7 or will additional suppliers need to be added?).

Response:

The forecast in Figure 6-2 above would be achieved by RNG projects with larger volumes. Please also refer to the responses to the BCUC IR1 5 series.

27.2 Figure 6-2 indicates an increase of 3300 TJ in supply occurring in 2022. Please discuss the likelihood of FEI being able to achieve this result.

Response:

FEI now anticipates that the total volume of Renewable Gas received from suppliers in 2022 will be approximately 2,000 TJ, down from the forecast of 4,000 produced toward the end of 2021. FEI notes that once all of 2022's suppliers begin providing Renewable Gas, the anticipated supply from this cohort of supply projects remains approximately 4,000 TJs over a 12-month period. Supply forecasts remain variable and can be materially affected by over or under performance by the larger supply projects, given the still relatively low volumes of supply in question, or by successfully signing new contracts with existing Renewable Gas producers.

27.3 On Figure 6-2, please depict the volume of RNG sales to customers.

Response:

The chart below represents the historical volume of Renewable Gas supply and Renewable Gas sales to customers as well as the current short-term forecast for 2022. Note that, at this time, not all of the anticipated growth in Renewable Gas supply for 2022 is operational. FEI is expecting several new supply projects to begin providing Renewable Gas later in the year. FEI is managing the growth of demand to maintain the balance between Renewable Gas supply and demand in the meantime. The actual volume of Renewable Gas sold to customers in 2022 may be higher than shown in Figure 1 below if the new supply volumes exceed FEI's current supply expectations described in the response to CEC IR1 27.2 above. Note also that the sale of Renewable Gas to customers will lag somewhat behind the increase in supply volumes as FEI manages demand in order to avoid a shortfall situation. Therefore the Renewable Gas sales volume is anticipated to be somewhat lower that the Renewable Gas supply volume at year end.

Figure 1: Total RNG Supply versus RNG Sales to Customers

28. Reference: Exhibit B-11 page 74

Table 6-1 below provides details on all of FEI's current contracted supply projects and their associated volumes. The table includes projects that are providing RNG in 2021 and projects that are anticipated to begin providing RNG in the near future.[74]

Table 6-1: Contracted RNG Supply Projects

	1	2	3	4	5	6	7	8	9
	Project	Type	Province/State	BCUC Approval Status	Start/Anticipated Start Date (Month-Year)	Contract Max Annual Volume (TJ/Yr)	Proportion of Total Max Contract Volume (%)	Expected Annual Volume (TJ/Yr)	Proportion of Total Expected Volume (%)
Existing	Fraser Valley Biogas	Farm Digester	BC	Approved	Sep-20	91	0.7%	67	0.7%
	Columbia Shuswap Regional Dist.	Landfill	BC	Approved	Jan-13	40	0.3%	19	0.2%
	Kelowna Landfill	Landfill	BC	Approved	Jun-14	110	0.8%	62	0.6%
	Noahdeco Farms	Farm Digester	BC	Approved	Feb-15	120	0.9%	90	0.9%
	City of Surrey	Organics Processing	BC	Approved	Jul-18	180	1.2%	75	0.8%
	Tidal Storm Fisher	Organics Processing	ON	Approved	Aug-20	247	1.7%	180	1.8%
	Lulu Island Waste Water	Waste Water	BC	Approved	Jun-21	330	0.7%	43	0.4%
	Lethbridge Biogas	Farm Digester	AB	Approved	Aug-21	475	3.5%	225	2.3%
	Shell Energy	Waste Water	AB	Approved	Aug-21	690	5.1%	519	5.4%
	Fareence CNG	Farm Digester	ON	Approved	Oct-21	120	0.9%	60	0.6%
	Total Existing (TJ/Yr)					2,151	15.9%	1,514	15.7%
Anticipated	Aitasi Energy	Landfill	PA	Approved	Jan-22	1,600	11.8%	1,200	12.3%
	Dickinson's Farm	Farm Digester	BC	Approved	Jul-22	190	1.4%	100	1.0%
	Walker RNG	Farm Digester	ON	Approved	Jul-22	160	1.2%	120	1.2%
	Total Niagara	Landfill	ON	Approved	Aug-22	690	5.1%	675	6.9%
	Net Zero Waste	Organics Processing	BC	Approved	Oct-22	170	1.3%	130	1.3%
	GrowTDC	Farm Digester	AB	Approved	Oct-22	140	1.0%	80	0.8%
	Evergreen (Offaing) Environmental	Organics Processing	ON	Approved	Oct-22	290	2.1%	200	2.1%
	City of Vancouver	Landfill	BC	Approved	Nov-22	290	2.1%	250	2.6%
	Miller	Farm Digester	BC	Approved	Jul-23	100	0.7%	75	0.8%
	Total GSE	Hydrogen Reduction	ON	Approved	Sep-23	800	5.9%	600	6.1%
	Delta Knds	Landfill	BC	In Progress	Jan-24	1,100	8.1%	700	7.1%
	EPCOR	Waste Water Treatment	AB	Approved	Mar-23	330	2.1%	220	2.3%
	EDERG	Landfill	BC	In Progress	Mar-23	90	0.7%	80	0.8%
	Total Rockford	Landfill	IL	Approved	Jun-25	681	4.7%	486	5.0%
	Enerkem Hamilton	Carbon Energy	ON	Approved	Jul-25	1,500	11.1%	1,125	11.5%
	Capital Region of District	Landfill	BC	Approved	Sep-25	280	2.1%	210	2.4%
	Enerkem Nagawicka	Carbon Energy Recovery	ON	Approved	Oct-25	1,500	11.1%	1,125	11.5%
	RSN Energy	Wood Biomass	BC	Approved	Dec-22	1,200	8.8%	900	9.2%
	Total Anticipated (TJ/Yr)					11,410	84.1%	8,454	86.3%
	Grand Total Volume (TJ/Yr)					13,561	100.0%	9,768	100.0%

Columns 6 and 8 of Table 6-1 above show the contracted maximum volume (column 6) and the expected annual volume (column 8) for each RNG supply project. The expected annual volume is the volume FEI presents in its volume forecasts and takes into account FEI's past experience with the initial output of new RNG supply projects. In particular, new supply projects have not historically operated at the full maximum value at first and may take time to ramp up their production to maximum volumes. As shown in the bottom row of column 8, FEI's total Expected Annual volume is approximately 9,768 TJs per year.

28.1 Please confirm that Table 6-1 shows expected Annual Volume of projects occurring over a period of time, and is not just depicting what will occur through to 2022.

28.1.1 If not confirmed, please relate Table 6-1 to Figure 6-2 and explain the discrepancies in volumes.

Response:

Confirmed. Please also refer to the responses to BCUC IR1 5.1, 5.1.1 and 5.1.1.1.

28.2 Please define the amount required to reach the Province's 2030 targets and show the amount needed to meet the 2030 objective for GHG reduction targets for the natural gas system (would this be in the range of 100 PJ, being about 25 times the 2022 amounts shown in Figure 6-2?).

Response:

Please refer to the response to BCUC IR1 1.1 where FEI discusses how it expects to meet the 2030 emission targets set out in the CleanBC Roadmap.

29. Reference: Exhibit B-11, pages 75 and 76

> ***6.3.1.1 Renewable Natural Gas (RNG)***
>
> RNG (or biomethane) is produced via anaerobic digestion processes that contribute GHG savings through reduced methane emissions, displacement of fossil fuels, reduced fertilizer use and in some cases, direct use of the CO_2 produced. The biomethane is produced as organic material is broken down by bacteria (anaerobic decomposition) and would be generated regardless of any human intervention. RNG provides the benefit of capturing and upgrading this methane, which would otherwise be released into the atmosphere, for use as a renewable fuel that displaces conventional natural gas.
>
> Further, in the absence of a project that captures and uses this methane, it would have otherwise been released into the atmosphere adding to global warming impacts. The global warming potential, or "atmospheric heating equivalency", of methane and carbon dioxide, which is the main greenhouse gas constituent emitted from the combustion of methane, is stated in the 2020 BC Best Practices Methodology For Quantifying Greenhouse Gas Emissions[75] as 25 and 1, respectively. In simple terms, this means that each molecule of methane has 25 times heat trapping potential as one molecule of CO_2. Utilizing RNG for heating and other purposes converts biomethane to carbon dioxide, preventing it from directly entering the atmosphere, thus reducing overall greenhouse gas emissions.

29.1 Please provide further explanations as to how the anaerobic digestion process reduces methane emissions, displaces fossil fuels, reduces fertilizer use and directly uses CO2.

Response:

Anaerobic digestion is the breakdown of organic material by microorganisms in a controlled environment that is isolated from the atmosphere. Alternative methods of disposing of organic waste, such as landfilling or open-pit manure storage, result in less controlled or uncontrolled emissions of methane. Anaerobic digestion facilities efficiently capture methane emissions from decomposition, preventing its release to the atmosphere.

Anaerobic digestion produces biogas and digestate. Biogas is a methane-rich gas that is upgraded into RNG. RNG is a drop-in replacement for conventional natural gas. Digestate is nutrient-rich slurry that remains after digestion is complete. Digestate can be directly land applied as a source of nitrogen, phosphorous, and potassium, thereby replacing synthetic fertilizers.

Biogas has two main gaseous constituents – methane and carbon dioxide. The carbon dioxide component is biogenic, which means it is generated as part of the biological carbon cycle and not derived from fossil fuels. As a by-product of concentrating the methane component of biogas into RNG, the carbon dioxide component is also concentrated. This carbon dioxide can be used directly in greenhouses, further processed into food-grade carbon dioxide, or sequestered.

29.2 Please elaborate further on what it means for a molecule of methane to have heat trapping potential.

Response:

The surface of the earth reflects some of the solar radiation that reaches the planet back as infrared radiation. GHGs are a class of gases that absorb infrared radiation and hold the energy/heat of the infrared radiation in the atmosphere. The accumulation of GHGs, such as methane, in the atmosphere increases the amount of heat that is trapped in the atmosphere.

30. Reference: Exhibit B-11, page 76

> Existing BC Government policy considers RNG (biomethane) captured from organic waste (including agriculture, landfill, or wastewater sources) to be a carbon-neutral fuel source.[75,77,78] In this context, carbon-neutral status means that both combustion and life-cycle emissions do not contribute any net carbon dioxide emissions to the atmosphere. The CO_2 generated from combustion of RNG is considered to be biogenic, or non-additive to atmospheric carbon.
>
> From a lifecycle perspective, the emissions savings from displacing conventional natural gas production with RNG far outweigh biomethane production emissions. The expected greenhouse gas sinks in the biomethane life cycle that reduce greenhouse gas emissions include:
>
> - Methane capture and destruction from landfill gas, manure management, and wastewater treatment. Under baseline conditions, organic material would typically decompose and release methane directly into the atmosphere;
> - Avoided emissions from the combustion of conventional natural gas, and
> - Avoided life cycle emissions from the extracting and processing natural gas.

[75] https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/methodology/2020-pso-methodology.pdf.
[76] https://www2.gov.bc.ca/assets/gov/taxes/sales-taxes/publications/ct-001-natural-gas-biomethane-sellers.pdf.
[77] http://www.energybc.ca/cache/biofuels/www.energyplan.gov.bc.ca/bioenergy/PDF/BioEnergy_Plan_005_0130_web0000.pdf#:~:text=The%20BC%20Bioenergy%20Strategy%20sets%20us%20on%20a,into%20bioenergy.%20Bioenergy%20provides%20new%20opportunities%20for%20agriculture.
[78] https://bcbioenergy.ca/wp-content/uploads/2011/07/Bioenergy-Guide-2010-final-updated-May-2011.pdf
[79] CleanBC, BC Hydrogen Strategy (2021), p. 5. Accessed at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/electricity/bc-hydro-review/bc_hydrogen_strategy_final.pdf.

30.1 Please confirm that the organic waste fuel source is always already in existence prior to being captured for RNG.

Response:

Confirmed. The sources of organic waste that FEI's suppliers are utilizing to create RNG are already in existence prior to being captured for RNG.

30.2 Please discuss whether or not the opportunity to use organic waste as a source for RNG, and for purveyors to potentially profit from it, could result in less drive to minimize organic waste in the first place.

Response:

FEI does not consider that using organic waste could result in less drive to minimize organic waste.

Organic waste, as distinct from inorganic waste (e.g., plastic), will always exist because of human consumption. Facilities that capture and utilize the organic waste create a way for the waste to be utilized as a resource rather than being landfilled. It is unlikely that waste would be deliberately

created in order to be turned into biomethane. It is conceivable that organic material could be grown to be turned into renewable energy. FEI is aware this is the case for biofuels such as ethanol but is not aware of any projects of that nature for biomethane.

30.2.1 How are such risks considered in assessing the value of RNG as a low carbon solution?

Response:

FEI does not see any significant risk associated with organic waste diversion. FEI includes any social impacts when evaluating RNG projects, including any potential negative impact from increased generation of waste solely for the purpose of energy generation. To date, FEI has not seen any evidence of projects where this has occurred.

31. Reference: Exhibit B-11, page 76 and page 77

> ***6.3.1.2 Hydrogen Gas***
>
> Hydrogen is a gaseous chemical element with the symbol "H" and atomic number "1" that is composed of two hydrogen atoms. When burned, hydrogen produces no carbon emissions.
>
> As described in Section 3.6.2, hydrogen presents a significant opportunity to complement RNG in decarbonizing the provincial gas supply. There is strong policy support to develop hydrogen as a low-carbon fuel within the energy mix to meet long-term decarbonization goals. For instance, the BC Hydrogen Strategy states: "Large-scale deployment of renewable and low-carbon hydrogen will play an essential role in reducing B.C.'s emissions."[79]
>
> FEI is involved with multiple national and international joint initiatives that aim to rapidly develop a hydrogen ecosystem capable of producing and distributing hydrogen affordably as part of a lower carbon energy supply. Through its involvement, FEI intends to learn best practices from pioneering hydrogen projects that may be applied in BC. As FEI's understanding of hydrogen production, distribution and end-use applications develops, FEI will pilot projects that will test the use of hydrogen in closed systems. FEI is currently progressing to pre-feasibility planning and technical analyses for introducing hydrogen into the gas distribution network before 2025 and is evaluating large-scale projects for the centralized production and distribution of hydrogen.
>
> Currently, natural gas is the primary resource used globally for hydrogen production and, in conjunction with technologies such as carbon capture, the resulting hydrogen is considered a low-carbon energy source. Further, when using renewable primary energy resources such as clean electricity or biomass, the resulting hydrogen is considered carbon-free. Therefore, hydrogen represents the largest potential source of carbon-free Renewable Gas.

31.1 Please provide the sources that show that global natural gas use with carbon capture and sequestration can be treated as carbon-free if produced using a renewable energy source.

Response:

FEI clarifies that the preamble is in reference to hydrogen production pathways, and not how natural gas with carbon capture, storage and sequestration can be treated as carbon free.

In particular, FEI stated that hydrogen can be “carbon-free” when: (1) clean primary energy resources, including electricity supplied from hydroelectricity, wind or solar, are used to produce hydrogen from water electrolysis; or (2) the gasification of biomass is used to produce hydrogen.

32. Reference: Exhibit B-11, page 77

> ***6.3.1.3 Synthesis Gas***
>
> Synthesis gas (or syngas) is a gaseous fuel produced through the gasification of biomass. Gasification is a thermochemical process that occurs when biomass is heated in an oxygen-starved environment to produce a synthetic gas, which contains carbon monoxide and hydrogen. Any reasonably dry biomass can be converted to synthesis gas.
>
> While synthesis gas is not suitable for direct injection into the natural gas system, it can displace conventional natural gas at a point of use or be used as a feedstock for upgrading via a methanization process step to create RNG (which can then be injected into the existing natural gas system).

32.1 Please elaborate on how synthesis gas can displace conventional natural gas at a point of use.

Response:

Please refer to the response to BCUC IR1 3.2.

32.2 Is there a trade-off for an entity with biomass available between whether or not to produce synthesis gas or RNG? Please explain.

Response:

Yes, there are a number of trade-offs to consider. Synthesis gas (syngas) is produced using generally commercially available technology and less capital intensive production facilities, and is therefore, lower cost to produce compared to RNG for a given biomass feedstock. Syngas can be used to displace conventional natural gas at an industrial gas customer operation but must be produced in proximity to where the displacement occurs, as syngas cannot be injected into and distributed in the gas system. This means the syngas production facility must be sized to match the maximum natural gas consumption that can be displaced. Even if there is more biomass available there would be no use for all of the syngas produced.

Upgrading syngas to RNG (biomethane) involves more technology and complexity and requires additional capital equipment and operating expenditures, and therefore, results in a higher cost gas compared to syngas. However, the production of RNG is technically only constrained by the limit on available biomass feedstock, as biomethane is physically and chemically similar to conventional methane and can be injected in the existing natural gas network. Therefore, significantly more RNG could be produced compared to syngas.

33. Reference: Exhibit B-11, page 77

> ***6.3.1.4 Lignin***
>
> Lignin is a complex, energy-rich organic molecule found in large quantities in biomass (wood). It is the natural glue that holds a tree and other plants together. Lignin is generated as a by-product of the kraft[80] pulping process contained in the liquid black liquor.[81] Lignin can also be precipitated out of black liquor in a refined form. Biomass-based fuels such as lignin can offer a zero-carbon alternative to natural gas using a displacement business model. Lignin is not a gas, and therefore cannot be injected into the gas system. Rather, if an industrial customer is able to use lignin instead of natural gas, it can provide an option to reduce emissions.

33.1 Please explain how an industrial customer can use lignin in place of natural gas through gasification and confirm this is already being done in significant quantities in BC.

Response:

Please refer to the response to BCUC IR1 3.2.

33.2 What changes would an industrial customer need to make in order to use lignin instead of natural gas?

Response:

Most chemical pulp mills already use lignin as a fuel to heat and power various processes.[21] Lignin is produced as a by-product of the chemical pulping process and also a biofuel that, in its unrefined form (black liquor), can be burned, partly as a fuel in recovery boilers and partly to get rid of an unwanted by-product, to recover entrained pulping chemicals. Existing pulp mills that operate recovery boilers would likely incur minimal plant changes to use incremental lignin in the form of black liquor to displace natural gas if there are available resources to produce the incremental lignin.

Instead of burning lignin as black liquor in recovery boilers, it can also be extracted from black liquor and, in its refined form, can be used as a fuel in a number of applications to replace natural gas use at pulp mills and cement plants in direct-fired lumber drying kilns, veneer dryers or as a supplemental fuel in wood-burning processes of the paper industry. Lignin can be further processed and sold to offsite markets as a high-grade solid fuel or as a feedstock for further natural gas replacement. Replacing natural gas in lime kilns with refined lignin is a niche application. Converting the existing gas burner with a solid fuel suspension burner is technically more challenging as the burner would have to be exchanged and the flame might have a different shape, resulting in spatially different temperature gradients inside the kiln. This might affect the

[21] Wells, K. *et al.* 2015. CO_2 Impacts of Commercial Scale Lignin Extraction at Hinton Pulp using the LignoForce Process & Lignin Substitution into Petroleum-based Products.

chemical reaction time, the wear of the refractory, maintenance, and downstream flue gas volumes. The flue gas treatment system, especially the particulate precipitators, would likely have to be changed.

33.3 Is this a new or established technology?

Response:

The generation of lignin is an established technology.

33.4 Does FEI expect there is a substantial amount of lignin opportunity remaining in BC? Please explain.

Response:

Compared to RNG, hydrogen and syngas, FEI expects that lignin will present a relatively smaller opportunity. FEI is currently evaluating a lignin project that would supply approximately 0.5 to 1 PJ per year. FEI expects that there may be a few more of these types of projects that could grow the lignin supply in the future.

33.5 If additional lignin is a significant opportunity for industrial customers to displace natural gas, has FEI considered the potential load impact when planning for its gas supply, and RNG requirements? Please explain.

Response:

Yes, FEI has considered the implications. FEI has targeted its acquisition of renewable and low carbon gas supply to meet BC provincial targets for carbon emission reductions in 2030 and beyond. The majority of FEI's long-term acquisition of Renewable Gas supplies will be made up of RNG and hydrogen, with smaller amounts of syngas and lignin. As FEI begins to integrate hydrogen, syngas or lignin, and in particular, supply that is delivered through industrial natural gas displacement, FEI will annually assess the impact to the Renewable Gas portfolio in each Annual Contracting Plan. Although there is still uncertainty as to what the precise impact will be to each of FEI's service regions, many of these projects will continue to utilize the existing regional gas infrastructure (pipelines and storage) in a significant way.

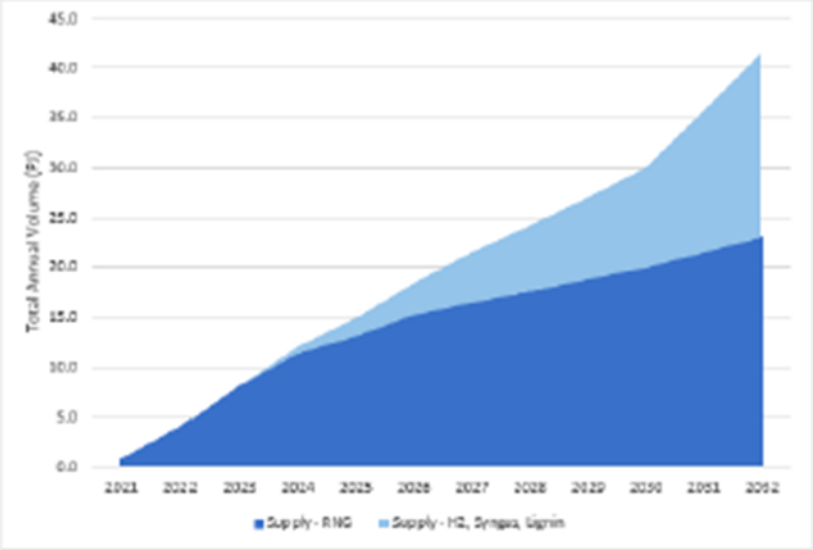
34. Reference: Exhibit B-11, page 77 to 78

6.3.2 FEI's Short and Long-Term Supply Forecast to Meet the Clean BC Plan

Based on a 10-year forecast of Renewable Gas supply, FEI anticipates that by 2032 it will have surpassed the 15 percent (of approximately 30 PJs) target for Renewable Gas set through the CleanBC Plan. FEI developed the 10-year forecast based on actual historical purchases of Renewable Gas, executed supply agreements, prospective supply agreements and an extrapolation of the current acquisition trend out to 2032.

- The forecast until 2026 is based primarily on existing and prospective supply agreements. During this period, FEI also expects to begin pilot and pre-commercial stage projects using alternate forms of Renewable Gas; however, these volumes are expected to be relatively low initially. Commencing in 2025, FEI expects to increase supply from alternate forms of Renewable Gas, such as hydrogen and synthesis gas.
- From 2027 and onwards, the forecast incorporates FEI's expectation of further growth in the use of hydrogen, synthesis gas and lignin.

Figure 6-3: 10-Year Renewable Gas Supply Forecast



Over the 10-year period shown in Figure 6-3, FEI's Renewable Gas portfolio is forecasted to grow from approximately 0.7 PJs in 2021 to 41 PJs in 2032 – the latter being equivalent to 11,389 GWhs of low carbon energy provided to British Columbians.[82] This is more than twice the anticipated energy output from the Site C dam, and enough energy to heat approximately 891,000 homes in BC.[83,84]

34.1 Please break out the supply of H2, Syngas, and Lignin in Figure 6-3.

Response:

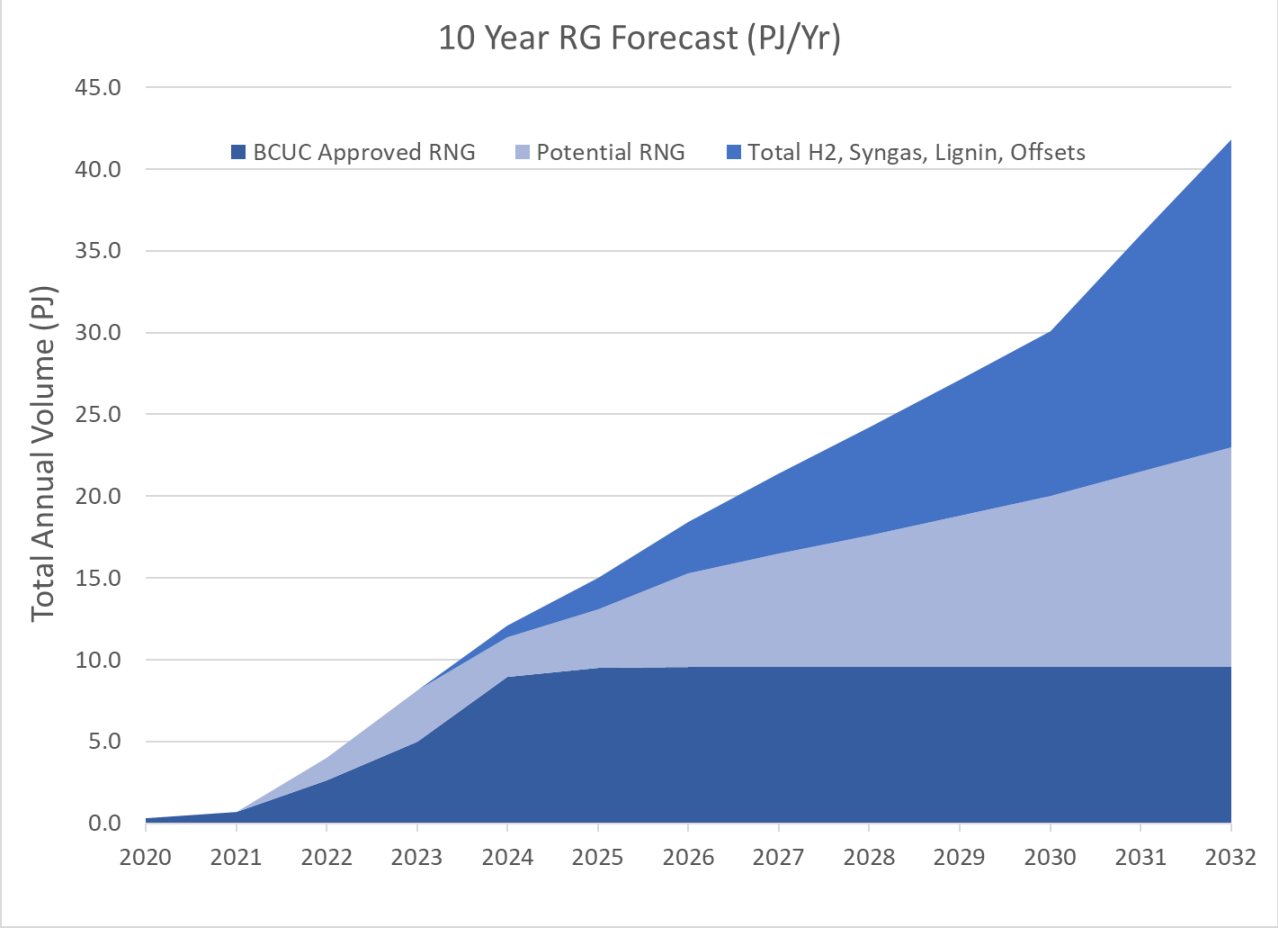
Please refer to the response to BCUC IR1 3.1 for the forecasted breakdown of hydrogen, syngas, and lignin.

34.2 Please break out the supply of RNG for which FEI has already contracted in Figure 6-3.

Response:

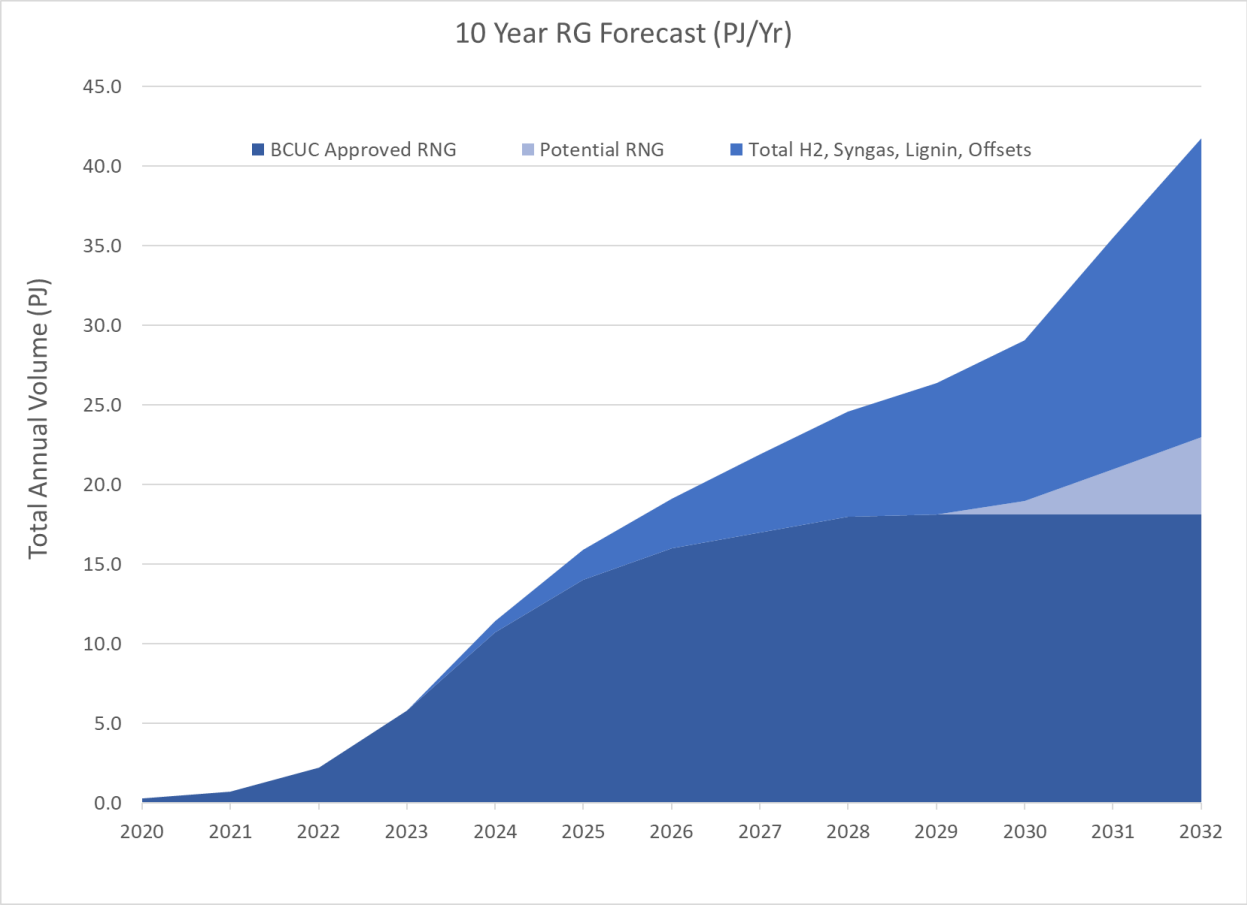
The following graph breaks out the supply of RNG FEI has already contracted as of December 2021 (shown as "BCUC Approved RNG") as well as the RNG forecast and the forecast of other sources of Renewable Gas (hydrogen, syngas, lignin, offsets) provided in Figure 6-3 of the Application.

Requested Figure 6-3: 10-Year Renewable Gas Supply Forecast with Potential RNG Broken Out from Approved RNG



Additional RNG supply agreements were approved since the Application was filed and the following graph has been updated with FEI's current forecast and breaks out the supply of contracted RNG as of April 26, 2022 compared to the updated forecast of what remains to be contracted.

Updated Figure 6-3: 10-Year Renewable Gas Supply Forecast with Potential RNG Broken Out from Approved RNG



34.3 FEI appears to meet the 15% target of 30 PJ in 2030, and then expects to exceed it by about 11 PJ by 2032. Please explain the rationale for planning to exceed the target by so much in two years.

Response:

Please refer to the response to BCUC IR1 1.1 which discusses the provincial targets past 2030 and the need to continue to increase Renewable Gas supply to achieve targets in 2050.

34.3.1 Please confirm what the Provincial cap for GHG reductions is for the natural gas system by 2030.

Response:

Please refer to the response to BCUC IR1 1.1 which discusses the proposed provincial cap for GHG emissions included in the CleanBC Roadmap.

35. Reference: Exhibit B-11, page 79 and page 81

> FEI also relied on available research data to gauge the long-term RNG market supply potential, including various studies that forecast the range of achievable Canadian RNG supply potential.[86,87,88] These studies show that there is approximately 61 to 82 PJs of supply potential per year by 2030. Other studies forecast the current range of achievable RNG supply potential in the United States, indicating approximately 350 to 460 PJs per year of supply that rises to 630 to 857 PJs per year beyond 2030.[89,90,91]
>
> As discussed in Section 6.3.2 above, FEI has forecast an increase in alternative forms of Renewable Gas (i.e., hydrogen, synthesis and lignin). These gases are expected to be produced at an achievable scale of up to 400 PJs per year in BC, entering the supply mix beginning in 2024/2025 and increasing until 2032, reflecting the province's abundant natural resources.[92]
>
> Therefore, as FEI continues to acquire RNG from suppliers in BC and across North America, and starts developing and scaling alternative forms of Renewable Gas, FEI expects there to be sufficient supply available to meet or exceed the CleanBC Plan target of 15 percent Renewable Gas by 2030. Furthermore, FEI is currently working with the provincial government to complete an updated Renewable Gas Potential study that will further increase the future supply available to FEI's Renewable Gas Program.
>
> ### 6.4.2 Early-Mover Advantage Mitigates Competition Risk
>
> A second supply risk is competition from other purchasers of Renewable Gas. 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 history in the Renewable Gas market is attractive to suppliers who are interested in long-term offtake agreements with a high degree of certainty of regulatory approval.
>
> Even so, an increasing number of entities in other jurisdictions, including Énergir in Quebec, are now seeking Renewable Gas supply. Further, the market for RNG is maturing and competition for supply is increasing. Over time, more and more market actors will develop the expertise and proven pathways to purchase RNG and other Renewable Gases. Therefore, to ensure FEI has access to supply at reasonable costs, FEI is working to secure biogas-derived Renewable Gas supply early in this decade rather than waiting for the market to mature further.

35.1 Please elaborate on the locations outside of BC from which FEI expects to acquire RNG.

Response:

FEI is currently considering projects from across Canada and the US. FEI has not considered RNG from other jurisdictions at this point in time.

35.2 The CEC understands that FEI expects to acquire about 20 PJ of the 61 PJ to 80 PJ available by 2030 or about 20% to 33% of the total supply. Please elaborate on whether or not FEI would expect significant increases in the cost of acquiring RNG if demand increases significantly over the next 8 years.

Response:

FEI does not expect to see significant increases in the cost of acquiring RNG for two primary reasons. First, FEI has managed to procure supply from outside of BC at lower average prices and higher average volumes. Second, FEI already has enough supply contracted to reach close to 20 PJ of supply, thereby locking in pricing until beyond 2030.

Over the past few years, FEI has established itself as a known off-taker in the North American market and has developed a reputation in the market as an off-taker with a known process and consistent timelines. This has enabled FEI to command interest from a variety of suppliers and therefore be competitive when negotiating prices with its counterparties. FEI uses an established process to evaluate new projects which also ensures good pricing. FEI ranks new opportunities against each other and pursues the highest value projects first. FEI actively negotiates each of its Renewable Gas supply projects to ensure the best value for customers, taking into account factors such as project volumes, price per GJ, speed to market, annual GHG reduction, and carbon intensity play. This disciplined approach ensures FEI acquires RNG cost effectively.

35.2.1 Please provide quantification for any expected RNG price increases that FEI expects to see as a result of factors other than inflation.

Response:

FEI does not anticipate any significant price increases other than inflation built into the existing RNG supply agreements.

36. Reference: Exhibit B-11, page 81

> **6.4.3 Gas System Readiness Risk Mitigation**
>
> There are technical and regulatory barriers to integrating alternate forms of Renewable Gas, such as hydrogen, into the gas system. These barriers could delay the use of hydrogen, synthesis and lignin to provide FEI's customers with low carbon energy services. FEI is undertaking steps to ensure that the existing gas pipeline system can accommodate other forms of Renewable Gas and, as applicable, that there are alternative methods to deliver these gases to customers. FEI is working internally, with the federal and provincial governments, and other industry participants including other utilities to remove barriers and advance the adoption of hydrogen for the whole of the province. The steps taken by FEI to date are discussed in the sections below.

36.1 Please provide order of magnitude costs for the ensuring gas-system readiness.

Response:

FEI has not yet determined the magnitude of the costs for ensuring the gas-system readiness. In particular, FEI is in the process of developing its hydrogen deployment strategy that will dictate where and how hydrogen is brought onto the system. This strategy will inform the approach to gas system readiness and the timing and execution of supporting projects and activities.

36.2 Please provide approximate cost relationships for the equivalent energy values for delivered methane, hydrogen and lignin when compared to natural gas, i.e. assigning natural gas a value of 1.

Response:

In the table below, FEI sets out the requested approximate cost relationships between energy values for 2022 and 2030.

FEI has made conventional natural gas plus carbon tax the comparator as this is the cost that customers will avoid by taking Renewable Gas service. In 2022, the carbon tax is equal to $2.559[22] per GJ and 2030 carbon tax will equal $8.400[23] per GJ. Finally, FEI has used its current cost of gas at $4.503 per GJ for both years.

Table 1: Cost Ratios of Renewable Gas Energy to Natural Gas plus Carbon Tax

	Natural Gas + Carbon Tax	Biomethane	Hydrogen	Lignin	Synthesis Gas
2022	1.0	2.7	3.7	2.6	2.7
2030	1.0	2.1	1.2	1.8	1.8

[22] Equal to $50 per tonne.
[23] Equal to $170 per tonne.

37. Reference: Exhibit B-11, page 82

> ***6.4.3.1 Gas System Readiness, System Planning and Deployment Strategy***
>
> FEI has over ten years of experience acquiring and injecting RNG into the existing gas system. As volumes of Renewable Gas increase, further system wide feasibility analysis is required to ensure that the gas system can manage these increasing volumes, including in particular:
>
> - Examining system extensions and upgrades required to connect producers of Renewable Gas where these producers are located in regions of BC without gas pipeline infrastructure connecting to the existing gas system.
> - Assessing the blending of hydrogen into the gas supply, including a technical readiness evaluation. FEI is also in the process of testing how hydrogen interacts with pipeline materials, components and other equipment on its system, enabling hydrogen transport as a blend in the gas system, and the feasibility of hydrogen transport via repurposed high-pressure transmission pipelines with a long-term goal of repurposing segments of existing natural gas networks for the delivery of 100 percent hydrogen gas.
> - Analyzing how the gas system can accommodate distributed gas production, at a scale large enough to meet FEI's Renewable Gas objectives, as more geographically diverse supply is brought on the system.
>
> These efforts and analyses will provide insight into how FEI can evolve its operational practices to allow more flexibility within its existing system, allowing for increased Renewable Gas injection into the system.
>
> ***6.4.3.2 Industry Collaboration, Research and Development, Feasibility Work and Sector-Specific Approaches***
>
> The development of hydrogen, wood-to-RNG, synthesis gas, and lignin as low-carbon fuels will require a number of innovative solutions. FEI's understanding of Renewable Gas production, distribution and end-use applications continues to expand. As such, FEI has also begun developing pilot and pre-commercial demonstration projects that will test hydrogen, synthesis gas and lignin production and the use of these newer forms of low-carbon fuels in a closed system. Given the rapid evolution of technology and the scale-up of Renewable Gas production needed to meet GHG emission reduction goals, FEI expects that there will be opportunities to acquire lower cost supply.

37.1 Please confirm that FEI expects to rely on its existing natural gas pipeline system for the delivery of increased RNG and hydrogen, and does not foresee the need for wholesale changes in order to accommodate the delivery of these gases.

Response:

Confirmed. FEI expects to rely on its existing natural gas pipeline system for the delivery of increased RNG and hydrogen. FEI has expanded and developed the existing gas system over the last 65 years to deliver more gaseous energy and incorporated new technologies to maintain and operate the system. FEI expects to continue developing the gas system into the future, which will involve changes to the existing gas system to accommodate increasing concentrations of Renewable Gas.

37.2 Please discuss how hydrogen in the natural gas stream will be dealt with at the LNG and CNG facilities.

Response:

FEI is currently of the view that hydrogen will need to be removed from the gas stream prior to processing at a CNG or LNG facility and diverted to other uses. FEI is studying technology options to minimize any impacts to NGV customers receiving CNG and LNG service. Once the studies are completed, FEI will determine the appropriate measures to implement.

If and when the gas pipelines to which the LNG and CNG facility are interconnected begin to contain significant amounts of hydrogen, FEI will need to incorporate systems to remove hydrogen from the incoming gas stream. This ability would be incorporated into future designs and retrofitted into existing equipment if necessary.

38. Reference: Exhibit B-11, page 87

> **7.2.1 Meet Provincial Targets for GHG Emissions and Balance Renewable Gas Supply and Demand**
>
> Provincial government policy seeks to transition the gas system away from delivering fossil natural gas to delivering Renewable Gas, and to cap emissions from gas used to heat homes and business at 47 percent below 2007 levels.[94] While other options such as energy efficiency will contribute towards this emissions cap, Renewable Gas is required to meet these policy goals. A revised Renewable Gas Program must contain mechanisms to ensure enough Renewable Gas can be delivered to a broad range of customers to support these provincial policy objectives.
>
> Further, as FEI acquires significant volumes of Renewable Gas, enabled through the GGRR, to meet provincial policy objectives, FEI needs to be able balance supply and demand. To align with the CleanBC Roadmap, FEI may need to acquire 45 and 65 PJs of Renewable Gas annually. This volume of Renewable Gas may result in a build up of unsold Renewable Gas volumes unless FEI has a means of ensuring that it can all be sold to customers.
>
> FEI's current Renewable Gas Program needs to be revised to fully utilize the significant increase in Renewable Gas supply needed to respond to current provincial policy that seeks to cap emissions from gas used to heat homes and businesses.

38.1 Please discuss whether or not the availability of RNG can serve to deter customers from implementing DSM measures.

38.1.1 If yes, how does FEI intend to ensure that customers also maximize use of the DSM options available?

38.1.2 If no, please explain why not.

Response:

FEI has not conducted any formal research on how the availability of RNG would impact customer interest in DSM offers. However, FEI has no reason to believe that the availability of RNG would deter customers from implementing DSM measures. In fact, FEI expects that increased availability of RNG could heighten customer interest in DSM offers, as customers will likely be interested in DSM as a means to keep their energy bills low while pairing with RNG to help meet climate action objectives. FEI intends to continue to develop and expand DSM offers in order to support the needs of its customers.

39. Reference: Exhibit B-11, page 88 and page 94

- Building owners, including home owners or non-public sector commercial building owners, often want action to be taken to address GHG emissions and climate change generally, but are sensitive to the price premium for Renewable Gas. FEI's program history shows that they are not inclined to voluntarily participate in the Renewable Gas program. As the carbon tax increases from $2.31/GJ today to over $8/GJ in 2030, these customers will expect their basic energy supply to be lower in carbon both to address climate change and to manage their energy costs.

- **Service at Less than 100 percent Renewable Gas Would Introduce Risk to the Builder or Developer:** As illustrated above, there are multiple factors determining whether or not a new home can comply with local building regulations on GHG emissions. Under these circumstances, any service based on less than 100 percent Renewable Gas would introduce a risk to the builder that the building would not meet the required GHGi standard. This uncertainty and risk would likely be sufficient for builders to not include gas service in their projects. The only way to ensure that a building served by the gas system will meet its emissions reduction obligations pre-construction, during construction, and post construction is for the gas service to be comprised of 100 percent Renewable Gas.

39.1 Can RNG be expected to provide a viable, and cost-effective alternative to low carbon District Energy Systems over the long term? Please explain why or why not.

Response:

Yes. Please refer to the response to CEC IR1 10.3.

39.2 Has FEI discussed the opportunity for Creative Energy to use 100% RNG in its District Energy Systems instead of electricity? Please explain.

Response:

Yes. FEI has discussed Renewable Gas with Creative Energy. These discussions have focused on introducing the Program, the applicable tariffs and potential pricing. However, Renewable Gas does not yet meet all of the City of Vancouver's emission reduction regulations.

40. Reference: Exhibit B-11, page 93

> - **Less than 100 Percent will Not Meet All Requirements:** Satisfying the GHGi standard in several Metro Vancouver municipalities like the City of Vancouver will require that new residential homes emit no more than 3 kg CO_2e/m^2/year. For some building archetypes, Renewable Gas blends of approximately 90 percent are required to meet a 3 kg CO_2e/m^2/year target. Other municipalities have adopted similar standards or are signalling the adoption of similar or more aggressive standards. Notably, the City of Surrey is contemplating a GHGi limit of 1 kg CO_2e/m^2/year by 2025[99]. These requirements can be updated anytime to become more restrictive, or additional municipalities could adopt new and more restrictive GHGi limits, creating uncertainty, for which builders are naturally seeking a solution. This means that Renewable Gas at less than 100 percent fails to provide a universal solution for all new residential construction, and there will be continual uncertainty as to its viability.

40.1 Please describe the building archetypes that would require 90% RNG in order to achieve the 3 kg CO2e/m2/year target.

Response:

Depending upon building design, equipment, occupancy and geography, some residential building archetypes can meet a GHGi of 3 kg CO2e/m2/year with 90 percent RNG. However, building modelling is complex and it is not possible to categorize certain building archetypes as broadly meeting or not meeting a building emissions target.

Further, while 3 kgCO2e/m2/year is a common target, as stated in Section 7.3.3 in the Application, the targets vary between local governments, sometimes change over time, and the plans themselves are changed relatively quickly. Lower GHGis such as 1 kg CO2e/m2/year have also been indicated as a target. As such, the only reasonable and viable solution is to provide 100 percent Renewable Gas because this percentage meets all GHGi regulations.

40.2 Please explain whether or not the 100% RNG will be able to meet the City of Surrey's target of 1 kg CO2e/m2/year and, if not, what Surrey is telling FEI will meet the requirement.

Response:

Yes, Renewable Gas is capable of meeting the target of 1 kg CO2e/m2/year set by the City of Surrey. Please refer to Table A-8 of Appendix A to the Application (page 9-10) in which FEI outlines the RNG requirement to meet 1 kg CO2e/m2/year in different building archetypes at varying levels of the Step Code.

40.3 Please explain the extra costs at the margin of thresholds set by municipalities for alternatives to deal with the last 1 or 2 kg CO2e/m2/year.

Response:

FEI understands this question to be asking about the cost to builders or home owners to move from a GHGi target of 3 kg CO2e/m2/year to either 1 or 2 kg CO2e/m2/year. At a high level, the closer a builder or homeowner moves to zero GHGi, the more difficult and costly the investment. Due to the diminishing returns associated with moving towards lower GHGi, the most significant GHG emission reductions remain from where a conventional natural gas home transitions to meet a 3 kg CO2e/GJ GHGi target. FEI cannot quantify additional costs to achieve the 1 or 2 kg CO2e/GJ target, because the method to achieve the target is variable with home performance capital upgrade costs and low carbon energy costs.

For example, a builder or homeowner can choose to reduce energy requirements via improved home performance such as improvements to walls or windows in combination with switching appliances to low carbon energies such as Renewable Gas or electricity. The costs to achieve low GHGi targets are thus a blend of capital equipment costs and energy costs. There are ultimately multiple paths to improve home performance with varying incremental costs to achieve the GHGi target.

FEI's proposed Renewable Gas Connections service (which delivers 100 percent Renewable Gas for the life of a building, with a carbon intensity near or below zero) allows the utility to meet local government GHGi targets without additional infrastructure costs.

41. Reference: Exhibit B-11, page 96

> - A Voluntary Renewable Gas Program can meet the needs of customers wishing to purchase Renewable Gas. However, a purely voluntary approach would be unlikely to sell the volume of Renewable Gas that FEI needs to acquire to meet provincial targets, as most customers will not be willing to voluntarily subscribe and pay the premium for that volume of Renewable Gas. A purely voluntary program will also not address the challenges faced in new residential construction due to the policies adopted by municipalities, as customers can opt out of a voluntary service. FEI would be increasingly challenged to add new customers in the residential new construction sector.

41.1 Please confirm that bylaws and other measures are note likely appropriate to ensure that residential customers do not opt out of RNG programs if low carbon thresholds are including in municipal or other governmental building approval processes.

Response:

FEI is unclear on the question being asked, but provides the following discussion on the topic.

A patchwork of diverse local government policies, bylaws and other measures across BC directed at reducing emissions in specific sectors or within building types can result in policy conflicts, gaps and confusion in the marketplace. As both local and provincial policy makers are implementing policy and legislation to address emission reductions, there is often overlap and a potential redundancy that does not result in greater emission reductions. Please also refer to the response to CEC IR1 53.1 for additional information on the need to align policies at different levels of government.

FEI has proposed the Renewable Gas Connections service to ensure it is able to service all new residential construction customers and address the concerns from local governments regarding the current program's purely voluntary nature. An approved tariff applied across large groups of customers, as FEI has proposed, with minimal requirements borne by the business or homeowner, is the most efficient method of administering a broad emissions reduction program.

41.2 Please confirm that having RNG as a component part of the natural gas supply to enable customers to avoid carbon taxes in the future is a simpler and more certain way to accomplish the GHG reduction targets of the BC Government.

Response:

Confirmed, with the understanding that "to avoid carbon tax" refers to the crediting back of the carbon tax to a customer. RNG is an effective and, from the customer perspective, simple way to reduce emissions. In particular, as a drop in fuel, RNG does not require a change in equipment, making it easy for customers to reduce emissions.

42. Reference: Exhibit B-11, page 97

> FEI is proposing to begin providing a Renewable Gas Blend whereby all customers who purchase their natural gas from FEI (i.e. sales customers)[100] will receive a percentage of their gas supply as Renewable Gas. Subject to available supply, FEI expects to begin with a one percent blend beginning January 1, 2024. When implemented, FEI will recover the costs of the Renewable Gas from all sales customers through a new Storage and Transport Low Carbon (S&T LC) rider.[101] This rider will be a storage and transport charge reflecting the fact that the cost of Renewable Gas will now be part of the overall costs of the commodity received by sales customers. Please refer to Section 8.4 for further discussion of the S&T LC rider.

42.1 Please provide an estimate of the cost of providing the 1% blend for FEI to use for all sales customers.

Response:

Assuming an average acquisition cost of $22 per GJ for Renewable Gas and 149,000 TJ of demand from FEI's Sales customers, it would cost approximately $33 million[24] to supply all of FEI's Sales customers with one percent Renewable Gas.

42.2 Over what period of time does FEI expect to increase the blend, and to what end points in order to meet the Provincial targets for the natural gas system? Please explain.

Response:

Please refer to the response to BCUC IR1 1.1 for a discussion of the supply required to meet Provincial targets and BCUC IR1 12.3.2, Corrected Figures 8-4, 8-5 and 8-6, for the Blend Percentage for years 2024, 2028 and 2032.

[24] 149,000,000 GJ x 1 percent x $22/GJ.

43. Reference: Exhibit B-11, page 98 and 99

> FEI is also proposing that all New Residential Connections will receive 100 percent Renewable Gas, which will meet municipal regulations limiting GHG emissions from new buildings, the provincial Building Code, and the policy objectives for new homes in the CleanBC Roadmap.[102]
>
> New Residential Connections will be charged an overall rate designed to mimic "regular" gas service rates that all other sales customers pay for under the equivalent rate schedule, including consideration of the S&T LC rider they will already be paying. As the driver of the need for 100 percent Renewable Gas for New Residential Connections is government policy, the cost of the incremental Renewable Gas needed above "regular" gas costs should be recovered from all sales customers. This will also preserve energy choice by providing a service that is economically feasible for these customers.

43.1 Please explain further what FEI means to do by 'mimicking' regular gas service rates.

43.1.1 Why does FEI deem this to be necessary?

Response:

For a discussion of how the rates for New Residential Connections will parallel existing gas services rates, please see Sections 7.4.2 and 7.4.2.1 in the Application. These sections outline that to provide equity between residential dwellings who are mandated to reduce emissions and those who are not, customers served under the Renewable Gas Connections tariff will pay the same effective rate for their gas service as existing customers in similar rate schedules.

An existing residential customer pays the CCRC plus the carbon tax for their natural gas commodity, and the S&T LC rider for the Renewable Gas Blend. A customer served under the Renewable Gas Connections tariff served 100 percent Renewable Gas will pay a rate equal to the CCRC plus the carbon tax, as well as the S&T LC rider for the Renewable Gas Blend portion of the 100 percent Renewable Gas.

In this way, customers requesting a new service for a residential dwelling are charged the same as any other customer in a residential dwelling already connected to the gas system.

FEI deems equity to be necessary so that one subset of the same customer type is not compelled to pay a higher price for gas which must be low carbon to comply with new municipal regulations.

43.2 What would the rates differ by if they were not meant to 'mimic' regular gas service rates?

Response:

Please refer to the response to BCUC IR1 18.1.

43.3 Please confirm that this approach by FEI will make owning a newly-constructed home and an older home equitable and not discriminatory for the customers.

Response:

Confirmed. The proposed Renewable Gas Connections service will enable the new residential construction sector with continued access to FEI's gas system by providing a gas service that aligns with GHG reduction requirements for this sector, including those set by local governments.

By charging effectively the same rate as in the equivalent rate schedule for existing customers, the Renewable Gas Connections service will not impose an undue financial burden on customers attaching to the gas system who live in new residential dwellings. These customers will also share in the cost of maintaining gas system infrastructure for existing users. As such, maintaining access to the gas system for new residential construction customers is central to the long-term viability of the utility, while also utilizing the assets of the utility more efficiently to keep rates more affordable for all customers. In particular, adding new customers helps to better utilize existing utility assets while bringing on additional revenue through the new residential construction market.

Please also refer to the response to BCUC IR1 13.2 for a discussion on the regulatory principles of rolled in ratemaking and just and unjust discrimination in ratemaking that support FEI's proposed approach.

44. Reference: Exhibit B-11, page 100

> **7.4.2 Renewable Gas Connections**
>
> FEI is proposing that all New Residential Connections will receive 100 percent Renewable Gas, where New Residential Connections are all residential dwellings[104] served by a service line installed after the date of implementation of the service, including new construction activity, conversions and retrofits. One hundred percent Renewable Gas will comply with municipal regulation (and proposed changes to the BC Building Code) which impose limitations on GHG emissions for new residential construction. The Renewable Gas Connections service also meets the CleanBC Roadmap objectives for new connections. Building regulations and policy dictate many aspects of the design of new buildings. FEI's Renewable Gas Connections responds to changing building emissions policies and creates a viable solution for builders and homeowners to continue to choose gas as their energy source.
>
> All Renewable Gas Connections will be designated as low carbon and will be served by a tariff that is tied to the building, rather than the customer. In this way, the building remains on a gas service receiving 100 percent Renewable Gas for its life (as opposed to the service tied to the individual customer who may leave the system at any time.)
>
> In order to provide for equity between residential dwellings who are mandated to reduce emissions and those who are not, customers served under the Renewable Gas Connections tariff will pay the same effective rate for their gas service as existing customers in similar rate schedules. For example, an existing residential customer pays for the commodity (via the CCRC) as well as a carbon tax, and a customer served under the Renewable Gas Connections tariff served 100 percent Renewable Gas will pay a rate equal to the CCRC + carbon tax. In this way, customers requesting a new service for a residential dwelling are charged the same as any other customer in a residential dwelling already connected to the gas system. They are not compelled to pay a higher price for gas which must be low carbon in order to comply with new municipal regulations.
>
> As FEI implements the Renewable Gas Blend, New Residential Connections will receive part of their 100 percent Renewable Gas from the Renewable Gas Blend, and a second part from the New Residential Connections service. The cost of Renewable Gas provided through the Renewable Gas Blend will be recovered though the new S&T LC rider. The cost of Renewable Gas provided through the New Residential Connections service will be recovered though a new Low Carbon Gas Charge with the rate charged specific to New Residential Connections. For example, if all sales customers are receiving one percent of their gas as Renewable Gas, customers served under the Renewable Gas Connections tariff will receive 99 percent of their Renewable Gas via the new Low Carbon Gas Charge and one percent via the new S&T LC rider. In this way a customer served under the Renewable Gas Connections tariff does not receive more
>
> [104] FEI serves a range of residential dwellings, including detached homes, semi-detached homes, row houses, duplexes and quadruplexes, townhouses and multifamily condominiums, under RS 1, RS 2 RS 3, or RS 5, depending on the volume of the gas service.

44.1 Will the New Residential Connections customers all receive 100% renewable gas molecules, or will they receive a notional 100% renewable gas? Please explain.

Response:

Please refer to the responses to BCOAPO IR1 10.1 and BCUC IR1 34.2.

44.2 If renewable gas is delivered notionally, why does FEI require the designation of a new service line in order to define a new customer? Please explain.

Response:

All new services require a new service line. A new service line allows FEI to easily designate that the customer is a Renewable Gas Connections customer, and as such will receive Renewable Gas for the life of the building. This also ensures that the building meets the carbon reduction regulations of the municipality. Delivery by displacement provides the mechanism to designate the level of Renewable Gas delivered to the customer.

45. Reference: Exhibit B-11, page 101 and Appendix D, page 330/559 PDF

Table of Charges

	Mainland and Vancouver Island Service Area
Delivery Margin Related Charges	
1. **Basic Charge** per Day	$ TBD
2. Rider 2 per Day	$ TBD
Subtotal of per Day **Delivery Margin** Related Charges	$ TBD
3. Delivery Charge per Gigajoule	$ TBD
4. Rider 3 per Gigajoule	$ TBD
5. Rider 5 per Gigajoule	$ TBD
Subtotal of per Gigajoule **Delivery** Margin Related Charges	$ TBD
Commodity Related Charges	
6. Storage and Transport Charge per Gigajoule	$ TBD
7. Rider 6 per Gigajoule	$ TBD
Subtotal of per Gigajoule **Storage and Transport** Related Charges	$ TBD
8. **Cost of Gas** (Commodity Cost Recovery Charge) per Gigajoule	$ TBD[24]
9. **Cost of** Low Carbon Gas / Low Carbon Gas Charge) per Gigajoule	$ TBD[23]

45.1 FEI's Tables of Charges for the Low Carbon Gas Service are all TBD. When does FEI expect to be able to provide final charges, and will the company seek BCUC approval for the charges? Please explain.

Response:

FEI has requested all approvals in the Application (including FEI's proposed tariff amendments, new proposed rate schedules, and approval to change the name of the current Biomethane Energy Recovery Charge to the Low Carbon Gas Charge) to be effective on the beginning of the first quarter[25] that is at least five months after the BCUC's final Order in this proceeding. This timing will allow FEI to align the implementation of the approved proposals in the Application with FEI's quarterly gas cost filings, and approval of the applicable Low Carbon Gas Charges per GJ by the BCUC.

[25] i.e., January 1, April 1, July 1, or October 1.

45.2 Please provide rough estimates for the charges for each rate schedule to the extent possible.

Response:

Please refer to the response to BCUC IR1 35.1.

45.3 How would FEI address an outcome whereby the proposals would not be considered as 'affordable' and result in extraordinary rate increases that exceed what may be considered as 'rate shock'?

Response:

Please refer to the responses to BCUC IR1 24.1, 41.4.1 and 41.4.2.

46. Reference: Exhibit B-11, page 103

> ***7.4.3.1 Modification 1: Expansion of Program for RS 7 Customers***
>
> FEI does not currently offer Renewable Gas service for customers in Rate Schedule 7, and expansion of Voluntary Renewable Gas offering to Rate Schedule 7 customers is now needed. Rate Schedule 7 provides an interruptible service for large volume customers that have the ability to switch to an alternate energy source. A customer/building type often found in this rate schedule is hospitals. With the growth of Renewable Gas supply and the re-opening of FEI's Renewable Gas Program, FEI has received a number of requests from customers in this rate schedule for Renewable Gas. Therefore, for consistency and fairness, FEI proposes to add Renewable Gas service for Rate Schedule 7 as part of the Voluntary Renewable Gas offering.
>
> As set out in Section 1.2, FEI is requesting permanent approval of new RS 7B effective February 1, 2022, to offer access to the Renewable Gas Program for these customers as other customers do under Rate Schedules 1B, 2B, 3B, 5B, and 11B. FEI's proposed RS 7B is included as Appendix D-1 and aligns with the Renewable Gas Program as currently approved.

46.1 Please provide FEI's original rationale for why did it not include RS 7 in its RNG service when it was implementing the RS for other rate classes.

Response:

FEI did not believe that there would be interest from RS 7 customers in the voluntary program at the time when the original RNG rate schedules were being implemented. Consequently, FEI did not propose an RNG rate schedule for RS 7 customers at that time.

46.2 Please indicate whether or not RS 7 may at some point be appropriately included in the process for implementing RNG-driven GHG emissions for meeting the Provincial GHG reduction targets.

Response:

FEI is not clear what process the question is referring to. However, FEI can confirm that to its knowledge, GHG emission reductions resulting from the consumption of Renewable Gas by RS 7 customers will contribute towards meeting the objective envisioned for gas distribution utilities in the CleanBC Roadmap.

47. Reference: Exhibit B-11, page 104

> ***7.4.3.2 Modification 2: Price of Renewable Gas for Transportation Service and NGV Customers***
>
> FEI proposes that the rate for NGV and T-Service customers be set to recover 100 percent of the average cost of Renewable Gas supply, on a cost per GJ basis. The rationale for this change is discussed below.
>
> There are two reasons for increasing the rate for NGV customers. First, any GHG emission reductions resulting from the sale of Renewable Gas to NGV customers will not contribute to achieving the GHG reduction policy described in the CleanBC Roadmap. The CleanBC Roadmap calls for the gas system to reduce emissions from natural gas used to heat homes and buildings and power industries to 47 percent lower than 2007 levels by 2030. Since Renewable Gas volumes sold to NGV customers cannot contribute to achieve the public policy target, additional Renewable Gas would have to be purchased by FEI ratepayers to meet the GHG emission reduction objectives described in the CleanBC Roadmap. If Renewable Gas is sold to NGV customers at a discount to the cost of acquisition, the effect would be to increase the costs borne by all other ratepayers as more Renewable Gas would need to be purchased to meet the policy objective. By setting the Renewable Gas rate for NGV customers at the average supply cost, gas system ratepayers should be indifferent to the sale of Renewable Gas to NGV customers.
>
> Second, Renewable Gas has a higher value to NGV customers than to other customer types. NGV customers receiving compressed natural gas (CNG) service and liquefied natural gas (LNG) service in British Columbia are eligible for Part 3 fuel supplier status under the BC-LCFS. NGV customers who purchase their own gas supply from a gas marketer are also eligible. Part 3 fuel suppliers that reduce the carbon intensity of their fuel relative to the baseline carbon intensity identified in the *Renewable and Low Carbon Fuel Requirements Regulation* can generate credits which can be sold in the credit market. In effect, the current BC-LCFS provides these customers with a financial incentive to reduce their GHG emissions by purchasing Renewable Gas, as discussed in Section 5.7.2.
>
> The rationale for charging T-Service customers full cost recovery for Renewable Gas is that T-Service customers do not participate in the Renewable Gas services provided to sales customers included in the Renewable Gas Blend. FEI is proposing an elimination of the BVA rider, which collects costs in excess of recoveries from all non-bypass customers, which includes both T-Service and sales customers.

47.1 Please confirm or otherwise explain that the NGV and T-Service customers do not currently pay for the 1% RNG added for all sales customers.

47.1.1 If not confirmed, do NGV and T-service customers currently purchase RNG at a discount to the cost of acquisition if they wish to contribute to GHG reductions, and if so, what is the discount?

Response:

The 1 percent Renewable Gas added for all sales customers does not currently exist as an approved mechanism, but is contemplated under FEI's proposed Renewable Gas Blend service in this Application.

Under the current voluntary RNG Program, NGV and T-Service customers can purchase RNG at the same cost as any other participant in the program. The price paid for RNG purchased through the current program is determined based on the BERC Rate Methodology as discussed in the

2020 BERC Rate Report[26]. The BERC rate as at January 1, 2022 is $13.808 per GJ. FEI estimates that the current discount to the full average cost of RNG acquisition is approximately $9 per GJ. Currently, both NGV and T-Service customers contribute to the recovery of RNG acquisition costs not otherwise recovered from Voluntary Renewable Gas customers through the BERC rate. The unrecovered costs are forecast to be recovered over one year via FEI's Biomethane Variance Account (BVA) rate rider which is a delivery rate rider applicable to all of FEI's non-bypass customers.

Under the proposed Renewable Gas Program, T-Service customers will not receive Renewable Gas and will not pay the S&T LC rider. However, NGV customers receiving service through a sales service rate schedule (except RS 46 – LNG) will receive Renewable Gas through the Renewable Gas Blend service and pay the S&T LC rider.

47.1.2 If these customers do purchase RNG, what would be the expected average bill impact on a % basis from having these customers recover 100% of the average cost of Renewable Gas supply versus what they might be currently paying?

Response:

The 1 percent Renewable Gas added for all sales customers does not currently exist as an approved mechanism, but FEI's Renewable Gas Blend proposal in this Application.

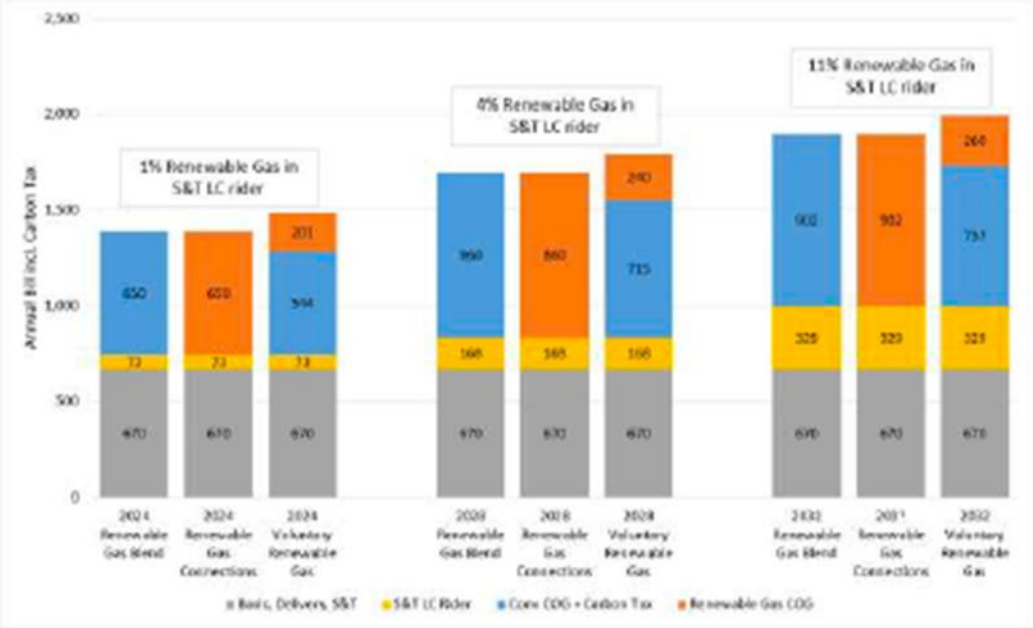
If the proposals in this Application are approved then FEI can confirm that NGV and T-Service customers, if electing to acquire Renewable Gas, will pay the average acquisition cost of Renewable Gas. If an NGV customer is taking service for conventional natural gas under a sales service rate schedule (except RS 46 – LNG) they will receive Renewable Gas through the Renewable Gas Blend and pay the S&T LC rider.

Please refer to the response to BC Transit IR1 11.c for a discussion on the bill impact for NGV customers.

[26] Biomethane Energy Recovery Charge Rate Methodology – Comprehensive Assessment Report, August 12, 2020.

48. Reference: Exhibit B-11, page 105

Figure 8-4: Annual Bill for Rate Schedule 1



7.4.3.3 Modification 3: Discontinuation of Price Discount for Long Term Contracts

FEI is proposing to continue offering long-term contracts for customers who meet the long-term contract eligibility requirements of a commitment to purchase no less than 60 thousand GJs in aggregate over a term of no less than five years and no more than ten years. FEI currently has long-term contracts with UBC, Translink and the CoV.

Long-term contracts still provide benefits to both customers and FEI. For eligible customers, the benefit is in the form of supply security for periods of five to 10 years. For FEI, the benefit is in the ability to foresee with confidence a sizeable portion of demand, and to administer the available Renewable Gas supply accordingly.

However, FEI is proposing to remove the $1/GJ discount for any future long-term contracts. The conditions that made the $1/GJ discount a reasonable approach in 2015 are no longer applicable. With the proposed Renewable Gas Blend, FEI does not run the risk of having unsold volumes of Renewable Gas. Given that the revised Renewable Gas Program will provide mechanisms for all Renewable Gas to be sold, FEI does not consider that a discount is necessary or required to encourage long-term contracts.

48.1 Does FEI believe that the $1/GJ discount was instrumental in securing long-term customers in the past? Please explain and provide examples of how it made a difference.

Response:

The $1/GJ discount has been an “important” factor in securing long-term customers, but may not have been “instrumental”. These long-term customers also valued RNG for its ready availability,

and the ease with which it could be used to reduce their GHG emissions without requiring significant capital upgrades. Cost competitiveness, and the enhancement to competitiveness offered by the discount, was certainly another important factor. FEI has, however, no means of truly weighting the relative importance of each consideration among those customers who entered into long-term services agreements.

49. Reference: Exhibit B-11, page 123 and 124

> For RS 1, FEI used a UPC of 83.1 GJs per year based on the 2021 approved forecast. As can be seen in the figure above, all customers receive some portion of their gas through the S&T LC rider and all pay the same cost for that portion of their Renewable Gas. The voluntary customer's bill is higher than new residential and existing residential because of the elected percentage of Renewable Gas which carries a $7 per GJ premium as discussed in Section 8.4.1. All else equal, a non-voluntary RS 1 residential customer's bill will increase from approximately $1,390 in 2024 to $1,900[115] in 2032 from acquisition of supply, increases in carbon tax, and proposals in this Application.

49.1 Please confirm that the comparison is in real dollars, and isolates the changes in RNG only.

Response:

Confirmed. Please also refer to the response to BCUC IR1 12.2.3 for further discussion.

49.2 Please provide the specific value of the Voluntary customer's increase as a result of the proposal.

Response:

Assuming an RS 1 Voluntary Renewable Gas customer elects 15 percent[27] Renewable Gas, their annual bill will increase from an estimated $1,490 in 2024 to approximately $1,930 in 2032 as a result of the proposals in this Application.

49.3 Please provide an estimate of the total increase that an FEI customer will likely experience between 2024 and 2032, including the bill impacts that will occur from the various CPCNs under review at this time.

Response:

Please refer to the response to BCUC IR1 42.4.

[27] 16 percent is the average of all elections made by RS 1 voluntary customers, so FEI has used 15 percent to respond to this question because voluntary customers can only select RG in 5 percent increments.

50. Reference: Exhibit B-11, page 124

Figure 8-5: Annual Bill for Rate Schedule 2

For RS 2, FEI used a UPC of 332.4 GJs per year based on the 2021 approved forecast. As can be seen in the figure above, all customers receive some portion of their gas through the S&T LC rider and all pay the same cost for that portion of their Renewable Gas. FEI used the average of 24 percent for elected Renewable Gas for the voluntary customer's bill. The voluntary customer's bill is higher than new residential and existing residential because of the elected percentage of Renewable Gas which carries a $7 per GJ premium as discussed in Section 8.4.1. All else equal, a non-voluntary RS 2 small commercial customer's bill will increase from approximately $4,800 in 2024 to $6,800[115][116] in 2032 from acquisition of supply, increases in carbon tax, and proposals in this Application.

[115] The increase equates to 37 percent over 8 years or a 4.0 percent compound annual growth rate.
[116] The increase equates to 42 percent over 8 years or a 4.5 percent compound annual growth rate.

50.1 Is 24% the current average for voluntary renewable gas customers at this time?

50.1.1 If yes, how does FEI expect that to change given the significant increase in cost over the next 10 years?

Response:

At the time that the analysis supporting the Application was being undertaken, the weighted average blend of RNG selected by customers in Rate Schedule 2B was 24.1 percent. The current average has since increased to a weighted average of 29.7 percent.

Under the revised Renewable Gas Program, Voluntary Renewable Gas service will be priced relative to conventional gas service in the same way that it is under the current program. FEI's experience to date suggests that it is the price differential, as opposed to the absolute price, that

determines customer willingness to purchase Renewable Gas voluntarily. In this light, FEI does not expect any erosion in the proportion of Renewable Gas desired by small commercial customers attributable to the price.

50.2 Please provide the specific $ increases for voluntary RS 2 customer bills.

Response:

Assuming an RS 2 Voluntary Renewable Gas customer elects 25 percent[28] Renewable Gas, their annual bill will increase from an estimated $5,367 in 2024 to approximately $7,069 in 2032 as a result of the proposals in this Application.

50.3 Please provide the 2032 breakdown of the bill increase causes between (a) RNG supply acquisition, (b) carbon taxes, and (c) the RNG for sales customers.

Response:

Please refer to the response to BCUC IR1 12.3.2 where FEI provides a corrected Figure 8-5 where the Renewable Gas Blend percentages for years 2024, 2028 and 2032 are 4 percent, 6 percent and 14 percent, respectively.

The following table breaks out the 2032 annual bill for an RS 2 Renewable Gas Blend and RS 2 Voluntary Renewable Gas customer. FEI has assumed that the Voluntary RS 2 customer has elected to receive 25 percent Renewable Gas. As discussed in Section 8.6, to isolate the impact to customers' bills from increasing Renewable Gas supply and changes in carbon tax, FEI has held all other rates at the current approved levels and held customer count, use per customer and total demand equal to those in FEI's Annual Review for 2021 Delivery Rates.

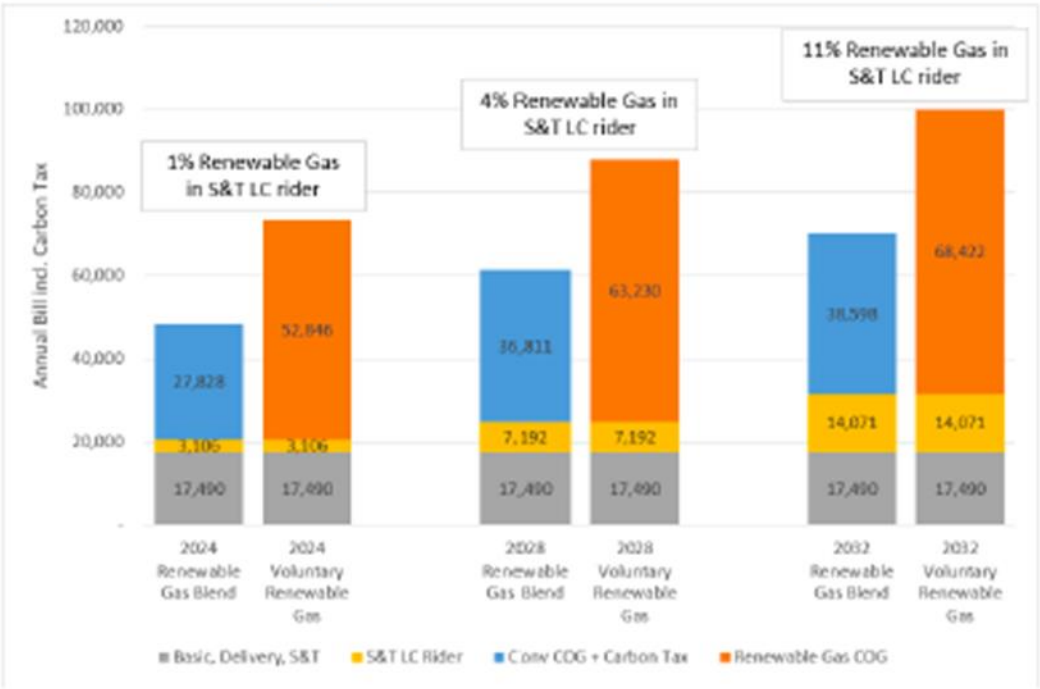
[28] 24 percent is the average of all elections made by RS 2 voluntary customers, so FEI has used 25 percent to respond to this question because voluntary customers can only select Renewable Gas in 5 percent increments.

Table 1: 2032 Rate Schedule 2 Annual Bill Components and Renewable Gas Blends

		RS 2 - Annual Bill Components	
		RG Blend	**RG Voluntary**
Basic Charges	$	346	346
Delivery Charges	$	1,216	1,216
Storage and Transport Charges	$	443	443
Cost of Natural Gas Charges	$	1,071	929
Storage and Transport Low Carbon Rider	$	1,417	1,417
Low Carbon Gas Charges	$	-	707
Total before Taxes	$	4,493	5,059
Carbon Tax on all Volume	$	2,708	2,708
Carbon Tax Credit from Low Carbon Gas Delivered	$	(368)	(677)
Total after Carbon Tax	$	6,833	7,090
Volume of Conventional Gas	GJ	279	242
Volume of Low Carbon Gas through S&T LC Rider	GJ	44	44
Volume of Low Carbon Gas elected	GJ	-	37
Total	GJ	322	322
Percent LCG delivered through S&T LC Rider	%	14%	14%
Percent LCG delivered as Voluntary	%	0%	11%
Total	%	14%	25%

51. Reference: Exhibit B-11, page 125

Figure 8-6: Annual Bill for Rate Schedule 3



> For RS 3, FEI used a UPC of 3,555.5 GJs per year based on the 2021 approved forecast. As can be seen in the figure above, all customers receive some portion of their gas through the S&T LC rider and all pay the same cost for that portion of their Renewable Gas. FEI's experience has shown that voluntary customers in RS 3 elect to take 100 percent of their gas as Renewable Gas; consequently, the voluntary customer's bill is markedly higher than new residential and existing residential because of the high elected percentage of Renewable Gas which carries a $7 per GJ premium. All else equal, a non-voluntary RS 3 large commercial customer's bill will increase from approximately $48,375 in 2024 to $70,110[117] in 2032 from acquisition of supply, increases in carbon tax, and proposals in this Application.

51.1 Please provide the specific data for the increase for voluntary RS 3 large commercial customer bill increases.

Response:

Please refer to the response to BCUC IR1 12.3.2 where FEI provides a corrected Figure 8-6 where the Renewable Gas Blend percentages for years 2024, 2028 and 2032 are 4 percent, 6 percent and 14 percent, respectively.

FEI provides the table below breaking out the 2032 annual bill for an RS 3 Renewable Gas Blend and RS 3 Voluntary Renewable Gas customer. As discussed in Section 8.6, to isolate the impact to customers' bills from increasing Renewable Gas supply and changes in carbon tax, FEI has held all other rates at the current approved levels and held customer count, use per customer and total demand equal to those in FEI's Annual Review for 2021 Delivery Rates.

Table 1: 2032 Rate Schedule 3 Annual Bill Components and Renewable Gas Blends

		RS 3 - Annual Bill Components	
		RG Blend	**RG Voluntary**
Basic Charges	$	1,749	1,749
Delivery Charges	$	11,658	11,658
Storage and Transport Charges	$	4,082	4,082
Cost of Natural Gas Charges	$	11,807	-
Storage and Transport Low Carbon Rider	$	15,628	15,628
Low Carbon Gas Charges	$	-	59,111
Total before Taxes	$	44,925	92,228
Carbon Tax on all Volume	$	29,866	29,866
Carbon Tax Credit from Low Carbon Gas Delivered	$	(4,064)	(29,866)
Total after Carbon Tax	$	70,727	92,228
Volume of Conventional Gas	GJ	3,072	-
Volume of Low Carbon Gas through S&T LC Rider	GJ	484	484
Volume of Low Carbon Gas elected	GJ	-	3,072
Total	GJ	3,556	3,556
Percent LCG delivered through S&T LC Rider	%	14%	14%
Percent LCG delivered as Voluntary	%	0%	86%
Total	%	14%	100%

51.2 Please provide the equivalent Figures and data for the other impacted rate classes.

Response:

Please refer to the response to BCUC IR1 12.3.2 where FEI provides corrected Figures 8-4, 8-5 and 8-6 where the Renewable Gas Blend percentages for years 2024, 2028 and 2032 are 4 percent, 6 percent and 14 percent, respectively.

FEI provides the table below breaking out the 2032 annual bill for the other Renewable Gas Blend impacted rate schedules (i.e., RS 4, RS 5, RS 6 and RS 7). As discussed in Section 8.6, to isolate the impact to customers' bills from increasing Renewable Gas supply and changes in carbon tax, FEI has held all other rates at the current approved levels and held customer count, use per customer and total demand equal to those in FEI's Annual Review for 2021 Delivery Rates.

Table 1: 2032 Other Rate Schedule Annual Bill Components and Renewable Gas Blends

		RG Blend Annual Bill Components			
		RS 4	**RS 5**	**RS 6**	**RS 7**
Basic Charges	$	3,087	5,628	732	10,560
Delivery Charges	$	11,436	36,429	5,546	191,506
Storage and Transport Charges	$	6,179	12,487	723	106,893
Cost of Natural Gas Charges	$	24,724	49,960	5,745	427,689
Storage and Transport Low Carbon Rider	$	32,723	66,124	7,604	566,064
Low Carbon Gas Charges	$	-	-	-	-
Total before Taxes	$	78,149	170,627	20,351	1,302,712
Carbon Tax on all Volume	$	62,538	126,370	14,532	1,081,811
Carbon Tax Credit from Low Carbon Gas Delivered	$	(8,510)	(17,197)	(1,978)	(147,215)
Total after Carbon Tax	$	132,177	279,800	32,905	2,237,307
Volume of Conventional Gas	GJ	6,432	12,997	1,495	111,261
Volume of Low Carbon Gas through S&T LC Rider	GJ	1,013	2,047	235	17,526
Volume of Low Carbon Gas elected	GJ	-	-	-	-
Total	GJ	7,445	15,044	1,730	128,787
Percent LCG delivered through S&T LC Rider	%	14%	14%	14%	14%
Percent LCG delivered as Voluntary	%	0%	0%	0%	0%
Total	%	14%	14%	14%	14%

52. Reference: Exhibit B-11, page 134

9.6 *RENEWABLE GAS PROGRAM REVIEW AFTER FIVE YEARS*

In order to assess the success of the proposed changes to the Renewable Gas Program sougl in this Application, FEI proposes to file a Program review five years from the date of the BCU final decision in this proceeding, given that it will be January 1, 2024 before all of FEI's proposa are fully implemented, and there will need to be adequate time to review and collect informatio on the Program success. The review will provide an assessment of the revised Renewable Ga Program and whether any further changes or adjustments are needed. This review will includ the following components:

- A review of customer feedback on the various components of the Program;
- Annual actual supply versus annual projected supply;
- Annual actual Renewable Gas demand versus annual projected demand;
- Forecast future Renewable Gas supply;
- An assessment of how the Renewable Gas Program has performed against the objective of the Program; and
- Potential recommended changes to the Renewable Gas Program.

52.1 Would FEI be open to providing annual updates commencing in 2024, with a comprehensive review in 5 years' time? Please explain why or why not.

Response:

Please refer to the response to BCUC IR1 44.3.

53. Reference: Exhibit B-11, page Exhibit B-11, page 153

> Some local governments, including the City of Vancouver and MetroVancouver, expressed how their climate policy focusses on setting emissions targets for both new construction and existing buildings at a more granular building by building level when a new building is constructed or existing building is renovated. This approach is in contrast with FEI's system-wide approach, but is aimed at the same decarbonization objective. FEI considered this difference and in response, FEI indicated that under its proposed Renewable Gas Connections, FEI would be able to meet the GHGi targets and the permanency requirement for new construction at the building permit stage. Incorporating these attributes was a key design feature of the proposed service. FEI also explained that providing Renewable Gas to all customers through the Renewable Gas Blend, meets both the needs of customers and governmental climate targets for existing buildings. Moreover, emissions reductions in existing buildings can be achieved without specific requirements at the building level that would entail homeowners or business owners changing out their equipment or completing extensive building upgrades. For local governments, to

53.1 FEI identifies several cities that have indicated support but does not include the City of Vancouver. Does FEI expect that the City of Vancouver will also support the program in the near future? Please explain why or why not.

Response:

FEI believes that the City of Vancouver (City) recognizes Renewable Gas as a fuel that could potential play a role in reducing GHG emissions in the future. However, the City's current focus is on how to electrify faster in order to reduce emissions. As such, FEI and the City currently have differing views on how Renewable Gas can and should be used to reduce emissions.

Three examples of the City's recognition of the role of Renewable Gas in its emission reduction strategies are included below:

- The City's most recent Climate Emergency Annual Report indicates: "We will work with FortisBC to facilitate the use of renewable natural gas as a compliance option the meet the City's carbon pollution limits, and to identify other actions to help FortisBC exceed their 15% renewable gas target for 2030."[29]
- The City's recent public consultation frequently asked questions referred to Renewable Gas as follows: "Renewable Natural Gas (RNG) will likely play a significant role as a renewable fuel source in our buildings, especially for situations where electrifying may be challenging or not cost-effective."[30]
- In a news release regarding the $4.28 million provided by the Province in support of Vancouver landfill RNG project, the City stated: "By working with the Province, we're able to capture more carbon pollution at the Vancouver landfill and use it to power the city's activities and create new low-carbon opportunities in the local economy."[31] FEI added the following: "The Vancouver landfill project is our largest renewable natural gas project to

[29] https://vancouver.ca/files/cov/2021-ceap-annual-report.pdf page 14.
[30] https://shapeyourcity.ca/home-heating-cooling/widgets/111144/faqs#21419 see frequently asked question regarding natural gas versus electricity.
[31] https://news.gov.bc.ca/releases/2021ENV0061-001981.

date and a key part of our 30BY30 plan to reduce customers' greenhouse gas emission by 30% by 2030."

When registering to be an intervener, the City indicated it intended to address the following key issues in the proceeding:

> The City intends to address issues related to the use of Renewable Gas as it impacts the City's and other governments' ability to deliver on their climate commitments, including market impacts; and, issues related to equity and public benefit for Vancouver's residents in structuring the Renewable Gas program.[32]

FEI believes that the City will continue to view Renewable Gas as a possible solution to emission reductions in the future; however, as noted in response to CEC IR1 9.2, there are differences in how it proposes to use Renewable Gas which differ from the proposed uses in this Application (e.g., Renewable Gas Connections and Renewable Gas Blend services).

Based on discussions with the City, there are three policy areas where further alignment between FEI, the City and the Province could be realized.

1. Emission Reduction Policy Redundancy

The City believes climate action policy redundancy is necessary between the provincial government's proposed GHG Reduction Standard (GHGRS) and its buildings policies. It expressed reservations that if climate action were left to gas utilities, there is a high risk that the City's climate targets would not be met. FEI understands from the CleanBC Roadmap that the intent of the GHGRS is for gas utilities to own the obligation to reduce GHGs in the building and industrial sectors. Ultimately, as the GHGRS is likely to have far stricter mechanisms for ensuring emission reductions than what the City is pursuing, climate action policy redundancy is unnecessary and, with the introduction of the GHGRS, certain buildings policies of the City should be revisited for their efficacy.

FEI illustrated to the City that its 2030 buildings target of 0.735 Mt is less than the expected proportionate share of GHG reductions from the GHGRS in 2030:

- The City represents approximately 15 percent of the natural gas delivered by FEI;
- 15 percent of the pending GHGRS obligation to reduce 5.5 Mt of GHGs equals 0.825 Mt where 0.825 Mt represents the City's proportional share of FEI's obligation; and
- Since 0.825 Mt exceeds 0.735 Mt, the City's targets will be exceeded.

By aligning efforts under the umbrella of the GHGRS policy, both the City, the provincial government and FEI will meet the shared emission targets.

[32] Request to intervene-FEI BERC Rate Methodology and Review of Revised RNG Program, February 4, 2022.

2. The Use of Renewable Gas in Residential New Construction and Existing Buildings

The City believes residential new construction is a relatively easy sector to decarbonize and because the City believes that Renewable Gas is in short supply, renewable gas should not be used in new construction. In contrast, FEI believes that new residential construction and existing buildings are both difficult to decarbonize sectors, there is adequate Renewable Gas supply to address both segments of the building sector, and the use of Renewable Gas in new construction benefits the long-term viability of the gas system, FEI's existing customers and British Columbians at large.

The City believes existing buildings are a relatively hard segment of the building sector to decarbonize and what it perceives as a limited amount of Renewable Gas should be prioritized accordingly. Therefore, the City is considering policies that would restrict the use of gas fueled appliances in existing and new buildings. As explained above, FEI believes both new construction and existing buildings are difficult to decarbonize, there will be adequate supply to serve both sectors, and any potential appliance-based barriers should be removed to the facilitate the use of renewable gas.

3. Appropriate Comparators of Renewable Gas

The City uses conventional natural gas as the benchmark for comparing the cost of Renewable Gas, whereas FEI uses both the cost of conventional natural gas and electricity.[33] The City's more restricted comparison framework does not recognize that Renewable Gas is more comparative to electricity than it is to natural gas and is therefore the appropriate clean energy benchmark.

In its comparisons, the City also indicates that, "BC Hydro has a surplus of clean electricity that is expected to last until at least 2029."[34] In contrast, FEI's modelling extends beyond 2029 to 2050 when it expects material deficits in the availability of clean electricity unless significant investments in generation capacity are made.

FEI expects that the approval of the Renewable Gas Connections service and further engagement associated with the provincial government's development of the GHGRS are required to bring alignment between FEI and the City.

53.2 What actions would FEI need to undertake to receive City of Vancouver support?

Response:

Please refer to the response to CEC IR1 53.1.

[33] https://shapeyourcity.ca/home-heating-cooling/widgets/111144/faqs#21419 see frequently asked question regarding natural gas versus electricity.

[34] IBID.

54. Reference: Exhibit B-11, page 155

> **10.4 *FEI RECEIVED SUPPORT FOR THE APPLICATION FROM THE MUSQUEAM INDIAN BAND***
>
> As part of FEI's ongoing discussions with Musqueam Indian Band, FEI shared its plans to file an application that would contemplate revisions to its Renewable Gas program. The Musqueam Indian Band expressed further interest and sought more details of FEI's proposals. They have provided a letter in support of the Application, included in Appendix F-5, with an extract of two paragraphs from the letter provided below:

54.1 Did FEI seek or receive letters or other documentation of support from any other First Nations? Please explain.

Response:

In addition to the Musqueam Indian Band, FEI received letters of support from the following Indigenous Peoples, organizations, and partners:

- Gary (P'asalath) Johnson, (Hereditary Chief, Laich-Kwil-Tach);
- Andion, (partnering with Semiahmoo First Nation); and
- Aboriginal Housing Management Association.

Attachment 9.2

REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)