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October 25, 2023

British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, B.C.
V6Z 2N3

Attention: Patrick Wruck, Commission Secretary

Dear Patrick Wruck:

Re: FortisBC Energy Inc. (FEI)

Application for a Certificate of Public Convenience and Necessity (CPCN) for the Okanagan Capacity Upgrade (OCU) Project (Application) ~ Project No. 1599152

Response to the British Columbia Utilities Commission (BCUC) Panel Information Request (IR) No. 2

On November 16, 2020, FEI filed the Application referenced above. In accordance with British Columbia Utilities Commission Order G-273-23 establishing a further regulatory timetable for the review of the Application, FEI respectfully submits the attached response to BCUC Panel IR No. 2.

For convenience and efficiency, if FEI has provided an internet address for referenced reports instead of attaching the 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:

Sarah Walsh

Attachments

cc (email only): Registered Interveners

2.0 Reference: PEAK DEMAND FORECAST

Exhibit B-36, BCUC Supplementary IR 3.4

Exhibit B-42, BCSEA IR 35.2

Stage 2 Comprehensive Review and Application for a Revised Renewable Gas Program, p. 2; Appendix D-2

20%-Better Energy Efficiency & Zero Carbon Step Code British Columbia Building Code 2018 – Revision 5, p. 1, 3

BC Building Code Requirements and ZCSC

In response to British Columbia Utilities Commission (BCUC) Supplementary Information Request (IR) IR 3.4, FortisBC Energy Inc. (FEI) stated:

> The ZCSC, which was adopted by the Province in May 2023, is a voluntary emissions reduction measure that can be adopted by local governments in conjunction with or as a standalone to the BC Step Code. The ZCSC has four levels, beginning with monitoring at EL-1, and progressing to very low levels of emissions at EL-4. At EL-4 it is not possible to install natural gas space or water heating appliances as the emissions from these appliances using conventional natural gas are too high to meet the threshold. However, at all levels of the ZCSC, ancillary appliances such as cooktops/dryers, outdoor appliances such as barbeques and patio heaters, and fireplaces are permitted as their use does not result in emissions levels exceeding the threshold. Therefore, the ZCSC does not prevent connections, but it will result in lower overall gas consumption.
>
> However, it is important to note that under FEI's proposal in the Renewable Gas Comprehensive Review application, all new residential connections would receive 100 percent renewable gas; therefore, all levels of the ZCSC (EL1-4) can be met (including the use of space and water heating). As such, there would be no impact to volumes of gas or peak load

In response to BC Sustainable Energy Association IR 35.2, FEI stated:

> FEI confirms that BCUC approval of the Renewable Gas Connections Program was not an input to the peak demand forecast. Further, FEI does not expect that the outcome of the Renewable Gas Connections Program will have a marked impact on the forecast of customers or peak demand for the ITS as continued gas deliveries (including the use of low carbon and renewable gas) to buildings is critical for meeting peak winter energy demand and maintaining a resilient, overall energy system in BC. Even in cases where gas may be relied upon to back up electric systems (i.e., in situations where dual fuel systems are installed in buildings), FEI anticipates that peak demand will remain the same for such customers. Given the extreme cold winter temperatures in the area served by the

> OCU [Okanagan Capacity Upgrade] Project and the high cost and challenges associated with upgrading the electric system to handle peak heating energy requirements as evidenced by the Kelowna Electrification Case Study, FEI anticipates that even if the Renewable Gas Connections Program is not approved and electric heat pumps become the predominant technology for heating in buildings, customers are expected to continue using gas (including low carbon and renewable gases) to meet their peak heating needs.

On page 4 of FEI's Stage 2 Comprehensive Review and Application for a Revised Renewable Gas Program, FEI states:

> Approval of FEI's proposed Renewable Gas Connections service as described in Sections 7 and 8 of the Application and the corresponding new RS [Rate Schedule] 1PLC [Permanent Low Carbon], RS 2PLC, RS 3PLC and RS 5PLC in Attachment D-2 of the Application.

Appendix D-2[1] to the Stage 2 Application includes the following definition for Permanent Connection Low Carbon Gas Service:

> Permanent Connection Low Carbon Gas Service Means firm Gas Service consisting of 100 percent Renewable Gas that is exclusive to and mandatory for Permanent Connection Low Carbon Gas Service Customers under Rate Schedules: (a) 1PLC for Residential Permanent Connection Low Carbon Gas Service; (a) 2PLC for Small Commercial Permanent Connection Low Carbon Gas Service; (b) 3PLC for Large Commercial Permanent Connection Low Carbon Gas Service; and (c) 5PLC for General Firm Permanent Connection Low Carbon Gas Service.

In the document titled "20%-Better Energy Efficiency & Zero Carbon Step Code British Columbia Building Code 2018 – Revision 5,"[2] on page 1 the Building and Safety Standards Branch states:

> As of May 1, 2023, the first incremental change to the BCBC requires new construction to be 20% more energy efficient… Effective May 1, 2023, most new buildings will be required to comply with the energy efficiency requirements of the BC Energy Step Code. The BC Energy Step Code's performance-based energy efficiency approach requires that a building's designed performance be evaluated through whole building energy modelling and on-site airtightness testing to validate how the building's design and construction meets performance targets for the desired 'Step' of the BC Energy Step Code.

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[1] Appendix D-2 "Proposed Tariff Revisions to Enable Renewable Gas Connections and Voluntary Renewable Gas Services".

[2] https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/bulletins/20_better_ee__zcsc.pdf

Additionally, page 3 states:

> The Zero Carbon Step Code has four levels of increasing stringency for Part 9 and Part 10 buildings. The first level of the Zero Carbon Step Code is called EL-1 (‘Measure-Only’) as it only requires measurement of a building’s emissions. EL-2 is the next level and will likely require decarbonization of either space heating or domestic hot water systems. The next level is EL-3 which will require decarbonization of both space heating and domestic hot water systems. EL-4 is the fourth and final level and indicates that the operation of the is as close to zero emissions as possible. <u>Initially, the Zero Carbon Step Code requirements will be voluntary. The CleanBC Roadmap to 2030 commits to requiring increasingly stringent emission requirements for new buildings in 2024 and 2027. In 2030 the BCBC [BC Building Code] will require all new buildings to be zero carbon.</u> [emphasis added]

2.1 Please explain the expected impact upon the Interior Transmission System (ITS) peak demand of the requirement in the BCBC for new construction to be 20 percent more energy efficient, compared to the peak demand shown in FEI’s Supplementary Filing Forecast.

<u>Response:</u>

The BCBC requirement for new construction to be more energy efficient applies to building efficiency overall and does not specify that the efficiency requirement is based on reducing energy use on the design day or design hour peak.[3] Therefore, the impact of efficiency improvements required by the BCBC are more relevant to annual demand forecasting than peak demand forecasting. Further, FEI considers that such a required reduction in annual demand does not necessarily translate to a proportional reduction in peak demand and that its peak demand forecasting method has appropriately addressed this uncertainty, as discussed below:

- While some measures such as building envelope improvements may lower the peak demand requirements for some buildings, other measures such as on-demand hot water and smart thermostats may have the impact of concentrating the peak into a shorter time period and potentially increasing peak demand for those uses as a result.[4]
- Due to the nature of gas metering technology currently in use, FEI does not have actual peak use data at a useful level of granularity at this time with which to evaluate the impact

[3] The BC Step Code states that energy performance is to be expressed in Thermal Energy Demand Intensity (TEDI) and Total Energy Use Intensity (TEUI) based on different climate zones within the province. See information bulletin: https://energystepcode.ca/requirements/#bcbc-2018-rev-5; and technical bulletin: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/bulletins/b19-08_step_code_revision_2_bulletin_2020_01_08.pdf.

[4] Exhibit B-2, BCUC IR1 5.2 and 5.2.1; Exhibit B-14, BCUC IR2 42.1.1, 42.3.1, 42.3.2.

of such building efficiency improvements on peak period demand trends and customer actions in situ during such periods.[5]

- While current building trends related to the implementation of the Energy Step Code are already embedded in the actual data used to assess peak demand requirements, the extent is unclear. FEI's analysis of customer demand and its work on energy efficiency programs indicate that generally, residential buildings in colder climates in BC such as the Southern Interior tend to already be more efficient than those in warmer parts of the Province such as the Lower Mainland, dampening any influence the Energy Step Code might be having on annual or peak demand analysis.
- Given the challenges and time required for shifting peak demand from the gas to the electric system as highlighted in the Kelowna Electrification Case Study,[6] the gas system is critical for energy system resiliency in the region served by the OCU Project and FEI therefore expects peak demand growth to continue.

In consideration of the above factors, FEI provides the following analysis to show that the OCU Project is needed even when considering hypothetical cases where peak demand might be impacted by the requirements of the BCBC and ZCSC.

In response to BCUC Supplementary IR1 13.2, FEI was asked to evaluate what pipeline length would be sufficient to meet the 20-year peak demand based on the Supplementary Filing Forecast. The resulting demand and pipeline length was determined to be 379 TJ/day and approximately 26 km, respectively.

Under a scenario where the Supplementary Filing Forecast of peak demand growth occurs through 2030, and assuming limited growth beyond 2030 as suggested in the preamble, the peak demand would be approximately 352 TJ/day. Using the same methodology that was used to determine the required pipeline length in the response to BCUC Supplementary IR1 13.2, the required length would still be approximately 16 km. This assumes no further growth of any kind would occur.

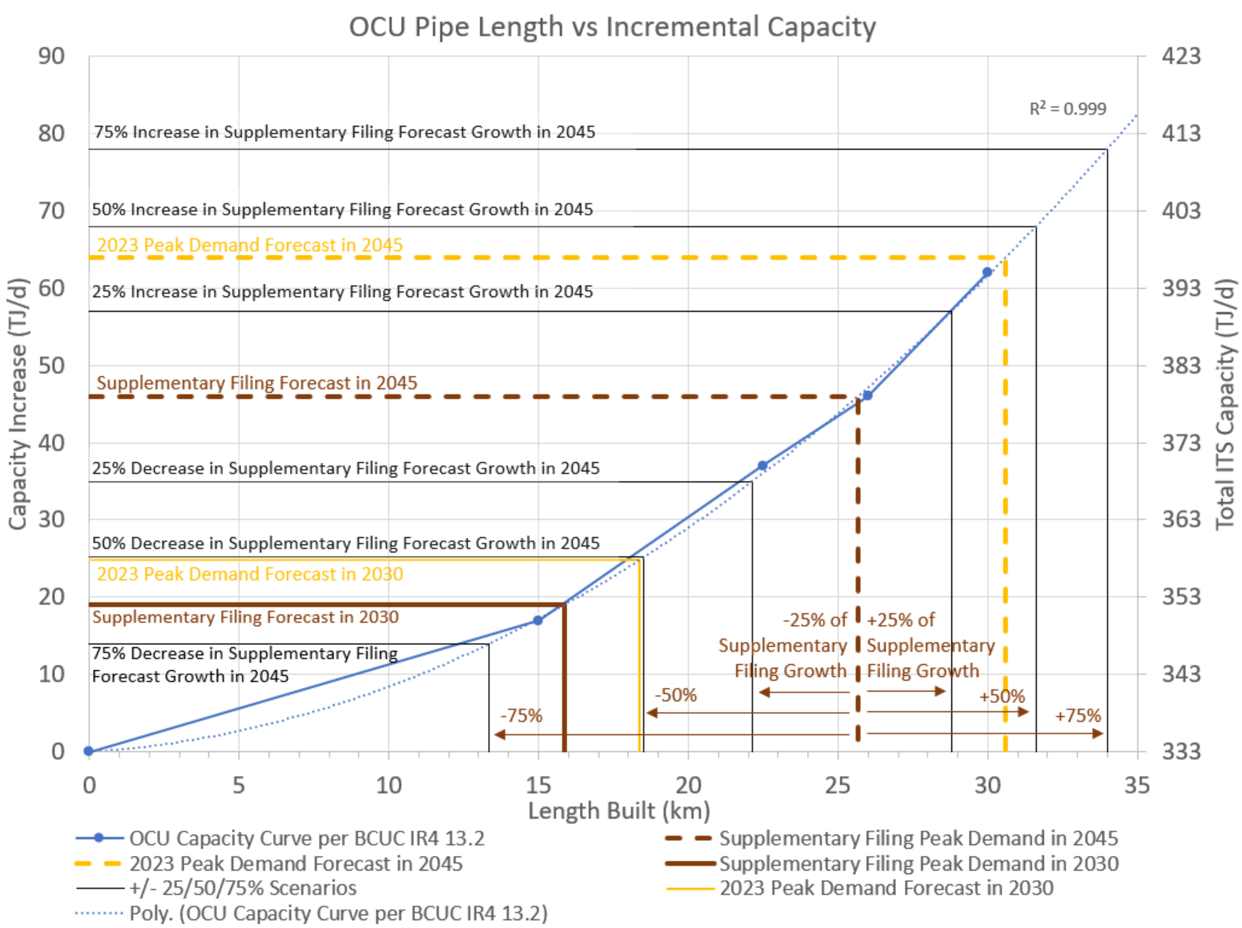
BCUC Panel IR2 3.3 asks that FEI consider alternatives, besides shortening the pipe, for scenarios where the 20-year demand growth is up to 75 percent less than the Supplementary Filing Forecast. However, to provide a more balanced scenario analysis, and in consideration that both decreases and increases in potential future peak demand growth are plausible, the figure below shows the pipe length required under scenarios where the Supplementary Filing Forecast's 20-year demand growth increases and decreases by 25, 50 and 75 percent.

Further, in the response to BCUC Supplementary IR1 1.1, FEI explained that its peak demand forecasts are prepared annually and are generally completed by the end of Q3 of any given year, which was why FEI provided the 2022 Peak Demand Forecast from BCUC IR2 103.1 of the 2022 LTGRP proceeding with an adjustment to account for 2022 actual core customer data (i.e., the

[5] Exhibit B-2, BCUC IR1 4.1 and 4.1.2; Exhibit B-14, BCUC IR2 42.1.1 and 42.4; Exhibit B-22, BCUC IR3 65.1.
[6] FEI 2022 Long Term Gas Resource Plan (LTGRP), Exhibit B-20, Evidentiary Update.

Supplementary Filing Forecast). FEI has now completed its 2023 peak demand forecast as part of its annual planning cycle. Given the Panel's questions regarding different peak demand forecast scenarios, FEI considered it appropriate to provide the now completed 2023 peak demand forecast as it represents the most up to date information available. The 2023 peak demand forecast was prepared using the same methodology as prior peak demand forecasts and shows a higher rate of growth than the Supplementary Filing Forecast due in large part to a higher growth in residential accounts supported by the most recent CBOC Housing Starts Forecast. By 2045, the 2023 peak demand forecast suggests a demand requirement of 397 TJ/day and would require approximately 31 km of pipe to accommodate.

These scenarios are all shown in the figure below which relates the length of the Project to the capacity required. The figure was made using data provided in the response to BCUC Supplementary IR1 13.2. ITS capacity values were provided for scenarios where the OCU Project length was decreased by 4 km, 25 percent and 50 percent. Those data points are plotted as a function of pipeline length in the figure below. The capacity benefit relates to the length of pipe constructed by a second order trendline that can be used to approximate the required length for a given capacity requirement.



The above figure not only confirms that the OCU Project is needed, but it also illustrates the diminishing value realized by decreasing pipe length as the change in capacity is proportional to the square of the change in length. That is, reducing the pipe length by 50 percent reduces the capacity benefit by approximately 75 percent.

Ultimately, and regardless of the forecast and assumptions made regarding long-term peak demand in the ITS, in all scenarios there continues to be growth in peak demand and a need for increased capacity, which is addressed by the OCU Project.

Further, while the timing and impact of the BCBC requirements on ITS peak demand may be unclear, there is a clear trend in historic customer attachments and growth in peak demand and these trends are expected to continue in the near to medium term. Regardless of the growth rate assumed, the regions within the ITS have shown vibrant growth trends and with the historic peak demand already exceeding the capacity of the ITS, any incremental demand further supports the need for incremental capacity in the ITS to mitigate a growing risk of customer outages and increasingly costly short-term mitigations.

2.2 Please discuss whether FEI anticipates that level EL-1 of the ZCSC will have any impact upon gas consumption.

Response:

FEI does not anticipate that adoption of level EL-1 of the ZCSC will have an impact on gas consumption because compliance for this level only requires the local government to measure GHG performance; there is no requirement that a GHG emissions target be met.

2.3 Please explain for each of level EL-2 to EL-4 of the ZCSC, whether peak gas demand for new customers would be expected to be lower than the peak demand assumed for new customers in FEI's Supplementary Filing Forecast, and if so, please estimate the amount of the decrease.

Response:

To the extent that the ZCSC remains voluntary for municipalities to 2030, FEI anticipates that the ZCSC will have little impact on new customer peak demand and that the BCBC Step Code will have some influence as discussed in the response to BCUC Panel IR2 2.1. In cases where the ZCSC is made mandatory through either municipal by-law adoption or through the BCBC implementation in 2030, FEI anticipates that the impact of the ZCSC on new customer peak demand will depend on whether or not the use of renewable natural gas (RNG) is a recognized pathway for meeting the ZCSC requirements and the extent to which the use of RNG is competitive with electric heating solutions that are supported by ratepayer and taxpayer funded incentives.

If RNG is a viable and competitive space and water heating energy option for new gas customers, then FEI anticipates that the gas system will continue to serve peak demand requirements for these customers at similar peak demand levels to today, as RNG will meet the requirements of all levels under the ZCSC. In this case, the gas system will help to avoid growth in peak energy requirements on the electricity system caused by fuel switching to electricity and thus will help to avoid electricity system constraints and the accelerated need for additional electric infrastructure as explained in the Kelowna Electrification Case Study.

If RNG is not viable or competitive for space and water heating energy in new residential and/or commercial buildings, FEI anticipates that the ZCSC will have some impact on the growth in peak demand on the gas system. In this case, the amount of the impact is not fully known, but FEI offers the following:

- Under ZCSC EL-2, FEI expects that building carbon intensity levels in buildings using high efficiency gas fired space heating and hot water equipment can be met using conventional natural gas appliances and as such, EL-2 can be expected to have minimal impact on the forecast for peak gas demand as customers can be expected to continue using gas for peak heating needs.
- Under ZCSC EL-3, high efficiency gas appliances using conventional natural gas will not be able to meet the stated carbon intensity levels if used year-round; however, FEI is not clear at this time if high-efficiency dual (electric and gas) fuel heating systems using conventional natural gas can meet the EL-3 requirements when used solely for peak heating needs. If so, FEI anticipates that dual fuel heating systems will be an alternative to all-electric systems due to their resiliency benefits. In the case where the gas system continues to support peak energy demand requirements for customers, FEI anticipates individual new customer changes to peak demand will be fairly minor. FEI does not have sufficient information at this time to predict how much uptake of such an alternative can be expected and is not able to accurately predict the amount of impact that EL-3 would have on its forecast for peak demand under these circumstances.
- Under ZCSC EL-4, high-efficiency gas appliances using conventional natural gas as a fuel will not meet the stated carbon intensity levels. In this case, FEI anticipates that growth in peak demand will begin to flatten to a greater extent than in the current forecast for peak demand in the region served by the proposed OCU Project. The full extent of such flattening in peak demand is not entirely known since FEI understands that conventional natural gas for some ancillary uses such as cooking and clothes drying can be done within the EL-4 stated carbon intensity levels and FEI may continue to add customers if EL-4 becomes mandatory in its current form. In this circumstance, since new peaking heating load will be shifted to the electric system, FEI anticipates that the electricity system

constraints and new electric system infrastructure requirements such as outlined in the Kelowna Electrification Case Study, will begin to materialize more rapidly.

As stated in the response to BCUC Panel IR2 2.1, given the immediate need for the OCU Project, there is not a level of the ZCSC that avoids the need to increase capacity into the Okanagan region.

2.4 Please further explain how RNG would be able to meet EL-4 in the ZCSC. Please outline any assumptions used with respect to carbon intensity.

Response:

RNG has a lower emissions factor than natural gas or electricity and thereby can meet EL-4. If FEI assumes an emissions factor of 0.2665 kgCO2e/GJ for RNG as published by the Province of BC,[7] the following example shows how this target can be met with RNG and electricity but not natural gas. The emissions factor for electricity from BC Hydro in 2021 is 2.69 kgCO2e/GJ.

As per the performance path approach of the ZCSC, EL-4 for a house requires that the:

- Maximum GHGi by house expressed in kgCO2e/m2/yr: 1.5
- Maximum GHG by house expressed in kgCO2e/yr: 500

Fuel type	BC Energy Step Code Level 3 Home built in Climate Zone 5 Modeled Emissions for a Sample Single Family Detached Home (3,030 sqft)		
	100% NG	100% RNG	100% Electricity
Space Heating appliance	Gas Furnace, 95% Annual Fuel Utilization Efficiency (AFUE)		Electric Furnace/Baseboards
Water Heating appliance	Tankless Gas Heater, 0.92 Efficiency Factor (EF)		Electric Tank Heater (40 US gallons, 0.83 Efficiency Factor (EF)
GHGi (kgCO2e/m2/yr)	9.9	0.3	1.0
GHG/yr (kgCO2e/yr)	2787	96	279
ZCSC EL-4 Emission Level achieved?	No	Yes	Yes

[7] See tab, “BC Stationary Fuel Combustion”, bottom of the table. https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/guidance-documents/emission_factors_catalogue.xlsx 0.0002665 kgCO2e/MJ = 0.2665 kg/GJ = 0.001 kg/kWh, as of Oct 16, 2023.

For the prescriptive pathway, EL-2 to EL-4 require that energy sources supplying heating systems have an emissions factor of less than or equal to 0.011 kgCO2e/kWh, which includes both the principal and supplementary heating systems. This target can be met with both RNG and electricity.

- Electricity emissions factor: 0.011 kg CO2e/kWh[8]
- RNG emissions factor 0.001 kg/kWh[9]

Please also refer to the response to BCUC Panel IR2 2.4.1 for a discussion of updates to the BCBC required to incorporate RNG as a compliance pathway.

2.4.1 Please discuss the risks that a future zero-carbon requirement for new buildings in the BCBC could preclude the use of renewable natural gas.

<u>Response:</u>

For clarity, FEI understands that the current EL-4 is the fourth and final step of the ZCSC and is identified as the Province's equivalent of a zero-carbon requirement, as it is as close to zero emissions as possible that can be achieved. If the Province were to limit the emissions target further than EL-4, electricity emissions would exceed the emissions target.

RNG is not currently listed as a compliance pathway in the BCBC and there is a risk that necessary amendments to add RNG are delayed or not made. FEI understands the intention of the ZCSC is to be fuel agnostic and the permanence of FEI's RNG voluntary tariff was the primary concern, which FEI is seeking to address through its Stage 2 Comprehensive Review and Application for a Revised Renewable Gas Program Application (Revised Renewable Gas Program Application). The Province has indicated that it is awaiting a decision on FEI's Revised Renewable Gas Program Application to determine how future updates of the BC Building Code can incorporate RNG. Please refer to the slide extract below[10]:

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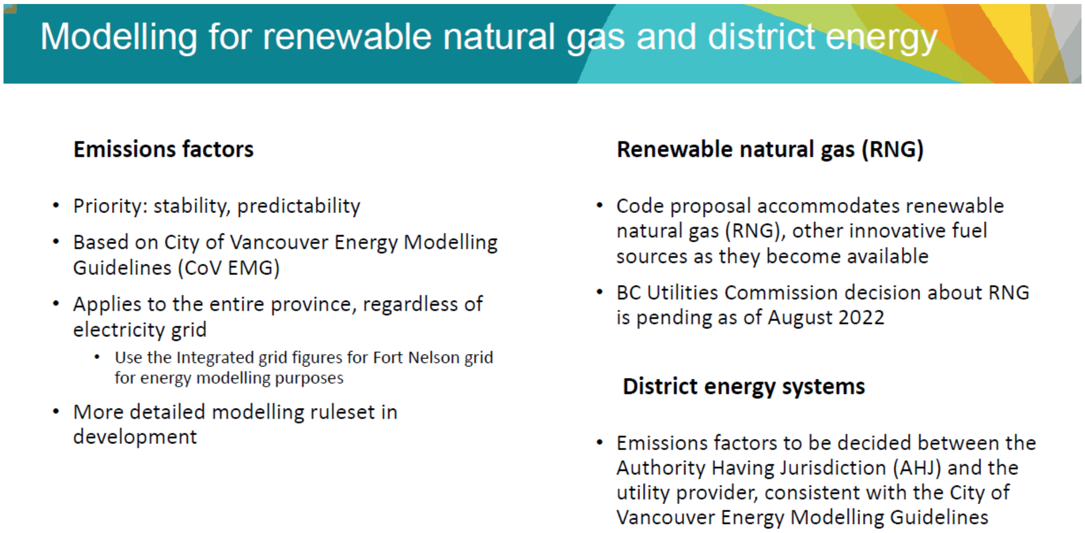
[8] https://free.bcpublications.ca/civix/document/id/public/bcbc2018/bcbc_2018dbs103r5

[9] See tab, "BC Stationary Fuel Combustion", bottom of the table. https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/guidance-documents/emission_factors_catalogue.xlsx 0.0002665 kgCO2e/MJ = 0.2665 kg/GJ = 0.001 kg/kWh, as of Oct 16, 2023.

[10] BC Building Code proposals for cleaner, more energy efficient Part 9 buildings (2022) - YouTube, Episode 4.



Below is an extract of the presenter notes accompanying this slide:

> On the gas side, there are also big efforts to reduce carbon intensity. There is significant interest in renewable natural gas, or RNG, as a way to decarbonize the conventional natural gas supply. Also known as biomethane, it is a refined form of biogas, which comes from landfills, oil production, agriculture, sewage treatment, and other activities where biogas would otherwise be released into the atmosphere and contribute to climate change.
>
> As of August 2022, a proposal from FortisBC to introduce RNG at scale is currently before the BC Utilities Commission (or BCUC), which is an independent agency of the provincial government responsible for regulating British Columbia's energy utilities. The BCUC has not issued a decision on the proposal yet. Given these variables, this draft code language is written to include future energy options, and terms like "decarbonized fuels" were chosen specifically to account for the breadth of possibilities.
>
> However, given the urgency of climate change, we are choosing to issue a Code proposal now so builders and local governments can start using it at scale, and when a decision is released, we will read it closely and assess if and how it affects the Code language.

2.5 Please explain whether gas as a back-up heating option for peak periods only would be permissible in new buildings under EL-4 of the ZCSC, and a future zero carbon requirement for new buildings in the BCBC.

Response:

Conventional natural gas as a back-up or emergency heating option, such as a fireplace, would meet the prescriptive path requirements of EL-4 (which requires all primary heating load be met using energy with an emissions factor of 0.011 kgCO2e/GJ or less). In contrast, under the performance path, gas as a back-up heating option is unlikely to meet EL-4 of the ZCSC, except in some larger homes. Please also refer to the response to BCUC Panel IR2 2.4.1 regarding FEI's understanding of a future zero carbon requirement.

2.6 Please confirm, or explain otherwise, that ancillary appliances (e.g. cooktops/dryers, outdoor appliances such as barbeques and patio heaters, and fireplaces) have a minor impact on peak day demand.

Response:

FEI estimates that the impact of end uses such as fireplaces, cooking, pool and spa, drying, and others currently contribute approximately 10 percent of peak day demand for FEI's core customers in the Southern Interior.

However, this trend may change and potentially increase in the future depending on how new customers' energy decisions change in relation to these new policies, codes and standards. For example, the use of backup or emergency heating appliances, such as fireplaces, in new buildings could change in response to policies like the ZCSC. For instance, in colder climates like the Southern Interior, customers using heat pumps require a backup source of heating. Under the ZCSC, backup heating equipment, whether gas or electric, is excluded from the calculation of emission performance in a building that uses electricity as its primary energy source to meet space and water heating load. As such, customers in new buildings may install and use a gas fireplace to provide backup or emergency heating during winter peak periods to a greater degree than they do today. In this case, although the peak may not increase above that forecast by FEI for the area served by the OCU Project, the ancillary uses described may contribute a greater proportion of that peak demand then they do today.

2.7 Please confirm, or explain otherwise, that FEI's Supplementary Filing Forecast does not account for zero carbon requirements for new buildings in the BCBC in 2030.

Response:

FEI's Supplementary Filing Forecast was created in accordance with the traditional method as described in the response to BCUC Supplementary IR1 1.1 and embeds trends inherent in energy use at the time of its preparation. FEI has not altered its methodology to include any special assumptions before or beyond 2030 regarding the impact that zero carbon new building requirements may have on peak demand growth on FEI's system. While FEI understands that the BCBC (Zero Carbon Step Code) will ultimately impact energy use, it is premature to change peak demand forecasting methods or defer infrastructure needed to serve customers today as this policy has not yet begun to influence peak gas demand and may not do so for several years for the following reasons:

- While municipalities are required to achieve the top step of the BCBC Zero Carbon Step Code by 2030, none of the municipalities in the ITS Region have adopted the Zero Carbon Step Code at this time;
- Expanding the electric system to support increased peak winter heating demand that is currently served by gas infrastructure is challenging and will take time;
- The role of renewable gases within the BCBC (Zero Carbon Step Code) has not yet been determined, making it premature to assume that new gas connections will be precluded by the BCBC; and
- As discussed in the response to BCUC Panel IR2 2.6 the BCBC does not preclude the installation of gas fireplaces in new buildings. Gas fireplaces are likely to be used as a backup source of heating during peak demand conditions.

Therefore, FEI's Supplementary Filing Forecast remains valid. Please also refer to the responses to BCUC Panel IR2 2.1 and 2.3 for a discussion of the potential impact of the BCBC and ZCSC under different future conditions that are yet to be determined.

2.8 Please explain the expected impact on FEI's ability to attach new residential and commercial customers if FEI's proposed Permanent Low Carbon rate schedules (as applied for in the Stage Two Application are (i) approved by the BCUC and (ii) denied by the BCUC, in each of the following circumstances:

a) Municipalities implement EL-2 between now and 2030;

b) Municipalities implement EL-3 between now and 2030;

c) Municipalities implement EL-4 between now and 2030; and

d) the BCBC requires all new buildings to be zero carbon in 2030.

Please quantify the estimated impact on peak demand in the ITS in each case.

Response:

Please refer to the response to BCUC Panel IR2 2.3.

2.9 In a circumstance where FEI's proposed Permanent Low Carbon rate schedules are denied by the BCUC, please explain and estimate the expected impact on peak demand prior to 2030.

Response:

Please refer to the response to BCUC Panel IR2 2.3.

3.0 Reference: ALTERNATIVES ANALYSIS

Exhibit B-1-2 (Updated Application), p. 45

Exhibit B-2, BCUC IR 2.6.1; 11.4

Exhibit B-36, BCUC IR 48.1

Project Alternatives to Meet Lower Demand Forecasts

On page 45 of the Updated Application, FEI states:

> As discussed in Section 4.1.1, measures such as CNG [compressed natural gas] injection, which can be used to mitigate a small, short-term capacity shortfall such as the shortfall projected for 2021/2022 and 2022/2023, are costly and inefficient in the long term when compared to standard gas supply methods such as pipelines.

In response to BCUC IR 2.6.1, FEI stated:

> FEI considered alternatives to address the forecast capacity shortfall at a local level in the communities of West Kelowna, Lavington, and Lumby. However, these alternatives are not viable long-term solutions for the ITS and do not provide the reliability, resiliency, and operational benefits to the ITS outside of these local areas. The capacity shortfall at a local level could be managed in two ways: by supplementing the supply deficit locally with compressed natural gas (CNG) or liquefied natural gas (LNG), or by curtailing local load to match the available supply.

BCUC IR 48.1 asked:

> IR 48.1 - For CNG/LNG Trucking, please provide a high-level estimate of:
>
> - The costs to install infrastructure, complete necessary site upgrades, and purchase/rent required equipment;
> - the operational costs in the first year of implementation; and
> - the incremental operational costs (if different from the above) associated with peak demand increases that are forecasted to occur each year.

In response to BCUC IR 48.1, FEI stated:

> FEI has not completed a detailed analysis of the costs which would be associated with implementing CNG supplementation in this specific instance, but has previously produced estimates for purchasing and operating its own CNG injection equipment for other uses on its system. These costs have been scaled to represent FEI's best approximation of costs associated with implementing CNG supplementation in the Kelowna region beginning in the winter of 2023/2024. A high-level summary of the costs is provided below for the years 2023 to 2028.

Costs would continue to rise as demand on the system, and consequently the CNG/LNG requirement, increases over time. These costs are based on the following assumptions:

- The CNG tanker filling point is at Oliver;
- The CNG injection point is near Kelowna;
- The Savona delivery pressure from Enbridge is 600 psig;
- Each CNG tanker has a capacity of 350 GJ per truck;
- Trucks are purchased rather than rented due to the uncertainty surrounding rental/lease contracts;
- The majority of civil work to be completed in year 1 to accommodate compression upgrades in subsequent years;
- Loading and offloading sites are manned by FEI operations personnel; and
- A 15 percent contingency is included in all estimates.

	# of Trucks/Peak Day	Capital Costs ($millions)	O&M Costs ($millions)	Total Year Cost ($millions)	Total Cumulative Costs ($millions)
Year 1 (2023/2024)	16	26.1	1.3	27.4	**27.4**
Year 2 (2024/2025)	36	8.5	3.3	11.7	**39.1**
Year 3 (2025/2026)	45	5.7	4.6	10.3	**49.4**
Year 4 (2026/2027)	54	3.3	6.7	10.0	**59.5**
Year 5 (2027/2028)	63	3.3	9.3	12.6	**72.0**

3.1 Please provide an updated high-level cost estimate (capital and O&M) for a CNG project that was designed to meet the forecasted ITS peak demand until 2030 only, based upon the trajectory of the Supplementary Filing Forecast. Please produce estimates for facilities assuming Savona tap pressure at (i) 600 psig and (ii) 650 psig, and include a discussion of any key assumptions or uncertainties associated with the cost estimates.

Response:

Please refer to the two tables below for FEI's updated high-level cost estimate for a CNG project to meet the 2030 peak demand based on the Supplementary Filing Forecast. The updated analysis has been provided for Savona tap pressures of 600 psig and 650 psig. Please refer to the response to BCUC IR2 48.1 for a list of key assumptions made in the analysis. Please refer to the response to BCUC Panel IR2 3.1.2 for an explanation of why FEI does not consider such projects to be feasible.

Table 1: Savona at 600 psig[11]

	# of Trucks/Peak Day	Capital Costs ($ millions)	O&M Costs ($ millions)	Total Year Cost ($ millions)	Total Cumulative Costs ($ millions)
Year 1 (2026/2027)	**18**	20.7	1.9	22.6	**22.6**
Year 2 (2027/2028)	**23**	1.8	2.5	4.4	**26.9**
Year 3 (2028/2029)	**28**	5.1	3.5	8.6	**35.6**
Year 4 (2029/2030)	**34**	3.6	4.2	7.8	**43.3**
Year 5 (2030/2031)	**39**	1.5	5.7	7.2	**50.5**

Table 2: Savona at 650 psig

	# of Trucks/Peak Day	Capital Costs ($ millions)	O&M Costs ($ millions)	Total Year Cost ($ millions)	Total Cumulative Costs ($ millions)
Year 1 (2026/2027)	**1**	15.5	0.8	16.2	**16.2**
Year 2 (2027/2028)	**6**	0.7	1.1	1.9	**18.1**
Year 3 (2028/2029)	**11**	2.6	1.6	4.3	**22.4**
Year 4 (2029/2030)	**17**	3.2	2.1	5.3	**27.7**
Year 5 (2030/2031)	**22**	1.1	3.0	4.1	**31.8**

3.1.1 Please also estimate the number of truckloads per day that would be required in 2030 in either scenario.

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[11] Estimated CNG injection requirements are a best approximation as it is difficult to accurately model the capacity benefits of CNG injection.

Response:

Please refer to the response to BCUC Panel IR2 3.1 for the estimated number of truckloads per day that would be required in 2030 in either scenario.

3.1.2 Please discuss whether FEI considers such projects would be technically feasible.

Response:

FEI does not consider this approach to meeting the longer-term capacity needs of the region to be technically feasible.

As noted in the response to BCUC IR1 11.1, there is a point where the number of daily and hourly truckloads required to maintain capacity during peak demand becomes logistically unfeasible. While the number of trucks per peak day has reduced based on the Supplementary Filing Forecast (see the response to BCUC Panel IR2 3.1), by Year 3 (2028/2029) the requirement for 28 Trucks/Peak Day exceeds what FEI considers to be feasible (somewhere between 16 – 36 Trucks/Peak Day as established in the response to BCUC IR1 11.1).

Please refer to the responses to BCUC IR1 11.1 and BCUC IR2 48.1 for a discussion of the logistical challenges associated with using a high number of CNG trucks. The key challenges are as follows:

- The high number of CNG trucks required would create severe space constraints at the fill and injection sites;
- Increased demand on FEI's operational resources at the compression and decompression sites; and
- The need to rely on and organize contracted resources to operate the virtual pipeline and haul the CNG trailers.

In addition to these challenges, FEI notes that for an operation of this size, it would need access to a large amount of equipment which would sit idle until needed. When the cold weather conditions were identified, FEI would have to mobilize the personnel required to operate the system, which would likely include contractors to drive the CNG trailers to and from the fill and injection sites. Relying on contractors and idle equipment to mobilize quickly in severe winter conditions creates an additional challenge that further reduces the reliability of the CNG system as a long-term peaking resource.

FEI notes that the required number of trucks per day under the Supplementary Filing Forecast with Savona at 650 psig may remain logistically feasible in Year 5 (2030/2031). However, as noted in the Supplementary Filing, there is no firm contractual obligation for Westcoast Energy Inc. to provide FEI with 650 psig at the Savona tap. As such, FEI is unable to rely on the Savona tap pressure being at 650 psig over the long-term. As a prudent operator, FEI would, therefore, need to plan for the lower tap pressure, making this option logistically unfeasible.

FEI views CNG trucking as a useful tool for certain initiatives such as emergency response, but due to the noted challenges finds that it is not ideal for longer term peak shaving applications of this size, especially when a superior alternative, such as the proposed OCU Project, is available.

3.1.3 Please estimate the lead time required for such facilities.

Response:

At a high level, FEI estimates it would take 3 years to establish CNG injection. This estimate is based on 12 months of project development, 6 months of design, and 18 months for procurement[12] and installation. As noted in the response to BCUC IR2 48.1, FEI expects there to be permitting and land acquisition challenges associated with a CNG injection project. Together, these challenges would create a schedule risk.

3.2 Please discuss any other alternatives besides CNG that could be available to FEI to meet the forecasted ITS peak demand until 2030 only, based upon the trajectory of the Supplementary Filing Forecast. To the extent FEI is able to, please provide a high-level overview of the magnitude of expected costs, risks, and service life associated with such alternatives.

Response:

For the reasons described in the response to BCUC Panel IR2 2.1, FEI does not consider it prudent to only plan to meet forecast ITS peak demand until 2030. However, to be responsive, FEI has developed the following two alternatives to meet the 2030 ITS peak demand under the Supplementary Filing Forecast. One alternative is a reduced length to Alternative 3, and the other

12 FEI's current understanding is that the lead time for most of the major equipment for the CNG project is approximately 52 weeks after the issuance of a purchase order.

is to implement a virtual pipeline through LNG trucking. Each alternative is discussed in more detail below.

Reduced Alternative 3 Pipeline Length

For Alternative 3 to provide sufficient capacity for the 2030 Supplementary Filing Forecast load, an approximately 16 km pipeline[13] would be required. FEI has not completed any detailed cost estimating for the reduced length pipeline. Due to the large change in project scope between the proposed OCU Project and this scenario, FEI is unable to provide an updated cost estimate. FEI notes that in the response to BCUC Supplementary IR1 13.2.2, a potential cost savings per kilometre was provided. However, as noted in that response, the value is only applicable to reductions of relatively short segments (i.e., less than 5 km), and as such cannot be applied to this scenario. The risks and service life associated with this alternative would be aligned with Alternative 3.

As shown in the Supplementary Filing Forecast, demand is expected to increase beyond 2030. As such, FEI would need to extend this alternative prior to Winter 2031/32 to meet the demand. A cost premium would be expected from constructing the pipeline in this manner and having to re-site, relocate or reconstruct the pressure control station at the tie-in location.

Virtual Pipeline via LNG Trucking

FEI considered a virtual pipeline project using LNG trucking to meet the 2030 peak demand based on the Supplementary Filing Forecast with the quantity of trucks per day shown below in Table 1.

Table 1: LNG Trailers per Peak Day from Delta to Kelowna by Year

	# of Trucks/Peak Day, Savona 650 psi minimum	# of Trucks/Peak Day, Savona 600 psi minimum
Year 1 (2026/2027)	**1**	**7**
Year 2 (2027/2028)	**3**	**9**
Year 3 (2028/2029)	**5**	**11**
Year 4 (2029/2030)	**7**	**13**
Year 5 (2030/2031)	**9**	**15**

Under this scenario, FEI assumed that the LNG tankers would be filled at the Tilbury LNG facility in Delta, BC and transported to Kelowna, BC for vaporization. FEI expects that overall costs for a

[13] FEI notes that this length is derived solely from the capacity requirement and does not consider constructability. As such, the actual end-point may need to be adjusted.

temporary LNG virtual pipeline solution would be of a similar magnitude to the temporary CNG virtual pipeline, however, the mix of capital versus operating costs would be different. FEI expects that there would be less capital expenditures due to fewer trailers being required but higher operating expenditures due to the longer distances the vehicles would need to travel, resulting in correspondingly higher drive times.

Further risks and challenges associated with an LNG virtual pipeline alternative can be found in the responses to BCUC IR1 11.1 and 11.4. Compared to the CNG virtual pipeline, the LNG option is more logistically feasible due to the reduced number of trucks. However, this comes at a cost as there are increased concerns with reliability due to the winter driving through high mountain passes that would occur with the LNG option. Due to the risks and challenges and the quantity of trucks required to support the system, FEI does not consider this to be a feasible option for this scenario.

Further, as shown in the Supplementary Filing Forecast, demand is expected to increase beyond 2030. As such, the required equipment would continue to increase after 2030 to meet the demand. In a hypothetical scenario where demand fully stops growing after 2030, FEI would still need to operate the virtual pipeline indefinitely to address the capacity shortfall between the 2030 peak demand and the current ITS capacity. That is, FEI would need to operate the virtual pipeline in perpetuity, at a cost to the ratepayer, or until the demand reduced to the existing ITS capacity.

FEI views LNG trucking as a useful tool for certain initiatives such as emergency response, but due to the noted challenges finds that it is not ideal for longer term peak shaving applications, especially when compared to the proposed OCU Project.

3.3 Please discuss the alternatives that could be available to FEI to meet ITS peak demand which is lower than the 20-year Supplementary Filing Forecast, besides shortening the length of the OCU pipeline. For example, if the 20-year demand were 25%, 50%, or 75% of the forecasted demand outlined in the Supplementary Filing Forecast. To the extent FEI is able to, please provide a high-level overview of the magnitude of expected costs, and risks associated with such alternatives.

Response:

FEI has proposed and discussed a variety of alternatives throughout the proceeding. At a high-level, the alternatives consist of:

- Increasing the flow of gas from the south (Alternatives 1, 2, and 3);
- Increasing the flow of gas from the north (Alternative 4);
- A peak shaving facility (Alternative 5); and

- A virtual pipeline through CNG/LNG trucking.

The challenges associated with each of the above alternatives are described in the Updated Application and in the response to BCUC Supplementary IR1 11.1.1, and these challenges persist regardless of the hypothetical reduction of the 20-year demand growth rate. The factors that support Alternative 3 as the preferred and superior solution to Alternatives 1, 2, 4, and 5 are still valid in the hypothetical reduced demand scenarios referenced in this IR. Additionally, the challenges associated with a virtual pipeline are described in the responses to BCUC Panel IR2 3.1 and 3.2.

As such, FEI considers the only alternative to meet the hypothetical reduced demand to be Alternative 3 with a reduced length pipeline. To meet the 75 percent scenario, roughly half the length of the proposed Project would need to be built. Due to the large change in project scope between the proposed Project and this hypothetical scenario, FEI is unable to provide an updated cost estimate. FEI notes that in the response to BCUC Supplementary IR1 13.2.2, a potential cost savings per kilometre was provided. However, as noted in that response, the value is only applicable to reductions of relatively short segments (i.e., less than 5 km), and as such cannot be applied to the hypothetical 75 percent scenario. Please also refer to the response to BCUC Panel IR2 2.1.

In response to BCUC IR 11.4, FEI stated:

> Truck transportation is far more likely to be disrupted by events such as inclement weather (which FEI would expect to be a significant factor should CNG be used to supplement supply during peak winter conditions), traffic accidents, mechanical breakdowns, road closures, heavy traffic, or dispatching issues. Traffic accidents and road closures are frequent in the British Columbia Interior during winter conditions due to heavy snowfall and ice causing dangerous driving conditions and poor visibility.

3.4 Please further discuss the extent to which heavy snowfall and/or ice would be expected to coincide with the design day temperatures.

Response:

Snowfall can occur when the ambient temperature is below the freezing point (0 degrees Celsius), even at extremely cold temperatures. Because relative humidity of the air drops proportionally with temperature, it is less likely for heavy snowfall to coincide with the design day temperatures and more likely to occur before or after the design day temperature.

- On December 27, 2021 (the coldest day recorded by Environment Canada in Kelowna[14]), snow accumulation on the ground was 20 cm with no new snow recorded on that day. However, approximately 7 cm of new snow was recorded on the days before and approximately 3 cm on the days following. The same trend was observed in Vernon[15] with 16 cm of snow falling on the days before and approximately 4 cm falling on the days following.
- On December 22, 2022 (the coldest day recorded by Environment Canada in Kelowna[16]), snow accumulation on the ground was 17 cm with no new snow recorded on that day. However, approximately 9 cm of new snow was recorded on the days before and approximately 12 cm on the days following. The same trend was observed in Vernon[17] with 12 cm of snow falling on the days before and approximately 18 cm falling in the days following.

This demonstrates that snowfall, ice and challenging conditions for truck transportation exist during the periods of high demand on the gas system. As an example, the Government of British Columbia provided an advisory to avoid non-essential travel because of the potential for dangerous road conditions during the recent cold temperatures experienced in the Southern Interior in December 2022[18], coinciding with near design day temperatures.

Therefore, FEI considers that supply via a virtual pipeline utilizing truck transportation is far more likely to be disrupted by events such as inclement weather, traffic accidents, mechanical breakdowns, road closures, heavy traffic, or dispatching issues compared to a conventional pipeline solution.

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14 Refer to: https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=51117&timeframe=2&StartYear=1840&EndYear=2023&Day=20&Year=2021&Month=12#.

15 Refer to: https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=46987&timeframe=2&StartYear=1840&EndYear=2023&Day=20&Year=2021&Month=12#.

16 Refer to: https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=51117&timeframe=2&StartYear=1840&EndYear=2023&Day=20&Year=2022&Month=12#.

17 Refer to: https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=46987&timeframe=2&StartYear=1840&EndYear=2023&Day=20&Year=2021&Month=12#.

18 Refer to: https://news.gov.bc.ca/releases/2022EMCR0070-001940.