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June 18, 2015

Via Email
Original via Mail

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)

Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Lower Mainland Intermediate Pressure (IP) System Upgrade (LMIPSU) Projects (the Application)

Response to the Commercial Energy Consumers Association of British Columbia (CEC) Information Request (IR) No. 2

On December 19, 2014, FEI filed the Application referenced above. In accordance with Exhibit A-7 setting out the Regulatory Timetable for the review of the Application, FEI respectfully submits the attached response to CEC IR No. 2.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc: Commission Secretary
Registered Parties (e-mail only)

1. Reference: Exhibit B-4, BCUC 1.1.1.5 and Exhibit B-6, CEC 1.3.1.2

> Corrosion rate can be influenced by a number of factors including, soil type, coating type and condition, ground water presence and rate of movement, temperature, presence of microbiological organisms, and other possible contributors such as aeration of the soil that could result from excavation activity of nearby utility operators.
>
> Due to site-specific influences, each leak site would be expected to have an independent corrosion rate.
>
> FEI review of the available data has not identified any factors other than the passage of time (such that corrosion rates resulted in "through-wall" penetration) that would have contributed to the higher number of leaks on the Coquitlam IP pipeline in 2013 versus the previous five years.

> 3.1.2 If there are other factors contributing to the failures and consequent pin-hole leaks, are these expected to re-occur in the new pipeline?
>
> **Response:**
>
> The proposed new pipeline will be constructed with industry standard Fusion Bonded Epoxy (FBE) factory applied pipe coating and field applied liquid epoxy at girth weld locations. Modern day pipeline coatings, such as FBE or liquid epoxy, are subject to strict application procedures as well as a greater level of inspection and quality control. In addition, these coatings are designed to be compatible with cathodic protection in the case of coating disbondment, damage or degradation. This coating system is considered "non-shielding" in the case of failure or loss of adhesion and therefore cathodic protection will continue to protect the pipe from corrosion.

1.1 Will FEI undertake any extra-ordinary assessments either during or following replacement to assess whether or not environmental factors contributed to the leaking of the original pipeline? Please explain why or why not.

Response:

FEI will not be performing any extra-ordinary assessment of the abandoned pipeline. As further described in the responses to BCUC IRs 1.2.2, 1.2.3, and 1.2.4, FEI has identified the factors that led to the accelerated corrosion which is occurring on the original pipeline. These factors are specific to the Coquitlam Gate IP pipeline and its coating and installation. Any learnings from further assessments could not be used to improve the integrity of the proposed pipeline and as such would not provide benefit for the additional expense.

2. Reference: Exhibit B-4, BCUC 1.1.1.7.2

> FEI has utilized soil modeling for other pipeline systems; however, based on review of the detailed inspection data described above, FEI determined that soil modeling was not meaningful for the Coquitlam Gate IP pipeline due to its installation under roadways where soils and natural drainage channels have been modified. In addition, the pipeline corridor and other buried utilities which cross the pipeline can act as conduits for water.

2.1 Please explain whether or not soil modeling might be appropriate in the new Coquitlam Gate pipeline route.

Response:

As discussed in the response to BCUC IR 1.1.1.7.2, the common factors at excavations of the existing pipeline were the presence of groundwater at pipe depth and disbonded shielding girth weld coating. As the new Coquitlam Gate IP pipeline will be installed under roadways for the majority of the route, where soils and natural drainage channels have been modified, site specific soil and moisture conditions would be difficult to assess and model. Further, as noted in the response to BCUC IR 1.1.1.7.3, ground water existence and migration are not considered controllable factors by FEI.

As described in the response to BCUC IR 1.11.4, FEI's selection of Fusion Bonded Epoxy (FBE) coating for the new pipeline mitigates the potential for cathodic protection shielding. As a result, the soil environment is expected to have minimal impact on the new pipeline.

FEI is confident that the combination of FBE coating and cathodic protection will be effective at managing corrosion on the new Coquitlam Gate IP pipeline.

2.1.1 If soil modeling might be appropriate, please provide the estimated costs and clarify whether or not FEI is undertaking this modeling.

Response:

Please refer to the response to CEC IR 2.2.1.

3. Reference: Exhibit B-6, CEC 1.3.2 and Exhibit B-1-6, page 20 and page 24 Table 3-1

3.2 Are there any particular links between the Fraser Gate IP portion and the Coquitlam Gate IP pipeline portion such that the projects should be undertaken at the same time? Please explain.

Response:

The proposed Coquitlam Gate IP and Fraser Gate IP Projects both involve the construction and installation of NPS 30 pipe to replace existing pipe along sections of the two primary pipelines supplying gas to the Metro IP system. The Coquitlam IP Project as applied for is larger in scope; however, in general, both Projects share common attributes in terms of design, routing process, materials procurement and specialized construction and installation techniques due to their urban location. More specifically, with the replacement NPS 30 Coquitlam Gate IP pipeline in service, it will be possible to isolate the Fraser Gate IP pipeline and replace the seismically vulnerable segment of pipe with the proposed upgraded pipe without the use of a bypass. This particular link will require the commissioning window for both pipelines to be synchronized, and any delay in commissioning the Coquitlam IP pipeline would also likely delay the Fraser Gate IP pipeline commissioning.

It is therefore logical that both Projects should be undertaken at the same time in terms of planning, permitting, stakeholder consultation and ultimately construction and commissioning.

3.2 *Revised Project Scope*

As the boundary of lateral spread ground displacement was determined at a point greater than 80 metres east of the location of Test Hole AH95-2, it was deemed feasible to optimize the scope compared to what was originally applied for in the Application. The new proposed scope of the Fraser Gate IP Project involves the replacement of approximately 280 metres of NPS 30 pipeline operating at 1200 kPa and extending from Fraser Gate station at the 2700 block of East Kent Avenue to a point 30 metres east of where the existing NPS 30 pipeline turns north to cross beneath the CP Rail line. This pipeline will replace the section of the existing NPS 30 pipeline which does not meet FEI's seismic criteria for resistance to a 1:2475 year event.

Table 3-1: Updated Fraser Gate IP Project Financial Analysis

	Reduced Scope Alternative 2 – Route Option 1 – East Kent Ave South
Estimate Accuracy	Class 3
Total Direct Capital Cost excl. AFUDC (2014 $millions)	7.378
Total Direct Capital Cost excl. AFUDC (As-spent ($millions)	8.572
AFUDC (as spent ($millions)	0.419
Total As-spent ($millions)	8.990
Annual Gross O&M (2014 $millions)	0.001
Levelized Rate Impact $ / GJ – 60 Yr.	0.004
PV Incremental Cost of Service – 60 Yr. ($millions)	10.764

3.1 Please provide an estimate of the increased costs that would occur if the Fraser Gate project was undertaken independently of the Coquitlam Gate project, and include any opportunity to mitigate costs that may have occurred as a result of

the change in project scope (ie. need for bypass or other factors influencing costs).

Response:

The basis of cost estimate included in Appendix A-23 of the Application assumes that the Coquitlam Gate IP Project and Fraser Gate IP Project would be constructed at the same time and by the same pipeline contractor. If the Fraser Gate IP Project was undertaken independently of the Coquitlam Gate IP Project, the following factors would impact the Fraser Gate IP Project cost estimate resulting in potentially increased Projects costs:

1. Contractor mobilization and demobilization, which would be shared between the two IP Projects, would increase to the full cost if the Fraser Gate IP Project was undertaken independently;

2. Independent pipe orders would not avail of the economy of scale associated with the larger pipe order for both IP Projects, and would therefore incur additional procurement costs due to the smaller order quantity for the Fraser Gate IP Project;

3. It is likely that the Coquitlam Gate IP pipeline contractor would not be available or interested in the much smaller scope of the Fraser Gate IP Project; therefore, knowledge and productivity gain from the Coquitlam Gate IP Project would be lost which could result in reduced pipeline productivity and an increased construction schedule;

4. A different pipeline contractor would require retesting and requalification to FEI procedures and standards, including revised pipeline test plans and hydrostatic test heads; and

5. If the Fraser Gate IP Project is constructed independently of, and prior to, the Coquitlam Gate IP Project, a temporary bypass would be required.

The above factors could result in additional Project costs in the range of approximately $2.7 – $3.2 million.

If the Fraser Gate IP Project could be constructed independently of, and after, the Coquitlam Gate IP Project, a temporary bypass would not be required. Please refer to the response to BCUC IR 1.3.6 for the portion of the total cost attributable to the bypass which would reduce the additional costs by approximately $1.4 million to an approximate range of $1.3 to $1.8 million.

3.2 Please provide an analysis of the net costs that would accrue to the ratepayer if the projects were undertaken separately and the capital costs reduced such that Fraser Gate IP project was not below the current capital exclusion criteria ($5 million) established for PBR.

Response:

If the Projects were undertaken separately, dependent on the timing of the Projects as described in FEI's response to CEC IR 2.3.1, the capital costs would not be reduced but rather increased. The increase in the capital costs of the Fraser Gate IP Project could be in the range of approximately $1.3 million to $3.2 million.

The following table presents the detail in Table 3-1 Updated Fraser Gate IP Project Financial Analysis after increasing the capital costs by $1.3 million and $3.2 million. The first row indicates the increase in the capital cost rather than the AACE Class level.

	Reduced Scope Alternative 2 – Route Option 1 – East Kent Ave South	
Capital Cost Addition (2014 $millions)	1.3	3.2
Total Direct Capital Cost excl. AFUDC (2014 $millions)	8.678	10.578
Total Direct Capital Cost excl. AFUDC As-spent ($millions)	10.082	12.289
AFUDC As spent ($millions)	0.492	0.600
Total As-spent ($millions)	10.574	12.890
Annual Gross O&M (2014 $millions)	0.001	0.001
Levelized Rate Impact $ / GJ – 60 Yr.	0.004	0.005
PV Incremental Cost of Service – 60 Yr. ($millions)	12.654	15.417

3.3 Please confirm that FortisBC has applied to the Commission in the FEI/FBC Capital Exclusion Criteria proceeding that capital exclusions from the PBR formula should be based solely on a dollar threshold and should be set to a threshold of $15 million for FEI and $5 million for FBC.

Response:

Confirmed. FortisBC proposed in its Capital Exclusion Criteria application that, subject to the Commission's approval, commencing with CPCNs applied for in 2016, exceeding the materiality

threshold of $15 million and $5 million for FEI and FBC respectively should be the only factor for determining the exclusion of capital projects from the PBR capital formula spending envelope.

3.3.1 If not confirmed, please provide further clarification.

Response:

Please refer to the response to CEC IR 2.3.3.

3.4 Please provide an analysis of the net costs that would accrue to the ratepayer if the projects were undertaken separately and the materiality threshold for capital exclusion criteria raised to $10 million or more such that the Fraser Gate project was below the capital exclusion criteria.

Response:

In its Decision accompanying Order G-138-14 regarding FEI's 2014-2018 Performance Based Ratemaking Application, the Commission approved FEI's $5 million CPCN exemption threshold as applied for until such time as any further determination by the Commission is made concerning capital exclusion[1]. The FEI/FBC Capital Exclusion Criteria proceeding that is currently underway will define what the appropriate capital exclusion criteria will be in the future and is not applicable to this Application, which was filed in 2014 under the then approved $5 million capital exemption threshold. FEI declines to provide the requested hypothetical information as it is not relevant to the CPCN under consideration.

[1] Order G-138-14, p. 181.

4. Reference: Exhibit B-6, CEC 1.3.2.1

> 3.2.1 If there is no link between the two projects so that they need to be addressed simultaneously, could the Fraser Gate IP portion be deferred? Please explain why or why not.
>
> **Response:**
>
> Please refer to the response to CEC IR 1.3.2.

4.1 If the Commission determined that the Fraser Gate project was to be approved independently of the Coquitlam Gate project, and the Fraser Gate project fell below the materiality threshold for capital exclusion due to changes in scope, cost estimates or other factors such as the ability of the project to be undertaken without bypass, would FEI defer the Fraser Gate project? Please explain why or why not.

Response:

As the priority of this project is unchanged if it were to be addressed independently of the Coquitlam Gate project, FEI has not identified any reasons that would either justify or necessitate deferral of the Fraser Gate IP Project beyond the current planned replacement timeline. Please also refer to the response to BCUC IR 2.22.1 which identifies that it is extremely unlikely that the forecast for the Fraser Gate IP Project costs would be below the $5 million threshold.

4.2 Please describe any regulatory or other issues that would arise if the Fraser Gate project was deferred until after the capital exclusion threshold for PBR were determined, and the capital exclusion materiality threshold was raised such that the project fell below the materiality threshold.

Response:

Any revisions to the capital exclusion criteria that may result from the FortisBC Capital Exclusion Criteria proceeding will not be applicable to this Application. The CPCN threshold of $5 million was approved and in place when this CPCN Application was filed and as such, it is the $5 million CPCN Capital Exclusion threshold that applies regardless of the outcome of the FortisBC Capital Exclusion Criteria proceeding. Similarly, FEI's Huntingdon Station Bypass CPCN was

approved under the CPCN threshold that was in place at the time the application was filed, even though it was not known what threshold would be in place at the time it was constructed.

Further, the capital planning and the timing of capital projects is guided by system sustainment, growth-related and other operational considerations to ensure that natural gas services are provided safely, reliably and at the lowest reasonable costs to meet the energy demands of our customers. The Fraser Gate IP Project involves the replacement of a segment of the Fraser Gate IP pipeline identified to be unacceptably vulnerable to seismic activity.

Please also refer to the response to BCUC IR 2.22.1.

5. Reference: Exhibit B-6, CEC 1.5.1 and Exhibit B-1-6 page 24

5.1 If the Coquitlam Gate IP upgrade is complete, would the system be resilient enough to withstand a Fraser Gate IP failure?

Response:

Following completion of both proposed Projects, the Metro IP system would have the resilience to serve customers through possible anticipated future failure events, as well as to support isolation of segments for repair.

Please note that if the Fraser Gate IP pipeline is not replaced as proposed, a full-bore rupture of the pipeline resulting from a seismic event may result in a release of such gas volume that the capacity of the Coquitlam Gate IP pipeline would be exceeded, therefore resulting in system outages before the pipeline segment could be isolated.

3.8 *FRASER GATE IP SUMMARY*

It was determined subsequent to FEI's Application that earthquake-induced hazards do not pose a threat to the pipeline from the location of Test Hole AH95-2 onward to the west and north. As a result, further test holes were conducted to determine where the soil conditions change from the conditions at Fraser Gate station to those at Section B-B'.

The additional subsurface information collected in March and April 2015 enabled a subsequent optimization of the extent of the pipeline that needs to be replaced to meet the seismic demand based on technical considerations.

The revised scope of the Fraser Gate IP Project involves the replacement of approximately 280 metres of NPS 30 pipeline extending west from Fraser Gate station. The reduction of the Project scope has not resulted in changes to the non-financial evaluation of the route options, and the financial evaluation has resulted in a revised Project Estimate of $8.572 million (As-spent excluding AFUDC).

The Fraser Gate IP Project will replace the section of pipeline that is vulnerable to a 1:2475 year seismic induced earth movement event. It will reduce the probability of pipeline failure which, in turn, will reduce the safety risk, the loss of gas supply risk and economic risk to approximately 171,000 customers. The preferred alternative will satisfy all the objectives and requirements outlined in section 4.2.1 of the Application.

5.1 Has the revision to the understanding of the earthquake-induced hazards resulted in any changes to the impact or likelihood of a full bore rupture occurring? Please explain and provide quantification of any figures that would be adjusted as result of the change in requirement or change in scope of the project.

Response:

D.G. Honegger Consulting provides the following response:

1 The revised understanding of the extent of soils susceptible to ground displacement does not
2 alter the estimates of the likelihood of a seismic event leading to a full bore rupture.

6. Reference: Exhibit B-1-6 page 3

> The total cost of the Projects is now forecast to be $255.244 million, which is a reduction of approximately $10 million as compared to the Errata to the Application filed April 24, 2015[1]. This reduction is primarily attributable to the reduced length of the Fraser Gate IP Project which equates to a project cost reduction of approximately $9.100 million. In addition, the change in the proposed route alignment for the Coquitlam Gate IP Project results in a reduction to project costs of approximately $1.250 million as a result of lower construction costs. Finally, the development costs have increased by approximately $0.375 million. Please refer to Appendix E-4 for comparative summary costs.

6.1 Please provide a line by line comparison of the development costs from the original application, errata and the new development costs with an explanation for any changes.

Response:

The following table provides a line by line comparison of the development costs in the original application with the evidentiary update, which shows an increase of approximately $486 thousand. There were no changes to the development costs related to the errata.

	Evidentiary Update	Original Application	Difference
Development Costs			
Consultant & Contractor Fees			
Engineering	$ 1,768	$ 1,505	$ 263
Environmental & Archeological	263	188	75
Stakeholder Engagement	82	76	6
Property Services	148	148	-
	2,260	1,917	343
FortisBC Internal			
Project Management	210	182	28
Engineering	311	263	48
Stakeholder Engagement	148	81	67
	670	526	143
Total	$ 2,930	$ 2,443	**$ 486**

As demonstrated in the table above, the majority of the increase is attributable to external engineering costs required to complete the revised scope of work for the route alignment for the Coquitlam Gate IP and the seismic stability for Fraser Gate IP projects. This includes costs associated with project design, traffic impact assessments and additional borehole analysis.

The additional costs for stakeholder engagement and environmental and archaeological work are attributable to the Lougheed route evaluation.

Parallel to external engineering costs, internal project management and engineering costs have also increased to complete the revised scope of work. This is due to providing direction to the various consultants and consequently reviewing and approving the work and preparing the Evidentiary Update. Internal stakeholder engagement includes conducting a public information session with respect to the Lougheed Highway route alignment in addition to third party utility stakeholder reviews and discussions with TransLink and BC Hydro.

6.2 Would the development costs have been lower if FEI had postponed the application for the CPCN until after it had determined whether or not the Lougheed route was acceptable?

Response:

The development costs would not have been lower if FEI had postponed the application for the CPCN until after it had determined whether or not the Lougheed route was acceptable. That is, the development effort to progress the route selection process and determine the Original Preferred route and New Preferred route would have been the same if FEI had postponed the CPCN Application until after it had determined whether or not the Lougheed route was acceptable.

6.2.1 If so, what savings could FEI have achieved by postponing the application until after it had completed all the analysis?

Response:

Please refer to the response to CEC IR 2.6.2.

7. Reference: Exhibit B-6, CEC 1.33.5

	$000's (2014$)		
	Alternative 4: 24 NPS @ 2070 kPa	Alternative 5: 36 NPS @ 1200 kPa	Alternative 6: 30 NPS @ 2070 kPa
Labour:CTS Station Mtnce. - PSV, Inspection Valve Mtnce., Instrument Mtnce., Meters Mtnce.	$ 15.1	$ 7.9	$ 15.1
Labour: Corrective Valve Mtnce.	10.0	10.0	10.0
Contractor: Vegetation Mtnce., Leak Survey	3.2	3.2	3.2
Facilities	27.6	-	27.6
Total O&M (2014$)	$ 55.9	$ 21.1	$ 55.9

7.1 Please provide any update to these costs based on revised project particulars.

Response:

There is no change to the forecast incremental O&M as a result of the changes in the Evidentiary Update from the original application or the Errata to the Application.

8. Reference: Exhibit B-6, CEC 1.39.2

> 39.2 Does FEI use in-line inspection tools for other pipelines in its system?
>
> **Response:**
>
> FEI uses in-line inspection tools in its transmission pressure pipeline system.

8.1 Please confirm that FEI does not currently use in-line inspection tools for Intermediate Pressure system or pipelines other than transmission pressure pipeline.

Response:

Confirmed.

8.1.1 If confirmed, please explain why not.

Response:

As stated in the response to BCUC IR 1.2.3, in-line inspection was not deemed a viable option for the existing Coquitlam Gate IP pipeline due to low operating pressures and the expected presence of inside diameter restrictions. Further, in response to BCUC IR 2.2.2, FEI has identified reasons as to why tethered in-line inspection was also not considered as a project alternative.

FEI confirms that the contributing factors as to why ILI has not been applied to the existing Coquitlam Gate IP pipeline also apply to other FEI IP pipelines. As such, FEI does not currently use ILI for its IP system or pipelines other than transmission pressure pipelines.

8.1.2 If confirmed, please explain why FEI believes it is necessary to design for the use of in-line inspection tools for this pipeline in this instance and not for other similar pipelines.

Response:

Over the lifespan of the new Coquitlam Gate IP pipeline, FEI expects ILI technology will maximize asset life by proactively identifying possible mitigation requirements and allow a longer-term planning horizon than otherwise possible. Due to the nature and quality of the data that can be collected, ILI enables more targeted mitigation planning and response than other currently available methods (e.g. above-ground cathodic protection and coating surveys, followed by excavations along the length of the pipeline). This in turn enables asset planning and risk mitigation decisions with minimal community disruption and optimal life-cycle cost.

As included in the response to BCUC IR 1.14.3, a "full bore" piping design (comprising full bore valves and sufficiently long-radius bends) is necessary to support the use of commissioning pigs (cleaning, gauging, caliper, etc.) for pipeline commissioning. As such, the incremental cost of supporting in-line inspection activities for this pipeline is for the launcher and receiver. As reported in the responses to BCUC IR 1.14.4, this cost is estimated to be $1.9 million (2014$).

In consideration of the benefits and incremental cost, FEI believes that it is appropriate to plan this particular project with the flexibility to leverage in-line inspection technology. Consistent with FEI's response to CEC IR 2.8.1.3, FEI considers the benefits and incremental cost when planning for ILI capability on other IP pipelines through case-by-case assessment. Currently, FEI has no similar end-to-end IP pipeline replacement projects planned.

8.1.3 Will FEI design for all its pipeline replacements in the future for inline inspection tools? Please explain why or why not.

Response:

For long lengths of IP pipeline replacement similar to the proposed Coquitlam Gate IP pipeline, FEI would consider designing such facilities with ILI capability, subject to technical feasibility and identified benefits to doing so.

However, where short-distance repairs/replacements are performed on existing IP pipelines, FEI considers cost along with the potential need and feasibility of running ILI tools in its decision to design for passage of an ILI tool. In these cases, the primary design considerations for accommodating ILI tools in the pipeline replacement segments are pipe diameter, wall thickness transitions and bend radius.

8.1.4 What is the incremental cost of designing for and using inline inspection tools in this instance?

Response:

Please refer to the response to CEC IR 2.8.1.2.

9. Reference: Exhibit B-6, CEC 1.39.2.2

> 39.2.2 If yes, please identify which tools FEI currently uses and why.
>
> **Response:**
>
> FEI runs both geometry and metal loss tools to inspect its transmission pressure pipeline system as part of FEI's Integrity Management Program. Geometry tools are run in the pipelines to locate, identify and size dents, ovalities, ripples, wrinkles, buckles, bends and bore restrictions. Metal loss tools are run in the pipeline to locate, identify and size metal loss (corrosion), manufacturing, and gouge anomalies. Both geometry and metal loss tools are run with inertial mapping systems and are used to map the pipeline in three dimensions and identify and size pipe movement (between successive inspection runs). These tools are also able to identify welds, fittings, and other appurtenances on the pipeline.

9.1 Does the use of inline inspection tools reduce O&M costs?

Response:

The use of in-line inspection tools does not reduce O&M costs. However, in addition to reducing failure risk, ILI generally enables targeted mitigation programs (O&M or Capital) that enable asset life extension.

9.1.1 If yes, please describe the types of savings and provide an estimate of the O&M savings that will accrue as a result of the use of inline inspection tools.

Response:

Please refer to the response to CEC IR 2.9.1.

10. Reference: Exhibit B-6, CEC 1.39.2.2

> 39.3 Will the pipeline design allow for all types of ILI tools to be used, or are there some that will not be available for use?
>
> **Response:**
>
> Currently only geometry and metal loss tools are available which can be run in gas pipelines that operate at 2070kPa. Tools with this low pressure capability are only available from a limited number of vendors and are relatively new to the market. Low pressure crack detection tools that can be run in gas pipelines are not currently available.

10.1 Is it expected that there will be increases in the availability of and/or reductions in price of inline inspection tools that are currently on the market such that the use of inline inspection tools will be more commonplace in pipelines that operate at 2070 kPa?

Response:

FEI anticipates that the demand for and use of ILI tools will continue to increase but is unable to determine if this will result in an increase or decrease in the price and availability of in-line inspection tools in the long term. FEI's recent experience with established ILI service providers is that increasing demand may result in price increases and/or negatively impact the availability of ILI tools over the near term.

With respect to ILI tools suitable for pipelines that operate at 2070 kPa potentially becoming more commonplace, FEI believes there is a strong possibility that this will occur over time. This is based on FEI's observations of technology advancement and recent commercialization efforts related to low-pressure/low-flow and self-propelled (robotic) ILI tools.

11. Reference: Exhibit B-6, CEC 1.45.4 And Exhibit B-1-6 page 20

> With regard to the NPS 20 Coquitlam Gate IP pipeline, the decision to abandon the pipeline in place was based on a number of factors including site specific considerations that limit the ability of the pipeline to be removed after commissioning of the replacement NPS 30 Coquitlam Gate IP pipeline.

> **2.1 *ORIGINAL PROPOSED COQUITLAM GATE IP ROUTE ALIGNMENT***
>
> Section 3.3.4 of the Application and supporting Appendix A-17 filed with the Application, describe the pipeline route evaluation process and the original proposed route alignment for the NPS 30 Coquitlam Gate IP pipeline. The routing process identified a route corridor based on the existing NPS 20 IP pipeline route alignment. An overview map of the route corridor (subdivided into seven Sections to facilitate the route evaluation process) is available in Exhibit B-1, Figure 3-7. The original proposed route aligns closely with the existing NPS 20 Coquitlam Gate IP pipeline, and the relative position of the original proposed route to the existing pipeline route is presented in Exhibit B-1, Table 3-11.

11.1 Please confirm that the new route for the new pipeline has little to no bearing on the viability of removing the original pipeline after decommissioning.

Response:

Confirmed. The new preferred pipeline route in route corridor Sections 5 and 6 has little to no bearing on the viability of removing the original pipeline after decommissioning.

11.1.1 If not confirmed, please discuss any factors influencing the viability of removing the original pipeline with the new route selection.

Response:

Please refer to the response to CEC IR 2.11.1.

12. Reference: Exhibit B-6, CEC 1.45.7 and 1.45.10

Response:

FEI is committed to responsible abandonment of the pipeline. FEI has concluded that, after commissioning of the replacement NPS 30 pipeline, it has no further use for the NPS 20 pipeline as a carrier for pressurized gas or as a conduit or casing for pressurized gas or other facilities. Therefore, as it is at FEI's discretion to discontinue cathodic protection and maintenance schedules, and there is no reason for continuing cathodic protection or maintenance activities on the pipeline, these activities will cease after abandonment. CSA Z662, Clause 10.16.1 states:

> *"The decision to abandon a section of piping, in place or through removal, shall be made on the basis of an assessment that includes consideration of current and future land use and the potential for safety hazards and environmental damage to be created by ground subsidence, soil contamination, groundwater contamination, erosion, and the creation of water conduits."*

- No cathodic protection: the abandoned pipeline will be subject to natural corrosion rates, which will differ along the length of the pipeline depending on soil type, coating condition, ground water presence and rate of movement, temperature, presence of microbiological organisms, and other possible contributors such as aeration of the soil surrounding the pipe.
- Stray current corrosion: the abandoned pipeline could be subject to stray current corrosion as it will act as a low resistance path for electrical currents in the earth from sources such as CP systems protecting other nearby utilities. To mitigate this risk, the abandoned pipeline will be sectioned into shorter lengths.

12.1 Is it possible to continue cathodic protection after the abandoned pipeline is sectioned and the decommissioning process is in place?

Response:

It is technically possible to continue cathodic protection after the abandoned pipeline is sectioned. However, it is not considered feasible to utilize the existing impressed current cathodic protection system for this purpose as it would negatively impact the ability of the CP system to adequately protect the new NPS 30 IP pipeline. Negative impacts would include inadequate CP system capacity to protect both pipelines, expected increased CP system downtime for the new pipeline due to issues impacting the CP system that will inevitably arise on both pipelines, and increased maintenance.

In order to continue cathodic protection of the sectioned and abandoned NPS 20 IP pipeline, it would have to be made electrically contiguous using bonding cables to ensure electrical

continuity through the pipe sections, and a dedicated CP system installed. Failure of one of these bonding cables would result in an increased potential for stray electrical currents from the CP system causing accelerated corrosion on the abandoned pipeline and potentially other nearby metallic utilities (including the new NPS 30 IP pipeline, where installed in close proximity). In addition, the continuance of cathodic protection in any form would require ongoing maintenance and inspection.

As FEI has not identified further use for the pipeline, the cost associated with continuing cathodic protection of the abandoned pipeline would have no worthwhile benefit. Therefore, FEI has concluded that all maintenance activities, including cathodic protection, for the abandoned pipeline will be discontinued following abandonment as described in the Application.

Costs to install a dedicated CP system for the abandoned pipeline could exceed $200 thousand, depending on detailed abandonment strategy (i.e. number of pipeline sections and installation of monitoring points at each bond wire) and property costs associated with buried anode installations. Cost to repair failures of underground bonding cables connecting abandoned pipe segments would be expected to cost approximately $10 thousand per occurrence. It is estimated that annual operation and maintenance costs for cathodic protection of the abandoned pipeline could be expected to exceed $30 thousand per year.

12.1.1 If yes, what would be the negative impacts of continuing cathodic protection? Please discuss and provide any quantitative assessments of costs that could accrue.

Response:

Please refer to the response to CEC IR 2.12.1.

13. Reference: Exhibit B-1-6, page 19

> FEI has undertaken further study of soil conditions and seismic analysis since filing its March 12, 2015 responses to Commission IR1, as indicated in the response to BCUC IR 1.31.4.
>
> Based on additional review of seismic susceptibility with experts at Test Hole AH95-2, FEI has determined that earthquake-induced hazards do not pose a threat to the pipeline from the location of Test Hole AH95-2 onward to the west and north. As a result, further test holes were conducted to determine where the soil conditions change from the conditions at Fraser Gate station to those at Section B-B'. FEI also initiated further seismic analysis to determine the length of pipeline replacement necessary within the competent soil zone such that an unacceptable stress is not incurred at the transition between the new and existing pipe. Further described in section 3.1, the pipe replacement for planning purposes was extended 80 metres into the competent soil zone to maintain stresses within acceptable limits.
>
> The additional subsurface information collected in March and April 2015 in conjunction with the seismic analysis enabled a subsequent optimization of the extent of the pipeline that needs to be replaced to meet the seismic demand based on technical considerations. As a result of this new information, FEI has updated the Project description, scope and capital cost estimate. The revised Fraser Gate IP Project scope presented in this Evidentiary Update now involves the replacement of approximately 280 metres of NPS 30 pipeline operating at 1200 kPa.

13.1 Does the additional study of soil conditions and seismic analysis or other new information revise the vulnerability or riskiness of the Fraser Gate site, either independently or relative to other site (sites) requiring seismic upgrading or other work on the FEI system? Please explain why or why not.

Response:

D.G. Honegger Consulting provides the following response:

The revised understanding of the extent of soils susceptible to ground displacement does not alter the estimates of the likelihood of a seismic event leading to a full bore rupture. This conclusion is based upon the fact that the location of greatest pipeline vulnerability is at the margins of the potential ground displacement zone. While the margin of a potential ground failure has moved approximately 45 metres to the east, the potential for failure at the new margin is unchanged.

FEI further adds the following comment:

Based on the above, the additional study does not revise the assessment of the vulnerability or riskiness of the Fraser Gate site. Due to the number of customers impacted by a failure of the Fraser Gate IP pipeline and the nearby residences, the Fraser Gate IP pipeline remains a priority for seismic upgrading.

13.1.1 If yes, please provide a discussion of how the new information changes the expected risks from the Fraser Gate site.

Response:

Please refer to the response to CEC IR 2.13.1.

14. Reference: Exhibit B-6, CEC 1.52.4 and 1.52.5 and 1.54.1

> Factors considered in selecting a schedule include:
>
> - Estimated probability of failure;
> - Estimated consequences of failure (safety, economic);
> - Ease or difficulty of determining or implementing a solution to mitigate the risk;
> - Ease or difficulty of repair, including duration of repair, in the event of a seismic-related failure; and
> - Financial considerations, including impact to other identified system work.
>
> The schedule essentially translates into a prioritization for implementation of mitigation projects.
>
> In accordance with the considerations identified in response to CEC IR 1.52.4, FEI has scheduled the Fraser Gate IP mitigation concurrent with the construction of the proposed NPS 30 Coquitlam Gate IP pipeline due to the following factors:
>
> - Identified pipeline vulnerability to a 1:2475 seismic event, as further discussed in Section 4.1.2.1 of the Application (Exhibit B-1);
> - Significant consequences of failure (both safety-related and economic-related), as further discussed in Sections 4.1.2.2 and 4.1.2.3 of the Application; and
> - An opportunity for improved constructability of a pipe replacement, as outlined in response to CEC IR 1.65.1.3.
>
> **Response:**
>
> The 1:2475 seismic level was evaluated to enable an assessment of pipeline compliance with FEI's seismic performance requirement. The rationale for this period is contained in FEI's design standard DES 09-02, included as Appendix A-28 (Exhibit B-1-1).
>
> The 1:475 seismic level was evaluated to provide an additional vantage point from which to assess relative vulnerability between sites, as well as to enable comparison with prior seismic assessment practices for FEI pipelines.

14.1 Please identify the relative vulnerability of the Fraser Gate IP site and discuss whether or not the relative vulnerability has changed due to FEI's recent revised assessments.

Response:

Please refer to the response to CEC IR 2.13.1. As the vulnerability has not changed, the relative vulnerability also remains unchanged.

14.2 If the pipeline was to be addressed independently of the Coquitlam Gate project, would there be other areas of greater priority than the Fraser Gate project?

Response:

No, the priority of the Fraser Gate IP project is unchanged if it were to be addressed independently of the Coquitlam Gate IP project.

14.2.1 If yes, please provide a list of the other projects that would be considered of higher priority than the Fraser Gate project and provide the probabilities of failure and the estimated consequences of failure of each and the proposed timing for dealing with those.

Response:

Please refer to the response to CEC IR 2.14.2.

15. Reference: Exhibit B-6, CEC 1.70.4

> 70.4 Why does the rate of increase for the leak frequency decline over time as a percentage increase even though the frequency of leaks rate increases in absolute terms over time?
>
> **Response:**
>
> DRAS provides the following response:
>
> The analysis that was reported in Exhibit B-1-1, Appendix A-1, employed reliability methods, based on corrosion feature sampling distributions obtained from an excavation program. It did not incorporate a mechanistic model that predicted corrosion behaviour based on the kinetics of corrosion reactions. Because the results of the analysis as presented in Table 1 of that report do not incorporate any underlying mechanistic basis for the results, it is not possible to ascribe any reason for the predicted behaviour. As such, it is not possible to provide an answer to the question posed in this information request.

15.1 Would an appropriate mechanistic model likely exhibit the anomaly referenced in the original question?

Response:

Dynamic Risk Assessment Systems, Inc. provides the following response:

The incidence and rate of external corrosion on a pipeline is a function of multiple interacting variables, many of which cannot be known with a great deal of certainty along the length of a pipeline. These variables include coating condition, local ground chemistry, local soil stress, the presence of localized anodic zones within the steel microstructure, local soil resistivity over time, local variations in ground water table over time, presence of localized aeration cells over time, localized presence and effect of ground microbial activity, etc. There is no known mechanistic model that can assimilate all these variables along the length of a pipeline to predict the kinetics of corrosion reactions and accurately predict the occurrence of failures.

As described in Exhibit B-1-1, Appendix A-1, the reliability model that was employed uses a statistical approach that utilizes excavation data that serves to provide an observational basis as to how corrosion is manifesting itself along the pipeline in terms of corrosion feature incidence rate, corrosion size distributions, and corrosion rate distributions. The reliability analysis then employs these data to model how the pipeline materials and design respond to the degradation processes observed, and to establish an understanding of how structural reliability changes over time through the use of limit state models. The failure rates predicted using this approach are provided in Table 1, Exhibit B-1-1, Appendix A-1.

Any discussion on the underlying mechanistic reasons behind trends of failure rate over time would constitute speculation, however we would not characterize the trend presented in Table

1 1, Exhibit B-1-1, Appendix A-1 as an ‘anomaly’ (as cited in the question). As provided in the
2 response to CEC IR 1.70.1, the predicted leak rate over time can best and most simply be
3 described as curvilinear, with a slope that increases with time.

16. Reference: Exhibit B-6, CEC 1.76.1

> **Response:**
>
> The base O&M embedded in the PBR formula does not account for the forecast level of O&M that would be incurred in the absence of these Projects. Thus, on a formulaic O&M basis there are no avoided costs associated with the Coquitlam IP or Fraser Gate IP Projects.
>
> Please refer to the responses to BCUC IRs 1.7.1, 1.24.1, 1.24.1.1 and 1.24.2 for avoided incremental O&M costs associated with the Coquitlam Gate IP Project as compared to the status quo.
>
> There are no avoided O&M costs associated with the Fraser Gate IP Project as compared to the status quo.

16.1 In the absence of BCUC approval, or deferral of either project, will the O&M expense be incurred under the PBR formula or would FEI account for the expense in another manner? Please explain.

Response:

If the CPCN was **not** granted, there would be no incremental O&M and no impact on the PBR formula associated with the Projects. If the Commission was to **approve** the CPCN but the timing of the projects was delayed, the timing of the project related O&M would also be delayed, and the delay of the project O&M would have no impact on the PBR formula.

However, in either case, and as described in the Application, incremental leak survey and repair costs are expected to be incurred if the Coquitlam Gate IP Project does not proceed as expected. To the extent that these costs do not qualify for exogenous factor treatment and could not be accommodated within the formula amount each year of the PBR, they would affect the earnings sharing mechanism.

17. Reference: Exhibit B-6, CEC 1.79.2

Response:

FEI notes that the WACC and ROE are not used in the determination of the discount rate for the purposes of the Appendix A-5.

The requested information, however, is as follows:

- Inflation – Assumptions regarding inflation rates and the Company's capital structure and cost of capital were not used in Appendix A-5, The Economic Consequence Analysis. The following requested information on inflation rates and FEI WACC which were used in Confidential Appendix E are as follows:

Assumptions for Inflation Rates

	2013	2014	2015	2016	2017	2018	2019	
CPI Rate	0.93%	1.46%	1.30%	2.42%	2.34%	2.36%	2.30%	2.30% for all years thereafter
Material Inflation	2.00%	2.00% for all years thereafter						
Labour Inflation	3.00%	3.00% for all years thereafter						
Capital inflation	4.50%	4.50% for all years thereafter						

- Capital Structure & Cost of Capital - Please refer to the response to BCUC IR 1.22.9 regarding the capital structure, embedded rates of return and the Company's after-tax WACC.

17.1 Please confirm that these forecasts for CPI do not explicitly assume a recessionary period in the timeframe over which the forecasts apply.

Response:

The forecast for CPI is from third party sources and FEI does not know if they explicitly assume a recessionary period.

18. Reference: Exhibit B-1-6, page 25, Exhibit B-6, CEC 1.94.1

Table 4-1: Updated Summary of Forecast Capital and Deferred Costs ($millions)

Particular	2014$	As-Spent	AFUDC	Tax Offset	Total
Coquitlam Gate IP Project	195.517	226.306	12.235		238.541
Fraser Gate IP Project	7.378	8.572	0.419		8.990
Total Addition to Plant	202.895	234.878	12.654		247.531
Abandonment/Demolition Costs[11]	3.536	4.169	0.115		4.284
Total Projects Capital Cost	206.431	239.047	12.769		251.815
LMIPSU Development Cost	2.920	2.929	0.215	(0.762)	2.382
LMIPSU Application Cost	1.307	1.307	0.080	(0.340)	1.047
Total	**210.658**	**243.283**	**13.064**	**(1.102)**	**255.244**

Table 5-1: Summary of Forecast Capital and Deferred Costs ($millions)

Particular	2014$	As-Spent	AFUDC	Tax Offset	Total
Coquitlam Gate IP Project	201.282	228.813	12.455		241.268
Fraser Gate IP Project	14.855	17.231	0.876		18.107
Total Addition to Plant	216.137	246.044	13.331		259.375
Abandonment/Demolition Costs[36]	3.540	4.172	0.117		4.289
Total Projects Capital Cost	219.677	250.216	13.448		263.664
LMIPSU Development Cost	2.441	2.442	0.197	(0.635)	2.004
LMIPSU Application Cost	1.307	1.307	0.080	(0.340)	1.047
Total	223.425	253.965	13.725	(0.975)	266.715

94.1 Please provide the annual impact to each class of Commercial customers from each project in 2019.

Response:

Based on the approved commodity and common delivery rates effective January 1, 2015, the approximate annual bill impact for small commercial customers is estimated to be approximately 1.4% and 0.1% from the Coquitlam Gate IP Project and the Fraser Gate IP Project respectively. For large commercial sales customers the approximate annual bill impact is estimated to be approximately 1.6% and 0.1% from the Coquitlam Gate IP Project and the Fraser Gate IP Project respectively. Due to their individual commodity arrangments, FEI cannot provide a comparable estimated annual bill impact for Transportation customers; however, it is reasonable to expect that these customers would have an annual bill impact similar to large commercial sales customers.

The sum of the results from the Coquitlam IP Project and the Fraser Gate IP Project is the same as in FEI's response to CEC IR 1.7.1.

18.1 Please provide the impact to commercial rate classes based on the revised project particulars in Table 4-1 of the Evidentiary Update.

Response:

Based on the approved natural gas commodity and common delivery rates effective January 1, 2015, the approximate annual bill impact for small commercial customers is estimated to be approximately 1.4% and 0.0% from the Coquitlam Gate IP Project and the Fraser Gate IP Project respectively. For large commercial sales customers the approximate annual bill impact is estimated to be approximately 1.6% and 0.1% from the Coquitlam Gate IP Project and the Fraser Gate IP Project respectively. Due to their individual natural gas commodity arrangements, FEI cannot provide a comparable estimated annual bill impact for Transportation customers; however, it is reasonable to expect that these customers would have an annual bill impact similar to large commercial sales customers.

For the sum of the results together from the Coquitlam Gate IP Project and the Fraser Gate IP Project based on approved natural gas commodity and common delivery rates effective January 1, 2015, the approximate annual bill impact for small commercial customers is forecast to be approximately 1.4% and for large commercial sales customers to be approximately 1.6%.

19. Reference: Exhibit B-4 BCUC 1.1.9 and 1.24.1 and Exhibit 1-5, FEI PBR Evidentiary Update page 3 and FEI PBR Evidentiary Update Attachment 5 page 4

1.1.9 What was the annual O&M expense for the NPS 20 pipeline for each of the past five years, and how much of this expense was required for additional work related to the coating disbondment issue, such as additional leak surveys, inspections and repairs?

Response:

The table below provides the requested information.

Year	Incremental Inspections (Excavations), $	Incremental Leak Repairs, $	Incremental Leak Surveys, $	Routine O&M, $	Total O&M, $	Incremental O&M Due to Integrity Concerns Arising From Field-Applied Coating Disbondment
2010	0	73,822		1,515	**75,337**	**73,822**
2011	1,039,797	189,489		5,303	**1,234,588**	**1,229,286**
2012	157,156	85,298		2,655	**245,109**	**242,454**
2013	463,000	775,598	11,048	6,152	**1,255,798**	**1,249,646**
2014	0	62,715	36,028	4,882	**103,624**	**98,742**
Total	**1,659,953**	**1,186,921**	**53,596**	**20,532**	**2,921,002**	**2,900,470**

24.1 Please provide the 2013–2014 leak detection and repair costs for the existing Coquitlam Gate IP by year and confirm that these costs were included in the 2013 Approved and 2014 FEI formula based O&M spending envelope.

Response:

Not confirmed. As outlined in the Evidentiary Update filed on February 21, 2014, the 2013 base O&M did not include the 2013 actual and unplanned leak repair and survey costs provided in the table below.[22] However, FEI confirms that $69.2 million of operations O&M was embedded in the 2013 base for the 2014-2019 PBR and this amount would have included the standard annual leak survey costs for the entire FEI distribution system.[23] Thus, it is important to note that the 2013 base O&M embedded in the PBR formula, which will only be escalated or de-escalated each year according to the approved inflation, productivity and growth factors does not consider the higher leak repair or survey costs experienced in 2013 or higher costs in the future that would likely be incurred with respect to the NPS20 Coquitlam Gate IP pipeline in absence of this Project.

[22] Exhibit B-1-5, FEI 2014-2018 PBR Plan Application Evidentiary Update dated February 21, 2014, p.3 and approved by Order G-138-14.

[23] Exhibit B-1-5, FEI 2014-2018 PBR Plan Application Evidentiary Update dated February 21, 2014, Attachment 5, p.4.

Table C3-1: Departmental O&M Review ($ thousands)

	2010 Actual	2011 Actual	2012 Actual	2012 Approved	2013 Actual	2013 Approved
Operations	54,444	55,756	59,806	58,599	64,226	63,189
Customer Service [1]	53,278	56,575	40,737	49,115	36,630	52,452
Energy Solutions & External Relations	14,636	15,456	18,075	17,509	19,022	18,181
Energy Supply & Resource Dev	2,075	3,409	3,488	3,664	3,937	3,738
Information Technology	17,320	18,654	23,442	24,553	24,249	25,379
Engineering Services & PM	13,566	14,329	13,599	16,705	15,297	16,956
Operations Support	10,916	10,580	11,038	12,132	11,718	12,990
Facilities	7,329	6,835	9,563	9,509	9,230	9,259
Environment Health & Safety	2,427	2,445	2,481	2,749	2,680	2,999
Finance & Regulatory Services	12,177	12,064	12,149	13,129	12,872	14,184
Human Resources	8,823	8,170	8,610	8,983	8,305	8,511
Governance	7,368	7,895	7,366	7,602	7,995	7,935
Corporate	2,158	1,439	1,915	2,743	(247)	230
	206,518	213,606	212,269	226,993	215,914	236,003

1 Excludes deferred Customer Service O&M for 2012 and 2013 Actual

Table C3-2: 2013 Departmental O&M Reconciliation ($ thousand)

	2013 Approved	Productivity (Sustainable Savings)	2013 Sustainable	PST (full year)	2013 Deferrals BCUC Fees & Insurance	Accounting Changes Pension/OPEI O&M portion	Pension/OPEI retiree portio	Software Fees	2013 Base
Operations	63,189	540	63,729	137		3,667	1,704		69,236
Customer Service 1	52,452	(12,498)	39,954	18		1,744	810		42,527
Energy Solutions & External Relations	18,181	1,034	19,215	23		1,012	470		20,721
Energy Supply & Resource Dev	3,738	262	4,000	7		295	137		4,440
Information Technology	25,379	(1,162)	24,217	340		691	321	(1,800)	23,768
Engineering Services & PM	16,956	(1,500)	15,456	58		1,027	477		17,018
Operations Support	12,990	(1,123)	11,867	69		802	373		13,111
Facilities	9,259	324	9,583	40		147	68		9,838
Environment Health & Safety	2,999	(319)	2,681	12		123	57		2,872
Finance & Regulatory Services	14,184	(1,086)	13,099	3	923	597	277		14,899
Human Resources	8,511	(53)	8,458	22		487	226		9,192
Governance	7,935	-	7,935	-	93	-	-		8,028
Corporate	230	(587)	(358)	34		13	(5,851)		(6,161)
	236,003	(16,167)	219,836	762	1,016	10,605	(930)	(1,800)	229,489

1 2013 Projection excludes Customer Service deferred O&M

Operations:

The additional O&M in the Operations department in 2013 was primarily due to higher activity levels for leak repairs TPIP activities (cathodic protection evaluations, pipe integrity assessments, natural hazards) and vegetation management. Of the $728 thousand in higher spending realized, $220 thousand is required to be carried forward to the PBR Period to manage higher levels of vegetation management activities that are forecast over the upcoming years.

19.1 Please provide further explanation as to how the cited evidence illustrates that the 2013 O&M PBR base specifically excluded all the Incremental O&M costs that occurred in 2013 as a result of the coating disbondment issue on the pipeline in question.

Response:

The 2013 O&M Base was determined as the 2013 Approved O&M less net sustainable savings, which for some departments, was a net cost.

In Exhibit B-1 of the PBR proceeding, Table C3-2 showed the reconciliation of the Operations department O&M for the 2013 O&M base. Specifically, FEI started with the 2013 Approved O&M, adjusted for net sustainable costs of $320 thousand[2], and then made other accounting adjustments that resulted in the 2013 Base.

The 2013 Approved, which was forecast in early 2011, was based on a three year average of actual costs incurred in 2008, 2009, and 2010 and therefore did not include any 2011 or 2012 actual costs. The Coquitlam Gate IP 2010 costs of $74 thousand included in the table provided in the response to BCUC IR 1.1.9 were known at the time. As such, there would have been approximately $25 thousand of Coquitlam Gate IP leak repair costs embedded in the 2013 Approved (one-third of the $74 thousand).

The $320 thousand increase to the Approved was discussed on pages 138 to 140 of Exhibit B-1, and none of the explanations for the increase were related to the Coquitlam Gate IP pipeline.

In Exhibit B-1-5, FEI submitted an Evidentiary Update, which further increased the Operations department net sustainable costs by $220 thousand. The explanation provided is as set out in the preamble to this question – the $220 thousand was for higher levels of vegetation management activities, and was not for the Coquitlam Gate IP pipeline.

Taken together, it is clear from the evidence cited above that although the 2013 Approved O&M would have been $25 thousand lower without the Coquitlam IP leak repair costs, there were no further incremental costs included in either the original $320 thousand net sustainable cost or the further $220 thousand increase to the net sustainable cost used in determining the 2013 O&M Base.

As stated in the response to BCUC IR 1.24.1, the 2013 Base did not consider the higher leak repair or survey costs experienced in 2013 or higher costs in the future that would likely be incurred with respect to the NPS20 Coquitlam Gate IP pipeline in the absence of this Project. However, there was an implicit consideration of the $25 thousand of costs that were embedded in developing the 2013 Approved. FEI acknowledges that under the terms of the PBR plan, the Commission could consider whether an adjustment to the formula O&M is required as a result of a CPCN. In this case, since the avoided leak repair costs would not be realized until at least 2018, and FEI has forecast additional O&M associated with this CPCN of $26 thousand in 2018 and $53 thousand in 2019 for which it has not proposed an increase to the base O&M, FEI has

[2] As updated in Table C3-2 provided in the preamble to be $540 thousand (the original $320 thousand from Exhibit B-1 plus the further $220 thousand discussed below from Exhibit B-1-5)

likewise not proposed a reduction of the Base O&M for the embedded $25 thousand in avoided leak repair costs.

No adjustment to the PBR O&M Base is required as a result of this CPCN application.

19.2 Please elaborate on whether or not the history of leak repairs occurring in 2012, 2011, 2010 and earlier, and the associated costs would have effectively been embedded as a part of the 2013 Approved in the 2012-2013 RRA due to analysis based on variance, or if all the incremental costs were explicitly excluded in each year such that only a normal level was incorporated in the 2012-2013 RRA and therefore incorporated into the PBR base.

Response:

Please refer to the response to CEC IR 2.19.1.

19.3 What is the process under PBR when a CPCN results in O&M savings that were effectively included in the O&M base?

Response:

As stated on page 182 of the PBR Decision:

"The Panel recommends that, if capital associated with a particular CPCN is excluded from the formula, the CPCN review of that project should include an assessment by the Commission of any potential impact of the project on O&M. If appropriate, an adjustment to the formula based O&M spending envelope should then be made."

19.4 Please provide FEI's views as to whether or not the Commission would likely have considered all the actual O&M expenditures including the cost of leak

repairs for a period of at least five years in determining the suitability of the 2013 Approved for the PBR base.

Response:

There is an extensive record in the PBR proceeding on the establishment of the 2013 base for the 2014-2019 PBR, based upon which the Commission has made a decision. FEI declines to speculate, as the decision speaks for itself.

19.5 Please confirm or otherwise clarify that of the incremental costs of $1.249646 million incurred as a result of the disbonding in 2013 only $508 thousand ($728 thousand less $220 thousand for increased vegetation in the future) would appear to have been excluded from the 2013 Approved based on the evidentiary update and approved for use in PBR by Order G-138-14.

Response:

Not confirmed. The $1.25 million identified in the response to BCUC IR 1.1.1.9 was the incremental cost for coating disbondment on the NPS 20 pipeline in 2013. Please refer to the response to CEC IR 2.19.1 for a discussion of what was included in the 2013 Base.

19.6 Please confirm that the $508 thousand in 2013 Actual expenditures above the 2013 Approved that were not accounted for by increased vegetation management would have been attributable to expenses across the entire FEI system and were not identified as being directly related to the project presently under consideration.

Response:

It is accurate that the total variance between actual and approved 2013 costs would have been attributable to expenses and savings across the entire FEI system. Please also refer to the response to CEC IRs 2.19.1 and 2.19.5.

19.6.1 If not confirmed, please explain why not.

Response:

Please refer to the response to CEC IR 2.19.6.

19.7 Please confirm or provide evidence to the contrary, that in establishing the PBR base (using 2013 Approved) there was no explicit analysis removing all the incremental O&M costs ($1.249646 million)experienced due to increased work related to the disbonding from the Actual experienced with any adjustment to the 2013 Approved.

Response:

Please refer to the response to CEC IR 2.19.1.

19.8 Is it FEI's position that none of the $1.249646 million in incremental O&M costs would have been effectively included in the PBR base using the 2013 Approved? Please provide a rationale.

Response:

Please refer to the response to CEC IR 2.19.1.

19.9 Please discuss whether or not it would be reasonable to consider that of the $1.249646 in incremental O&M spending effectively

Response:

FEI has not provided a response as the question was withdrawn at the request of CEC.

20. Reference: Exhibit B-4, BCUC 1.24.1

> 24.1 Please provide the 2013–2014 leak detection and repair costs for the existing Coquitlam Gate IP by year and confirm that these costs were included in the 2013 Approved and 2014 FEI formula based O&M spending envelope.
>
> **Response:**
>
> Not confirmed. As outlined in the Evidentiary Update filed on February 21, 2014, the 2013 base O&M did not include the 2013 actual and unplanned leak repair and survey costs provided in the table below.[22] However, FEI confirms that $69.2 million of operations O&M was embedded in the 2013 base for the 2014-2019 PBR and this amount would have included the standard annual leak survey costs for the entire FEI distribution system.[23] Thus, it is important to note that the 2013 base O&M embedded in the PBR formula, which will only be escalated or de-escalated each year according to the approved inflation, productivity and growth factors does not consider the higher leak repair or survey costs experienced in 2013 or higher costs in the future that would likely be incurred with respect to the NPS20 Coquitlam Gate IP pipeline in absence of this Project.

20.1 Did FEI raise the issue of the potential of the increasing leak repair costs related to the coating disbondment at the time of the PBR being negatively impacted by the O&M formula which would only be escalated by the formula at the time of the PBR?

Response:

Potential increased leak repair costs related to this specific coating disbondment issue were not identified as an issue that needed to be addressed as part of the O&M Base in the 2014-2018 PBR Application process.

The extent of the leak repairs was not known at the time of the June 2013 Application as six of the major leaks in 2013 occurred in the last half of the year. Further, the Dynamic Risk Quantitative Reliability Assessment that projected a significant and increasing leak frequency for the pipeline, included as Appendix A-1 of the Application, was not finalized until July 4, 2014.

Although FEI was aware of the increased leak repair costs that occurred in 2013 at the time of the Evidentiary Update which was filed in February of 2014, the base was not adjusted as FEI had initiated its preparation of a CPCN to address the integrity concerns associated with the existing NPS 20 Coquitlam Gate IP pipeline.

20.1.1 If yes, please provide the appropriate references.

Response:

Please refer to the preamble to CEC IR 2.19.1 which contains an excerpt from page 3 of FEI's Evidentiary Update in the PBR proceeding, where FEI stated that "the additional O&M in the Operations department in 2013 was primarily due to higher activity levels for leak repairs […]".

As discussed in the response to that same IR, although FEI referenced the higher leak repairs that had occurred in 2013 in its Evidentiary Update, the 2013 O&M Base was not increased for these higher costs.

20.1.2 If not, please explain why not.

Response:

Please refer to the response to CEC IR 2.20.1.

21. Reference: Exhibit B-1-8 Appendix E-4, page 2

> Subsequent to the Errata to the Application filing, and during review of the original Alternative 4 cost estimate for the new proposed Lougheed Highway alignment, the allowance for contractors overhead and markup was determined to be too low. Therefore, the revised Alternative 4 estimate has been amended to reflect the appropriate estimated amount for contractors overhead and markup. As a result, Alternative 4 is still less than the revised Alternative 6, but the margin between these two alternatives has reduced. Detailed financial schedules for Alternative 4 are included in Confidential Appendix E-2-1-a.

21.1 Please provide the original and revised allowance for contractors overhead and mark-up.

Response:

This response addresses CEC IRs 2.21.1, 2.21.2, 2.21.3, and 2.21.3.1.

The original Alternative 4 (NPS 24 at 2070 kPa) AACE Class 4 cost estimate included with the Application had no allowance for contractors overhead and mark-up included in the estimate. This was an oversight during development of the original AACE Class 4 estimate and was corrected with the revised AACE Class 4 estimate submitted as part of the Evidentiary Update. The revised AACE Class 4 estimate for Alternative 4 includes an allowance of approximately $7 million for contractors overhead and mark-up.

Please note that in the response to BCUC IR 2.15.1, FEI has updated the AACE Class 4 estimate for Alternative 4 included in the Evidentiary Update with an AACE Class 3 estimate; variances between the new Class 3 estimate and the Class 4 estimate are also explained in that response. The financial and operational risk comparison of Alternative 4 (NPS 24 at 2070 kPa) and Alternative 6 (NPS 30 at 2070 kPa) has also been updated using the Alternative 4 AACE Class 3 estimate and is presented in BCUC IR 2.15.2.

21.2 Please discuss what situation occurred that resulted in the original cost estimate being too low.

Response:

Please refer to the response to CEC IR 2.21.1.

21.3 Does FEI anticipate that there could be further changes to any cost estimates beyond that which would be anticipated from a class 4 Cost Estimate? Please explain.

Response:

Please refer to the response to CEC IR 2.21.1.

21.3.1 If so, please identify all those cost areas which are subject to potential changes and explain why.

Response:

Please refer to the response to CEC IR 2.21.1.

22. Reference: Exhibit B-1-8 page 10

> Lougheed Highway Option A would incur lower traffic impact compared to Option B; Option A exits off Lougheed Highway onto Madison Avenue while Option B continues west along Lougheed Highway to Boundary Road and then north to East 1st Avenue. The traffic impacts would be managed via advanced warning, media messaging, traffic diversions and road users would have the option to plan alternative routes and potentially use alternative modes of public transport. Lougheed Highway Option A would however potentially impact more business access routes and parking along Madison Avenue, Douglas Road and Graveley Street compared to Option B. The business impacts would be managed through advanced consultation with business owners, construction staging, and minimizing access disruption. However, because some business impact would be unavoidable Lougheed Highway Option A is considered a higher impact route choice compared to Option B which is considered a moderate impact route choice.
>
> - Original Preferred Option: low impact, better route choice (4)
> - Lougheed Highway Option A: high negative impact, poor choice (2)
> - Lougheed Highway Option B: moderate impact, good route choice (3)

22.1 For how long would businesses expect access disruption?

Response:

The length of time that businesses can expect to be disturbed will vary depending on a number of factors, such as:

1. Whether or not pipeline construction is in an area congested with other underground utilities which would result in slower construction;
2. Whether or not the pipeline construction is immediately adjacent to the business accesses; and
3. Whether or not the nature of the business allows for service vehicles to travel across metal road plates.

The sequence of construction associated with the Coquitlam Gate IP pipeline will include: 1) locate existing buried utilities and cut pavement, 2) excavate trench, 3) install pipe and tie-in, and 4) backfill trench and repave. Steps 2, 3 and 4 will involve the core pipeline construction activities which would potentially impact the business access during execution where the pipeline is located in the adjacent roadway to the business access. Typically, in built up urban locations, where there are multiple adjacent businesses, there would also be a higher density of buried utilities. Therefore, the length of pipeline trench excavated would be shorter to facilitate installation of the pipeline while avoiding the buried utilities. The shorter length of open trench would result in a lower number of business accesses impacted at any one time. It is estimated

that businesses can expect to be disturbed between 3 days and 5 days. In some cases the impacts could be longer depending upon the construction complexities and challenges.

22.2 What options exist for business owners to manage the disruptions during construction? Please discuss and confirm that such options will be presented to business owners during consultation.

Response:

Engagement with business owners is underway and ongoing, with the purpose of learning the nature of their business and access requirements for both customers and pick-up/delivery of commercial goods. As FEI moves toward detailed design of the Project, the impact to access and egress that businesses and commercial operations rely on will become more apparent; i.e. FEI will be able to communicate more information with respect to the exact location of the installation, how long the pipeline will take to construct near the business, and other construction impacts. An ongoing dialogue with businesses will be necessary to address specific concerns and mitigate these various disruptions where possible. This will also give businesses the opportunity to mitigate impacts on their own by scheduling the pick-up / delivery of commercial goods at times that will coordinate both with Project construction as well as their own business requirements.

Also, FEI will work with some businesses to place temporary signage to highlight pedestrian access and temporary parking options. The Company will communicate with the pipeline contractor and work closely with both the contractor and affected businesses to ensure agreements and understandings related to business access are fulfilled. FEI Community Relations representatives will be available to business owners/operators throughout the entire construction period and afterwards.

23. Reference: Exhibit B-1-8 page 18 and Appendix E-4 page 2, and Exhibit B-1-6 page 40

Table 1-2: Springer Ave. to Boundary Rd. Route Options Screening Matrix

Metro IP Route Selection: Broadway and Springer to Boundary Road (Burnaby West)

Option		Originally Preferred Option		Lougheed Highway Option A		Lougheed Highway Option B	
Length (m)		3100		2900		3200	
Impact and Vulnerability Considerations	Weight	Springer Ave + Halifax St + Delta Ave + Highlawn Dr + Midlawn Dr + Fairlawn Dr + Brentlawn Dr + Graveley St		Lougheed Hwy + Madison Ave+ Douglas Rd + Graveley St		Lougheed Hwy + Boundary Rd + E 1st Ave	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Community/Stakeholder							
Health and Safety	15	3	45	3	45	2	30
Socio-Economic	15	4	60	2	30	3	45
Land Ownership and Use	5	4	20	4	20	3	15
Environmental							
Ecology	5	4	20	3	15	2	10
Cultural Heritage	5	5	25	5	25	5	25
Human Environment	15	2	30	4	60	4	60
Engineering/Technical							
Engineering/Design	5	4	20	4	20	2	10
Construction	10	4	40	5	50	3	30
Operation	10	3	30	3	30	2	20
System interface	5	3	15	3	15	4	20
Adjacent Infrastructure	5	3	15	3	15	2	10
Natural Hazards	5	3	15	3	15	3	15
Totals	100		335		340		290
Ranking		2		1		3	
Relative Cost		109%		100%		142%	
Cost Ranking		2		1		3	

Table 2: Errata to the Application and Updated Coquitlam Gate IP Project Financial and Operational Risk Comparison

		Alternative 4 Install NPS 24 Pipeline at 2070 kPa Original Route*	Alternative 4 Install NPS 24 Pipeline at 2070 kPa Lougheed Route	Alternative 6 Errata Install NPS 30 Pipeline at 2070 kPa Original Route*	Alternative 6 Install NPS 30 Pipeline at 2070 kPa Lougheed Route
1	Potential Operational Risk Reduction Per Appendix A-10 (2014 $millions/year)	2.456	2.456	2.456	2.456
2	Operational Risk Reduction (Coquitlam Gate IP Pipeline and Cape horn to Coquitlam TP complete) (2014 $millions/year)	0.352	0.352	2.456	2.456
3	Operational Risk Reduction (%)	14.34%	14.34%	100.0 %	100.0 %
4	Remaining Operational Risk (2014 $millions/year)(line 1-Line2)**	2.104	2.104	0	0
5	PV Remaining Operational Risk – 60 Yr ($millions)	33.307	33.307	0	0
6	PV Incremental Cost of Service – 60 Yr ($millions)	257.908	266.379	298.714	297.183
7	PV Remaining Operational Risk + PV Incremental Cost of Service – 60 Yr ($millions)	291.215	299.686	298.714	297.183

Table 8-1: Coquitlam Gate IP Project Financial Comparison

	Alternative 6 Install NPS 30 pipeline at 2070 kPa Original Route (Errata)	Alternative 6 Install NPS 30 pipeline at 2070 kPa Lougheed Route
AACE Estimate Accuracy	*Class 3*	*Class 3*
Total Direct Capital Cost excl. AFUDC & includes Abandonment / Demolition (2014 $millions)	200.080	199.053
Total Direct Capital Cost excl. AFUDC (As-spent $millions)	231.632	230.474
AFUDC (as spent $millions)	12.444	12.351
Total As-spent includes Abandonment / Demolition & AFUDC ($millions)	244.076	242.825
Annual incremental gross O&M (2014 $millions)	0.055	0.055
Levelized Rate Impact – 60 Yr. ($ / GJ)	0.100	0.100
PV Incremental Cost of Service – 60 Yr. ($millions))	298.714	297.183

23.1 Please provide further clarification of the 109% relative cost of the originally preferred option indicated in Table 1-2, versus the PV Incremental cost of service figures identified in Tables 2 and 8-1.

Response:

The referenced 109% (Table 1-2) is the relative pipeline construction cost (pipeline direct and indirect construction costs and materials costs) comparison between the Originally Preferred Route and Lougheed Highway Option A for route corridor Section 6 (Springer Ave. and Boundary Road). This cost comparison only compares route option construction costs in a portion of the overall pipeline route; it does not represent the relative cost comparison of the entire Coquitlam Gate IP Pipeline project.

The "PV Incremental Cost of Service – 60 Yr. ($millions)" is the sum of the present value for 60 years of the incremental cost of service, this can be seen in Confidential Appendix E-1-1, Schedule 10, Line 22 (the value in this schedule is in $000's and is divided by 1,000 to be expressed in $millions). The cost of service is the total incremental cost of capital and operating costs that FEI customers would be paying over the 60 year period and is discounted at FEI's after tax WACC of 6.14%.