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July 27, 2021

Residential Consumer Intervener Association
c/o Midgard Consulting Inc.
Suite 828 – 1130 W Pender Street
Vancouver, B.C.
V6E 4A4

Attention: Mr. Peter Helland, Director

Dear Mr. Helland:

Re: FortisBC Energy Inc. (FEI)

Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Coastal Transmission System Transmission Integrity Management Capabilities Project (Application)

Response to the Residential Consumer Intervener Association (RCIA) Information Request (IR) No. 1

On February 11, 2021, FEI filed the Application referenced above. In accordance with the British Columbia Utilities Commission Order G-149-21 setting out the Regulatory Timetable for the review of the Application, FEI respectfully submits the attached response to RCIA IR No. 1.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email only): Commission Secretary
Registered Parties

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A. Project Need and Justification

1. Reference: Exhibit B-1 pp. 26, 39; Workshop Transcript 2021-May-13 p. 78

"FEI addresses any cracking through pipeline repairs or replacement, as necessary, and records any SCC-related findings for future tracking. Through these digs FEI is aware of the existence of cracking threats on its system and has been monitoring such threats on its transmission pipeline system as part of its IMP-P."

"Table 3-6: FEI CTS Pipelines: Occurrences of Cracking on FEI pipe identified through JANA's review of selected integrity digs"

"[A]ny time that we expose our pipe, we need to reduce the operating pressure. And that's a safety activity that we undertake, just to make sure that as people are working around a line, that is typically covered with dirt and now is being exposed, and they have equipment around there, it's to make sure that it keeps our personnel safe."

1.1 Has FEI identified any SCC or seam weld cracking through opportunity digs which required FEI to immediately reduce the operating pressure of the line, or would have prompted FEI to reduce the pressure had it not already reduced the pressure prior to exposing the line for worker safety reasons? If so, provide details.

Response:

FEI has not identified any SCC or seam weld cracking through opportunity digs which required FEI to immediately reduce the operating pressure of the line, or would have prompted FEI to reduce the pressure had it not already reduced the pressure prior to exposing the line for worker safety reasons.

1.2 Has FEI identified any SCC or seam weld cracking through opportunity digs which could not be repaired by grinding? If so, provide details.

Response:

FEI has identified seam weld cracking through opportunity digs which could not be repaired by grinding. These seam weld cracking defects were repaired by replacing a segment of pipe. An example of this type of imperfection was shown in Figure 3-11 of the Application.

1.3 Explain whether circumferential stress corrosion cracking is a threat to FEI's CTS pipelines.

Response:

Circumferential stress corrosion cracking (CSCC) is a potential threat to FEI's CTS pipelines. To date, FEI has not observed any occurrences of CSCC during previous opportunity digs. FEI requested that JANA provide its independent, expert opinion in response to this question.

JANA provides the following response:

Where SCC is possible, circumferential SCC is also a potential if the SCC occurs in an area of the pipeline with additional external loading. The QRA considered the overall potential for failure due to SCC based on historical industry failure rates that included the potential for circumferential SCC.

1.3.1. If CSCC is a threat to FEI's CTS pipelines, explain how FEI is addressing this threat.

Response:

As with axially oriented SCC, FEI continues to screen all integrity excavations for the presence of both axially and circumferentially oriented cracking and conduct mitigation as required. At this time, there are no commercially available crack detection ILI tools to detect and size CSCC in gas pipelines. FEI will consider running such tools when they become proven, commercially-available, and adopted by industry.

1.4 Has FEI conducted hydrotests of its CTS pipelines in the past in order to verify the integrity?

1.4.1. If so, provide details of each hydrotest including the integrity concerns that each hydrotest was addressing.

Response:

To the best of its knowledge, FEI has not conducted hydrotests of its CTS pipelines to verify their integrity. FEI has only conducted hydrotests of new or replacement pipelines, before they are placed into service, to qualify their fitness for operation.

2. Reference: Exhibit B-1 p. 27

"A primary driver for the Project is the evolution of industry knowledge about cracking threats and industry practice on how to manage those threats. Other operators have found cracking on pipelines with characteristics similar to those in the FEI system and are moving towards using EMAT ILI tools to monitor cracking threats on pipelines for which suitable tools exist."

2.1 Identify which Canadian operators have found cracking on pipelines with characteristics similar to those in the FEI system.

2.1.1. Provide the pipeline characteristics (age, coating type, pipeline product, MOP as a percentage of SMYS)

2.1.2. Identify which of these Canadian operators have conducted inline inspections with EMAT tools.

Response:

Based on publicly available information, FEI understands that all major operators of natural gas transmission pipelines in the Province of British Columbia, namely FEI, Westcoast, and Pacific Northern Gas, have adopted EMAT in-line inspection as part of their integrity management activities. FEI is also aware, through its industry participation, that EMAT in-line inspection has been adopted by all Canadian Energy Pipeline Association (CEPA) members who are natural gas pipeline operators.

FEI does not have public access to the instances of cracking found and the pipeline characteristics of other Canadian natural gas transmission operators and is therefore unable to provide these characteristics as requested in the question above. Please refer to Section 3.3.2 of the Application for FEI's knowledge of industry practice with respect to EMAT and cracking.

2.2 Confirm or otherwise explain whether the need for the CTS TIMC project is primarily driven by the knowledge and experience of other pipeline operators and secondarily by the findings of SCC on FEI's own pipelines.

Response:

FEI has not identified specific primary and secondary drivers for the Project. Rather, the CTS TIMC Project is driven by multiple factors in combination. These include:

- FEI's evolving understanding of the cracking threat to identified pipelines in its transmission system, including the QRA reports prepared by JANA, the findings of SCC on FEI's own pipelines, and the knowledge and experience of other pipeline operators;

- FEI's interest in aligning with evolving industry best practices that are utilizing tools with new and improved capabilities and functionalities to assess, manage, and mitigate cracking; and
- FEI's regulatory obligations to mitigate cracking threats to its transmission pipelines.

2.3 Explain why the project must be initiated immediately. What is the driver for the urgency of the project?

Response:

As explained in Section 3.2.4 of the Application, cracking is a time-dependent threat, meaning that its potential to impact the pipeline increases over time. This threat can lead to pipeline failure by rupture, which could have significant consequences, especially given the urban development surrounding the CTS pipelines. Given factors including industry knowledge about cracking threats, FEI's identification of cracking on its own pipelines, and the understanding that FEI's existing integrity management practices do not, and cannot, identify all cracking, it is necessary for FEI to initiate this project in a timely manner to enable the collection of cracking-related ILI data for its system. FEI has timed its submission of the TIMC project with particular consideration to the availability of proven and commercialized EMAT tools suitable for use in its transmission pipelines, and following its baseline system-level QRA which has informed the priority and urgency of the Project. As indicated by the QRA, cracking poses the highest safety risk to the CTS.

The TIMC project, if completed over a reasonable planning horizon as FEI has proposed, reflects an appropriate operator response to available information regarding the potential threat posed by pipeline cracking.

3. Reference: Exhibit B-1 p. 27 (Footnote 10, Canadian Energy Pipeline Association Recommended Practices for Managing Near-neutral pH SCC, 3rd edition, p. 17)

"As of December 2014, there were over 800 colonies in the NEB 'significant SCC' database dating back to 1997. Of the crack colonies for which coating information was provided, 89% occurred on single- or double-wrapped polyethylene tape coating, 11% were associated with asphalt coating, and only a single case of 'significant SCC' was found on a coal-tar coated line."

3.1 In light of the quoted passage from the CEPA Recommended Practices, explain why FEI considers its coal tar enamel-coated pipelines to be susceptible to SCC and requiring threat mitigation in the near future.

<u>Response:</u>

JANA provides the following response:

The SCC susceptibility criteria were developed based on analysis of all available pipeline industry information on SCC and not just the referenced NEB database. There are multiple industry incidents involving coal-tar coated lines. Coal-tar coated pipelines are involved in multiple PHMSA documented SCC incidents, and for incidents reported from 2010 to 2016, coal-tar coatings are the most common reported coating type. FEI dig reports have also identified SCC on coal tar coated pipe.

4. Reference: Exhibit B-1 pp. 29, 88

"As part of FEI's project development work, FEI is completing a pilot of EMAT ILI evaluations on two CTS pipelines. This pilot is in progress, and as such, FEI is in the process of validating potential cracking detected by the EMAT tool."

"The features will be inspected, and a subset will be cut out and taken for further testing."

4.1 Confirm whether FEI has received the vendor's final report of the pilot EMAT inline inspections. If confirmed, provide the vendor's final report.

Response:

FEI has not received the vendor's final report of the pilot EMAT ILI. FEI is still in the process of validating EMAT ILI performance, the results of which will be used to generate the final report.

4.2 Confirm how many of the five remaining validation digs on each of the LIV PAT 457 and CPH BUR 508 lines have now been completed.

Response:

For the LIV PAT 457 line, FEI has completed 10 EMAT-specific integrity digs and is planning an additional five digs by 2022.

For the CPH BUR 508 line, FEI has completed one EMAT-specific integrity dig, and is planning an additional five digs for later in 2021.

Please also refer to the response to BCUC IR1 11.1 for further information on the validation dig findings to date.

4.3 Provide details of the validation dig findings including descriptions of features investigated, comparison of the in-ditch measurements with ILI measurements, and an assessment of the EMAT tool's performance.

Response:

FEI has not completed the process of validating potential cracking detected by the EMAT tool as part of the pilot project and therefore cannot provide dig findings at this time. Please refer to BCUC IR1 11.1 for an update on the status of the pilot project.

4.4 Confirm whether the cut-outs were or will be necessary to repair the pipeline (as opposed to other repair options such as grinding) or whether they were or will be made in order to obtain pipe samples for further analysis.

Response:

To date, FEI has only utilized cut-outs in order to obtain pipe samples for further analysis. FEI has not identified a need for cut-outs to conduct pipeline repairs, although a cut-out is an acceptable repair method for cracking per the CSA Z662:19 standard, and this method may be selected for future repairs.

5. Reference: Exhibit B-1 p. 35

"Table 3-3: FEI CTS Pipelines: Susceptibility to Cracking Threats based on Installation Year and Coating Type"

5.1 Confirm whether all the pipelines planned for TIMC upgrades have operated above 30% SMYS in the past 12 months. If not confirmed, explain why upgrades and EMAT inspections to these lines must be completed now and deferred until FEI gains more experience with the EMAT tool and can better characterize the threat of SCC.

<u>Response:</u>

FEI confirms that all of the pipelines planned for TIMC upgrades have operated above 30 percent of SMYS in the past 12 months.

5.2 Three pipelines (HUN BAL 1066, ROE TIL 914, and portions of NIC FRA 610) were installed after 1970. Is the fact that they are coated with coal tar enamel the only characteristic that makes these pipelines susceptible to SCC? If not, explain.

<u>Response:</u>

JANA provides the following response:

The 1970 criteria for susceptibility is for seam weld cracking and not SCC. The three pipelines referenced meet the SCC susceptibility criteria.

6. Reference: Exhibit B-1 p. 40

"Approximately half of reported PHMSA SCC incidents through 2002-2016 occurred at 60 percent of SMYS or lower; and

Approximately one quarter of reported incidents occurred at 55 percent of SMYS or lower, with some circumferential SCC leaks occurring below 30 percent of SMYS (in presence of additional loading factors)."

6.1 How does JANA (or its PHMSA source) define "SCC incident"? Is an incident a failure or does incident refer to the existence of SCC on a pipeline?

Response:

JANA provides the following response:

An 'incident' is defined by PHMSA as follows:

> "Incident" means any of the following events: (1) An event that involves a release of gas from a pipeline, or of liquefied natural gas, liquefied petroleum gas, refrigerant gas, or gas from an LNG facility, and that results in one or more of the following consequences: (i) A death, or personal injury necessitating in-patient hospitalization; (ii) Estimated property damage of $50,000 or more, including loss to the operator and others, or both, but excluding cost of gas lost; (iii) Unintentional estimated gas loss of three million cubic feet or more; (2) An event that results in an emergency shutdown of an LNG facility. Activation of an emergency shutdown system for reasons other than an actual emergency does not constitute an incident. (3) An event that is significant in the judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2) of this definition.

An SCC incident is an incident as defined above where the cause of the incident was identified as an SCC failure. Incidents do not include leaks that do not meet the above 'incident' criteria.

6.2 Did JANA analyze the PHMSA data and correlate the characteristics and operating conditions of the PHMSA incidents with the characteristics and operating conditions of FEI's CTS? If so, provide this correlation.

Response:

JANA provides the following response:

There are two key questions regarding SCC – is the line susceptible to SCC (i.e., is there are reasonable possibility for SCC to form on the pipeline) and could such SCC then grow to failure under the specific operating conditions of the pipeline (i.e., could SCC grow to failure if present). Two correlations of industry data with the characteristics of FEI's CTS were conducted to assess each of these questions:

- Table 1 of Confidential Appendix B-1 correlates the properties of FEI's CTS pipelines with conditions shown in the industry to correlate with SCC being found on pipelines and identifies those lines with susceptibility, based on this correlation, to SCC.
- Figure 2 of Confidential Appendix B-1 shows the operating stresses of the reported PHMSA SCC leak and rupture incidents (an incident is specifically defined by PHMSA as having a specific set of more substantial consequences) versus the operating conditions of the FEI system to demonstrate that failures have been observed in the industry throughout the operating stress range of the pipelines in the CTS.

7. Reference: Exhibit B-4 Workshop Presentation p. 12; Workshop Transcript 2021-May-13 p. 26; rosen-group.com/global/solutions/services/service/rocorr-mfl-c.html

In the May 13, 2021 workshop, FEI described the types of ILI tools commercially available and that it has used, including MFL-C (magnetic flux leakage – circumferential).

Rosen Group explains the capabilities of its MFL-C tool on its website, including: "A precise and detailed identification of metal loss and in particular axial oriented anomalies like narrow corrosion, gouging, channeling, crack like features and preferential seam weld corrosion is a basic element for the integrity management of oil and gas pipelines. Our RoCorr MFL-C service is a reliable and effective means of managing your pipeline integrity especially for concerns related to the long seam (e.g. pre-1970 ERW)." and "Precise long seam categorization and assessment using magnetic saturation in circumferential direction."

7.1 Has FEI previously run circumferential magnetic flux leakage tools through CTS pipelines? If so, for each CTS pipeline that has been inspected with a MFL-C tool, indicate the date that the most recent ILI occurred, summarize the findings of the ILI, and describe any defects that were required to be repaired related to SCC or the seam weld.

Response:

The table below summarizes FEI's experience with circumferential magnetic flux leakage (MFL-C) tool runs through CTS pipelines. As MFL-C ILI tools are unable to detect SCC, only the findings related to the seam weld can been summarized.

Table 1: FEI CTS Pipelines: Summary of MFL-C ILI Runs in the CTS Pipelines

#	Pipeline Short Name	Pipeline Full Name	Year of ILI Run	Summary of the Findings from the MFL-C Tool Related to the Seam Weld	Defects that Required to be Repaired Related to the Seam Weld
1	HUN BAL 1066	Huntingdon to Balfour 42"	2018	MFL-C tool has identified (82) metal loss anomalies in the long seam, and (25) manufacturing anomalies affecting the long seam.	No repair related to the seam weld defects.
	BAL NIC 1066	Balfour to Roebuck 42"			
2	HUN NIC 762	Huntingdon to Nichol 30"	2017	MFL-C tool has identified (56) metal loss anomalies in the long seam, and (55) manufacturing anomalies affecting the long seam.	No repair related to the seam weld defects.
3	LIV COQ 323	Livingston to Coquitlam 12"	2019	MFL-C tool has identified (252) metal loss anomalies in the long seam, and (10) manufacturing anomalies affecting the long seam.	One repair on "possible crack like" called by the previous MFL-C tool run in 2015. The feature was found to be an internally connected lack of fusion in the seam weld.

#	Pipeline Short Name	Pipeline Full Name	Year of ILI Run	Summary of the Findings from the MFL-C Tool Related to the Seam Weld	Defects that Required to be Repaired Related to the Seam Weld
4	LIV PAT 457	Livingston to Pattullo 18”	2019	MFL-C tool has identified (214) metal loss anomalies in the long seam, and (161) manufacturing anomalies affecting the long seam.	One repair on “metal loss anomalies in the long seam” features called by the MFL-C tool. The feature was found to be an internally connected metal loss in the seam weld.
5	NIC PMA 610	Nichol to Port Mann 24”	2016	MFL-C tool has identified (11) metal loss anomalies in the long seam, and (46) manufacturing anomalies affecting the long seam.	No repair related to the seam weld defects.
6	CPH BUR 508	Cape Horn to Burrard Thermal 20”	2020/2013	2020 (Coquitlam to Noons Creek, a sub-segment of Cape Horn to Burrard Thermal): MFL-C tool has identified (9) metal loss anomalies in the long seam, and (6) manufacturing anomalies affecting the long seam. 2013 (Cape Horn to Burrard Thermal): MFL-C tool has identified (169) metal loss anomalies affecting the long seam.	No repair related to the seam weld defects.
7	ROE TIL 914	Roebuck to Tilbury 36”	2016	MFL-C tool has identified (3) metal loss anomalies in the long seam, and (4) manufacturing anomalies affecting the long seam.	No repair related to the seam weld defects.
8	TIL BEN 323	Tilbury to Benson 12”	2017	MFL-C tool has identified (66) metal loss anomalies in the long seam, (3) external crack-like seam weld anomalies, and (30) manufacturing anomalies affecting the long seam.	No repair related to the seam weld defects. Two out of three “external crack-like seam weld anomalies” have been investigated and found two internal features in the long seam weld. Both passed the assessment criteria and pipeline was recoated.
9	TIL FRA 508	Tilbury to Fraser 20”	2016	MFL-C tool has identified (21) metal loss anomalies in the long seam and (65) manufacturing anomalies affecting the long seam.	No repair related to the seam weld defects.
10	NIC FRA 610	Nichol to Fraser 24”	2016	MFL-C tool has identified (14) metal loss anomalies in the long seam and (64) manufacturing anomalies affecting the long seam.	No repair related to the seam weld defects.
11	TIL LNG 323	Tilbury to LNG Plant 12”	2020	MFL-C tool has identified (1) axially oriented metal loss on pipe body and (1) long seam anomaly.	No repair related to the seam weld defects.
12	NOO EMT 610	Noons Ck to Eagle Mtn 24”	Baseline inspection scheduled for 2022	N/A	N/A
13	PMA CPH 914	Port Mann to Cape Horn 36”	2016	No seam weld related anomalies have been identified by MFL-C tool.	None

7.2 What are the limitations of MFL-C technology when assessing axial cracks and seam weld features?

Response:

MFL-C technology has significant limitations when assessing axial cracks and seam weld features. Axial anomalies (which can include cracks), whether located in the seam weld or pipe body, need to be wider than 1 mm and have a minimum depth of 20 percent of the wall thickness to be detected by a typical MFL-C ILI tool (per vendor specifications). Most axial cracks and seam weld features are narrower than 1 mm and therefore will not be detected by MFL-C technology.

For MFL-C technology to detect axial anomalies, there has to be sufficient loss of metal volume associated with the features, which is typically not the case with axial cracks and seam weld features. MFL-C is typically only relied upon to detect and size volumetric features such as narrow, axially-aligned corrosion and long seam corrosion.

7.3 While EMAT may be a superior technology to assess axial cracking in pipelines, does FEI expect that its prior MFL-C ILI runs will generally inform the presence of severe cracking and seam weld features, or indicate the likelihood of finding severe cracking and seam weld features with EMAT tools? If not, explain why not.

Response:

Please refer to the response to RCIA IR1 7.2. FEI does not expect that its prior MFL-C ILI runs will generally inform the presence of severe cracking and seam weld features, or indicate the likelihood of finding severe cracking and seam weld features with EMAT tools.

8. Reference: Exhibit B-1 p. 30, 47, 87, 89

"While the results of the pilot are encouraging, as significant repairs or replacements have not been required to address these instances of cracking, the pilot also demonstrates that cracking exists on FEI's pipelines which FEI's existing practices are unable to detect."

"Total Length of CTS TIMC Pipelines: 254 km"

"FEI conducted a baseline inspection of the entire 29.8 km length of [LIV PAT 457]"

"FEI performed a baseline inspection of a 4.4 km long segment of [CPH BUR 508"

RCIA calculates that the FEI pilot project inspected approximately 13.5% of the total length of CTS TIMC pipelines (34.2 of 254 km).

8.1 Does FEI consider the pilot project to have collected data on a statistically significant portion of the CTS TIMC pipelines? Please discuss.

Response:

FEI does not consider the pilot project to have collected data on a statistically significant portion of the CTS TIMC pipelines. As described in Section 3.2.5 of the Application, cracking is a highly localized, and often unpredictable phenomenon, resulting from the variable contribution of three factors: (1) a susceptible material; (2) a tensile stress; and (3) a suitable environment. This means that cracking found on one segment of a pipeline does not inform whether cracking may be occurring on another segment of pipeline. As such, even though FEI found instances of cracking on the two EMAT pilot project pipelines, FEI cannot extrapolate those findings onto other CTS pipelines. EMAT inspection of each individual line is required to collect the necessary information to determine if cracking is present.

8.2 Did FEI conduct a statistical analysis of the pilot project relative to the entire system of CTS TIMC pipelines to attempt to extrapolate the results of the pilot project across the entire system? If yes, please provide and discuss the results. If no, please discuss why not.

Response:

Please refer to the response to RCIA IR1 8.1.

8.3 Have the findings of the pilot project (i.e. "significant repairs or replacements have not been required" on 13.5% of the system) influenced FEI's assessment of the risk posed by cracking on its system? Please discuss why or why not.

Response:

The findings of the pilot project have not influenced FEI's assessment of the risk posed by cracking on its system. Please refer to the response to RCIA IR1 8.1 for an explanation of the applicability of the pilot project's findings to other CTS pipelines.

8.4 Did FEI conduct a comparison of the results of its pilot project to the JANA risk assessment, in order to gauge the expectations of the risk assessment versus actual findings of the pilot project? If yes, please provide and discuss the results. If no, please discuss why not.

Response:

JANA provides the following response:

The EMAT pilot projects and the JANA risk assessment provide different types of risk data and so a direct comparison can only be done at a general level. Based on that level of comparison the results are consistent. The JANA risk assessment provided an assessment of the general failure potential of the lines based on their specific characteristics and historical industry failure rates of comparable lines (i.e. to determine the potential cracking risk for the lines compared to other threats and the potential value of running EMAT tools to mitigate risk). The EMAT ILI runs provide specific information on cracking in the pipelines (i.e. the specific areas of the pipeline where integrity digs should be conducted to mitigate the risk of cracking).

FEI adds the following response:

FEI expects to use the data from its EMAT in-line inspections in future iterations of its QRAs.

B. Project Description

9. Reference: Exhibit B-1 p. 90

"The EMAT ILI data collected during the pilot run also confirmed that EMAT ILI tools with speed control return back to their optimal velocity range quickly as compared to MFL-C tools. This information allowed FEI to conservatively refine the scope of the remainder of the pipelines within the scope of the CTS TIMC Project and defer removal or alteration of pipeline components with a minor or moderate affect on the speed until after the baseline EMAT ILI runs. This resulted in a reduced Project scope, and therefore a reduced Project cost."

9.1 How many instances of piping components does FEI expect to have an effect on tool speed which FEI is not proposing to remove or alter?

<u>Response:</u>

Please refer to the response to BCUC IR1 13.1.

9.2 Does FEI expect the EMAT tool to successfully capture data at these locations despite the minor or moderate effects on tool speed?

9.2.1. If not, for each of the instances (identified by location and pipeline) provide the distance that FEI expects the EMAT tool to be unable to capture data.

<u>Response:</u>

Please refer to the response to BCUC IR1 13.1.

10. Reference: Workshop Transcript 2021-May-13 p. 72

"The BCUC panel has asked us to discuss what we learned from the pilot project. Well first, the tool runs were successful. They traveled through the pipeline as planned. High quality data was collected and FEI was able to find and action cracking threats."

10.1 For what percentage of each pipeline inspected in the pilot project did FEI obtain high quality data?

Response:

High quality data was obtained for 91.4 percent of the LIV PAT 457 EMAT inspection and 97.9 percent of the CPH BUR 508 EMAT inspection.

10.2 Confirm whether FEI attempted to correlate data from the pilot EMAT ILI with prior ILI data, such as from circumferential MFL tool runs, including with indications that were not sufficiently severe to excavate and repair. If confirmed, indicate the findings of the correlation.

Response:

As prior ILIs were not capable of detecting and sizing cracks and crack-like anomalies, correlations could not be conducted. Speed excursions experienced by the EMAT tools also occurred at the same locations as with the MFL-C tools.

11. Reference: Exhibit B-1 p. 92; BCUC IR1 6.2

"One phenomenon that affects the tools' data collection capabilities is known as 'speed excursion'. Speed excursions are localized increases in tool velocity where the tool travels beyond the maximum allowable velocity at which it can collect quality data. The effect of speed excursion ranges from degradation of data quality to a complete inability for the tool to collect data, resulting in blind spots."

BCUC IR1 6.2: "Please explain whether FEI explored a project alternative to perform above-ground facility modifications and delay replacement of the 13 heavy wall segments after the first run of the EMAT ILI tools. Please discuss any benefits or drawbacks to this approach."

11.1 Confirm whether it is the change in internal diameter that affects the EMAT tool's capabilities, or whether it is the higher velocity through the smaller internal diameter of the heavy wall segments that affects the data capture capabilities. That is, once the tool velocity stabilizes after the change in internal diameter, does it begin to gather reliable data again?

Response:

The EMAT tool velocity through the heavy wall segments is typically slower than the velocity in the thinner wall pipe upstream and downstream of the heavy wall segment. The increased tool velocity in the thinner wall pipe immediately downstream of the heavy wall section results in a speed excursion which affects the EMAT tool's capabilities.

Once the tool velocity stabilizes following a change in internal pipe diameter, it begins to gather reliable data again.

Please refer to the response to BCUC IR1 14.3 for further discussion of EMAT ILI tool behaviour.

11.2 If the 13 modifications are not completed, what percentage of each pipeline will not be expected to have valid inspection data due to speed excursions?

11.2.1. What percentage of each pipeline will not be expected to have valid inspection data (for any reason) even if the 13 modifications are completed?

Response:

Please refer to the response to BCUC IR1 14.3.

11.3 For each the 13 instances of heavy wall piping that FEI proposes to remove, but assuming that they are not removed, estimate the distance after the existing heavy wall section that FEI expects the EMAT tool to be unable to capture data or have degraded data.

Response:

Please refer to the response to BCUC IR1 14.3.

11.4 Further to BCUC IR1 6.2 (in a scenario where FEI leaves the 13 heavy wall piping sections in place for the initial EMAT ILI then, if significant SCC is found on any pipeline segment, makes the modifications necessary to achieve full data capture for subsequent EMAT ILI runs): Confirm whether the subsequent modifications to remove heavy wall sections could also remove the blind spots from the first EMAT ILI run, thus eliminating the possibility of SCC or seam weld cracks in these sections.

Response:

The removal of heavy wall sections of pipe will not remove blind spots from the first EMAT ILI run. As described in FEI's response to BCUC IR1 14.3, speed excursions (resulting in data quality degradation) take place in piping located downstream of heavy wall pipe segments. Therefore, removal of heavy wall pipe after the first EMAT run will remove the source of speed excursion for future runs, but it will not alleviate concerns of the potential for SCC or seam weld cracks in sections of pipe located downstream of the heavy wall sections where the ILI tool ran over-speed during the first run. An additional EMAT ILI run will therefore be required in order to collect data in those blind spot sections.

11.5 For each of FEI's MFL and geometry ILI tool runs conducted over the past five years, provide the distance inspected, the distance for which valid ILI data were not obtained, and the percentage of each pipeline that was successfully inspected.

Response:

The table below provides data for FEI's most recent MFL and geometry ILI tool runs conducted over the past five to seven years on the CTS pipelines.[1] The distance for which valid ILI data were not obtained includes all distance where ILI data has been lost or quality has been degraded due to speed excursions, including the distances from 13 speed excursion events driving pipeline alterations in the Application.

Where data has not been obtained during past ILI or where degraded specification data has been obtained, FEI manages integrity through:

- Reliance on data from a complementary technology previously run successfully in the line, with additional conservatism applied, where available;
- Reliance on data from a prior successful run(s) of the same technology, with additional conservatism applied, where available; and
- Analysis that accounts for uncertainty associated with degraded specification data, where available.

The above strategies, while appropriate over the timeframe that they have been adopted, are not appropriate on a permanent basis for managing time dependent threats on an aging pipeline system, as time-dependent threats can grow with time. The CTS TIMC Project will provide the necessary lifecycle integrity management capabilities for FEI to run EMAT ILI tools. The elimination of heavy wall pipe segments as part of the CTS TIMC Project will also improve FEI's ability to run other ILI tools by minimizing speed excursions and reducing the distances where FEI cannot obtain high quality data. Further, the proposed CTS TIMC facilities work will also improve FEI's ability to run other ILI tools as operating parameters such as gas flow rate can be optimized for all ILI tool runs.

[1] Except for 2013 MFL-C ILI run on CPH BUR 508 (Cape Horn to Burrard Thermal 20"). After decommissioning of the Burrard Thermal Generation in 2016, there is very low gas flow in the Noons Creek to Burrard Thermal segment, and therefore this segment cannot be inspected with ILI tools under current operating conditions.

1 **Table 1: FEI CTS Pipelines: Summary of most recent MFL and geometry ILI tool runs**

#	Pipeline Short Name	Pipeline Full Name	Distance Inspected (km)	MFL-A/Caliper			MFL-C		
				Year of ILI Run	Distance Valid ILI data were not Obtained (m)	Percent of Pipeline Successfully Inspected	Year of ILI Run	Distance Valid ILI data were not Obtained (m)	Percent of Pipeline Successfully Inspected
1	HUN BAL 1066 BAL NIC 1066	Huntingdon to Balfour 42” Balfour to Roebuck 42”	55.7	2018	0	100	2018	143	99.7
2	HUN NIC 762	Huntingdon to Nichol 30”	56.4	2016	45.2	99.9	2017	1312	97.7
3	LIV COQ 323	Livingston to Coquitlam 12”	34.9	2019	278.9	99.2	2019	1410	96.0
4	LIV PAT 457	Livingston to Pattullo 18”	29.8	2020	0	100	2019	2801	90.6
5	NIC PMA 610	Nichol to Port Mann 24”	4.9	2016	294	99.3	2016	130	97.3
6	CPH BUR 508	Cape Horn to Burrard Thermal 20”	9.0/8.0 (MFL-A/Caliper) 17.0 (MFL-C)	2019/2016	1641/242	81.8/96.9	2013	3490	79.5[2]
7	ROE TIL 914	Roebuck to Tilbury 36”	12.8	2020	39.7	99.7	2016	527	95.9
8	TIL BEN 323	Tilbury to Benson 12”	5.9	2021	0	100	2017	368	93.7
9	TIL FRA 508	Tilbury to Fraser 20”	9.6	2020	0	100	2016	2033	78.8[3]
10	NIC FRA 610	Nichol to Fraser 24”	24.3	2020	271	88.8	2016	1012	95.8
11	TIL LNG 323	Tilbury to LNG Plant 12”	1.7	2020	0	100	2020	10	99.4
12	NOO EMT 610	Noons Ck to Eagle Mtn 24”	1.8	2015	0	100	Baseline inspection scheduled for 2022	N/A	N/A
13	PMA CPH 914	Port Mann to Cape Horn 36”	1.3	2016	0	100	2016	0	100

[2] The percent of pipeline successfully inspected is lower because the ILI tool experienced significant speed excursions due to the presence of heavy wall pipe and fittings along the route. This value will be improved for future runs because some of the heavy wall pipe and/or fittings have been replaced and because of footnote 1 above.

[3] The percent of pipeline successfully inspected is lower because the ILI tool experienced significant speed excursions due to the presence of heavy wall pipe and fittings along the route. This value will be improved for future runs because some of the heavy wall pipe and/or fittings are planned to be removed and replaced under the CTS TIMC Project.

12. Reference: Exhibit B-1 pp. 90, 99, 101

"Installation of a PRS at Cape Horn Valve Station (the upstream end) to allow for pressure reduction, post EMAT run, if required"

"Once the EMAT ILI tool has completed its run, with the exception of the HUN ROE 1067 transmission pipeline, it is not known how many features will be found, and as such, it may not be possible to complete all repairs in the same calendar year. Should this be the case, the integrity risk of having unrepaired features on those pipelines can be mitigated by a 20 percent reduction in operating pressure until all repairs are complete."

"New PRSs have been designed for installation at four (4) facilities across the CTS in order to expand FEI's operational and maintenance capabilities.

1. Nichol Valve Station;
2. Roebuck Valve Station;
3. Livingstone Regulating Station66; and
4. Coquitlam Gate Station"

12.1 Clarify what FEI means when it states that it will not know how many features will be found with the exception of the HUN ROE 1067 line.

<u>Response:</u>

FEI acknowledges that the referenced sentences from page 99 of the Application are unclear. The following revision conveys FEI's intending meaning more clearly:

> Until the EMAT ILI tool has completed its run and the data is analyzed, it is not known how many features will be found. As such, it may not be possible to complete all repairs in the same calendar year. Should this be the case, with the exception of the HUN ROE 1067 transmission pipeline, the integrity risk of having unrepaired features on those pipelines can be mitigated by a 20 percent reduction in operating pressure until all repairs are complete.

FEI cannot know how many features will be found on any of the 11 CTS TIMC pipelines until after each of their baseline EMAT ILI runs and initial data analysis, including on the HUN ROE 1067 line. However, all CTS pipelines – with the exception of the HUN ROE 1067 pipeline – can have their operating pressure reduced by 20 percent for extended periods until all repairs are complete.

As described in Section 5.5.4.1 of the Application, the HUN ROE 1067 pipeline forms the backbone of the CTS, meaning that a 20 percent reduction to the operating pressure of this pipeline cannot be sustained for extended periods, particularly through the winter, without adversely impacting customer supply. As such, when FEI indicated an exception for the HUN

ROE 1067 pipeline, it was in reference to the inability to mitigate integrity risk through a pressure reduction due to capacity restraints.

12.2 Explain why FEI expects or considers it probable for the EMAT ILI to identify so many features requiring remediation that it could not complete repairs prior to the winter peak season, considering the findings from the pilot EMAT ILIs which found zero instances of severe cracking.

Response:

FEI is aware through its discussions with peer pipeline operators that initial EMAT ILI tool runs can result in a significant number of indications that require timely inspection and validation. These indications do not always require repair; however, until they are excavated and inspected, they may need to be treated as an integrity risk. On this basis, there is the possibility that FEI may have more features requiring an in-ditch assessment in a timely manner than can be dealt with prior to the winter peak season. Consequently, FEI needs to be able respond by reducing operating pressures for an extended period.

Section 3.2.5 of the Application discusses how the requirements for SCC initiation and growth are site specific in nature. This means that cracking results from one pipeline cannot be applied to another pipeline, and that conversely a lack of findings on one pipeline does not predict a lack of findings on a different pipeline.

12.3 Approximately how many anomalies could FEI excavate and remediate prior to the date when there is a need to return the CTS to full pressure, assuming the ILI is completed and the vendor report is received in the spring?

Response:

The complexity and scope of integrity digs vary depending on the ILI finding, location of the dig, and pipeline specifications. Additionally, features requiring repair can extend the dig timeline and resourcing needs. Historically, FEI has performed up to approximately 25 digs on the CTS in a single year. FEI notes that this total is not necessarily indicative of future EMAT ILI digs as FEI still must complete integrity digs identified by its existing geometry, MFL, and CMFL ILI tool runs.

As discussed in Section 5.11 of the Application, FEI intends to increase resources required to support the addition of EMAT to its existing ILI program. The level of increased resources required will be assessed in conjunction with the baseline EMAT ILI runs. As such, FEI is unable to quantify at this time the future number of digs it could perform including those from EMAT and current ILI activities.

12.4 Explain whether the ILI runs can be scheduled over several years to provide sufficient time to address the possibility that there are more features found than can be remediated in a single season, obviating the need for pressure control stations.

Response:

FEI has developed a preliminarily schedule for ILI runs over several years, ensuring risk is mitigated in a timely manner. In advance of an ILI run, FEI cannot know how many features will be found on any single pipeline, but must nonetheless be prepared to mitigate unrepaired features should they be found. The new PRSs proposed as part of the CTS TIMC Project will allow the pressure on individual pipelines to be reduced as necessary without affecting the capacity within the entire CTS. Please also refer to the responses to BCUC IR1 2.8 and RCIA IR1 12.2.

12.5 Did FEI reduce the pressure of either of the LIV PAT 457 or CPH BUR 508 pipelines in response to the findings from the pilot EMAT ILIs?

Response:

FEI will typically reduce the operating pressure in a pipeline for following situations:

1. In response to findings from an ILI run. If the results from the ILI run indicate that pipeline has a critical level of defects, FEI would reduce the pressure as required to mitigate the threat from those defects.

2. Prior to inspections or repairs. FEI may reduce the operating pressure of individual pipelines for short periods to establish a factor of safety when working around the gasified line (for example while conducting integrity digs).

For the LIV PAT 457 and CPH BUR 508 pipelines, FEI did not reduce the pressure after running the EMAT ILI tool because FEI found no critical cracks in those pipelines. However, FEI did drop the pressure on some sections of that pipeline when conducting integrity digs.

12.6 Now that the pilot EMAT ILI has been completed and a pressure reduction was not required, did FEI consider relocating the pressure control station from the Cape Horn station used in pilot program to another CTS line proposed for EMAT ILI? If not, why not?

12.6.1. Explain whether relocating the new Cape Horn pressure control station could result in cost savings for the CTS TIMC project by avoiding the cost of new facilities at one of the four proposed new installations.

12.6.2. Estimate the cost savings that could be achieved by relocating the new Cape Horn pressure control station used for the pilot to avoid the cost of another of the proposed new pressure control stations.

Response:

FEI did consider relocating the PRS used in the pilot program at Cape Horn Valve Station to another station, but it was determined to be not feasible. FEI evaluated the use of the Cape Horn Valve Station PRS at Coquitlam Gate Station and Noons Creek Valve Station for the CTS TIMC Project requirements and determined that the PRS was too small and too large for these locations, respectively.

12.7 Confirm whether the pressure regulating station used for the LIV PAT 457 pilot EMAT ILI will be repurposed for the LIV COQ 323 line, as indicated by footnote 66 on page 101.

Response:

The pressure regulating station (PRS) used for the LIV PAT 457 pilot EMAT project was originally a temporary installation at the Livingstone Regulating Station to implement a 20 percent reduction in operating pressure on the LIV PAT 457 pipeline after the EMAT ILI run, if it was required. This PRS will now be a permanent installation at the Livingstone Regulating Station and piping modifications to and from the PRS will be completed as part of the CTS TIMC Project to allow for selectable regulation of the LIV COQ 323 and/or LIV PAT 457 pipelines. As such, the PRS will be able to regulate pressure on the LIV COQ 323 pipeline, and may still be used to implement a pressure reduction on the LIV PAT 457 after future ILI runs as required.

12.8 Explain why a new pressure control station is required at Coquitlam valve station considering the new pressure control station at Cape Horn valve station used for the pilot EMAT ILI would appear to be able to control the pressure on the CPH BUR 508 line.

Response:

The PRS proposed at the Coquitlam Gate Station will allow for pressure reductions on the CPH BUR 508 line between Coquitlam Gate Station and Noons Creek Valve Station, as well as the LIV COQ 323 pipeline. While the existing PRS at Cape Horn Valve Station could be left in place to manage pressure reductions on the CPH BUR 508 pipeline, it is not the preferred location from a hydraulic or operational perspective, and a new PRS would still need to be constructed and installed at Coquitlam Gate Station to allow for pressure reduction on the LIV COQ 323 pipeline.

As described above, Cape Horn Valve Station is not the preferred location for the PRS. However, due to space constraints at Coquitlam Gate Station when the pilot project was being undertaken, FEI temporarily located the PRS at Cape Horn Valve Station. The CTS TIMC Project contemplates installing the proposed pressure control stations as permanent facilities, and as such, FEI chose to relocate pressure control on the CPH BUR 508 to Coquitlam Gate Station. FEI prefers locating the PRS at Coquitlam Gate Station for hydraulic and operational reasons. In particular, this location enables a pressure reduction further downstream on the pipeline than if the reduction were applied at Cape Horn Valve Station and better pressures as gas flows through the CPH BUR 508 to the V1 Compressor Station and onwards to the Vancouver Island System. Should any features be found between Cape Horn Valve Station and Coquitlam Gate Station, FEI can completely shut in this segment of the CPH BUR 508 pipeline to mitigate the integrity risk and maintain gas flow to Coquitlam Gate Station through the parallel NPS 36 pipeline.

12.9 What is the total cost of the four new pressure control stations?

Response:

The cost of the four new pressure control stations is provided in the table below.

Location	Cost ($millions)
Nichol Valve Station	5.9
Roebuck Valve Station	7.9
Coquitlam Gate Station	5.2
Livingstone Regulating Station (permanent PRS)	1.1
TOTAL	20.1

Note the costs above are in 2020 dollars and include engineering, materials, fabrication, installation, and any other direct and indirect costs to install the pressure control stations at the four locations but exclude Owner's costs, contingency or escalation.

12.10 Are the costs of the new Livingstone pressure control station included in the costs of the pilot program (and therefore in the TIMC Development Cost deferral account) or are they in the total cost of the four new pressure control stations?

Response:

The costs to construct and install the PRS at the Livingstone Regulating Station for the purposes of the EMAT ILI Pilot Project, which is currently in-service, have been included in the deferral account costs. The modifications required to convert this from a temporary to a permanent installation and expand its use for pressure regulation on the LIV COQ 323 pipeline, as well as the LIV PAT 457 pipeline, are included in the total cost for the four new PRS as referenced in the question.

C. Project Cost Estimate and Schedule

13. Reference: Exhibit B-1 p. 96

"As noted in the table above, 13 facilities were identified as requiring modifications to enable FEI to ready the system for introduction of EMAT ILI tools while ensuring that full resolution data is collected during inspections."

13.1 What is the cost of the 13 modifications necessary to remove the heavy wall sections?

Response:

Please refer to the response to RCIA IR1 15.1.

14. Reference: Exhibit B-1 p. 104

"Table 5-9: Project Schedule"

Activity	Date
CPCN Preparation	Jun 2020 to Jan 2021
CPCN Filing	Feb 2021
CPCN Approval	Q1 2022
Contractor Selection and Award	
Engineering Services Contractor Selection and Contractor Negotiation	Sep 2021 to Dec 2021
Construction Contractor Selection and Contract Negotiation	Apr 2023 to Aug 2023
Permitting for CTS TIMC	
Municipal and Community Consultation	Nov 2020 to Nov 2024
Indigenous Communities Consultation	Nov 2020 to Dec 2023
OGC Permits	Jul 2022 to Jan 2024
ALC Permits	Jun 2022 to Jan 2024
Federal Permits (Vancouver Fraser Port Authority, Transport Canada, Department of Fisheries and Oceans)	Jun 2022 to Jan 2024
Railway Crossing Permits	Jun 2022 to Jan 2024
Ministry of Transportation and Infrastructure Permits	Jun 2022 to Jan 2024
Municipal and Regional District Permits	Jun 2022 to Jan 2024
Utility Permits & Approvals	Jun 2022 to Jan 2024
Environmental and Archaeological Permits	Jul 2022 to Jan 2024
CTS TIMC CONSTRUCTION	
Land Owner consultation	Apr 2023 to Aug 2023
Secure Detail Design Engineering Consultant	Feb 2022
Engineering Detailed Design	Mar 2022 to Jan 2023
Procurement and Manufacturing	
Long Lead Items	Jun 2022 to Mar 2023
Facilities, Electrical, and Instrumentation	Mar 2023 to Aug 2023
Fabrication	Oct 2023 to Jul 2024
Mobilization to Site	Feb 2024
Site Installation	
Construction	Mar 2024 to Nov 2024
Restoration and Demobilization	Mar 2024 to May 2025
Project Close Out	Dec 2024 to Nov 2025

14.1 If FEI does not proceed with the modifications to the 13 heavy wall segments, how far could the schedule be advanced?

Response:

All pipeline and facilities modifications, including removal of the 13 heavy wall segments, are required to successfully complete EMAT ILI runs of the CTS and to ensure the collection of useful and meaningful data.

If FEI does not proceed with the modifications to the 13 heavy wall segments, there would be no changes to the overall schedule shown in Table 5-9. The pipeline modifications and facilities construction are currently scheduled to be undertaken concurrently by separate crews; however, the scope of the facilities construction is considerably larger and more complex than that of the pipeline modifications. On this basis, it will likely take longer to complete the facilities as compared to the pipeline modifications. As the facilities construction schedule is on the critical path, the removal of the modifications to the 13 heavy wall segments from the Project scope would not advance the schedule.

14.1.1. Identify which permits would no longer be required if FEI only undertakes the modifications within its station facilities (i.e. does not proceed with the 13 modifications to the heavy wall segments)

Response:

The majority of the permitting activities listed in Table 5-9 are required for both the facilities and the pipeline modifications scope. Therefore, there would be no significant reduction to what is shown in Table 5-9 if the heavy wall pipeline modifications were not included in the Project scope. The only identified permits that would no longer be required are those for the crossing of Lougheed Highway and the railway crossing HDD.

14.1.2. Re-file the schedule in Table 5-9 assuming FEI does not proceed with the 13 modifications to the heavy wall segments.

Response:

As described in the response to RCIA IR1 14.1, there would be no change to the Project schedule if FEI did not proceed with the 13 modifications to the heavy wall segments.

14.2 Provide the approximate schedule for EMAT ILI tool runs following completion of the construction works. Does FEI anticipate inspecting all the targeted CTS pipelines in 2025? In 2026? Over several years?

Response:

FEI anticipates EMAT ILI tool runs will be completed in four years starting from 2024 to 2027, with a preliminary schedule provided in the table below. Detailed EMAT ILI planning such as scheduling with tool vendors is not complete, so this schedule is subject to change based on factors such as resource and tool availability.

Year	Pipeline	Baseline Run
1	HUN ROE 1066	2024
2	HUN NIC 762	2025
	NIC PMA 610	2025
	NIC FRA 610	2025
3	ROE TIL 914	2026
	CPH NOO 508	2026
	LIV PAT 457	2026 (Rerun)
4	TIL BEN 323	2027
	TIL FRA 508	2027
	TIL LNG 323	2027
	LIV COQ 323	2027

15. Reference: Exhibit B-1 p. 114

"Table 5-14: Project Capital Budget"

Line	Item	Amount
1	Construction Cost Estimate (Contractor)	$ 72.4
2	Owners Costs (FEI)	$ 15.2
3	**Sub-Total Construction Base Cost Estimate ($2020)**	**$ 87.6**
5	Pre-Construction Development Costs	$ 30.7
6	Contingency	$ 14.7
7	**Sub-Total Cost Estimate ($2020)**	**$ 133.0**
8	Cost Escalation Estimate	$ 7.8
9	**Sub-Total Cost Estimate (As-Spent)**	**$ 140.8**
10	AFUDC	$ 6.1
11	Tax Offset	$ (9.1)
12	**Total Project Cost Estimate (As-Spent)**	**$ 137.8**

15.1 If FEI does not proceed with the modifications to the 13 heavy wall segments, how much could the project budget be reduced?

Response:

Modifications to the 13 heavy wall segments including construction, owner's costs, contingency, and AFUDC is estimated to be $56.9 million.

Please see the following table which updates Table 5-14 of the Application excluding the capital costs for these modifications and shows a reduced estimate of $81.0 million.

Line	Item	Amount
1	Construction Cost Estimate (Contractor)	$ 36.5
2	Owners Costs (FEI)	$ 7.7
3	**Sub-Total Construction Base Cost Estimate ($2020)**	**$ 44.2**
5	Pre-Construction Development Costs	$ 30.7
6	Contingency	$ 7.2
7	**Sub-Total Cost Estimate ($2020)**	**$ 82.1**
8	Cost Escalation Estimate	$ 3.8
9	**Sub-Total Cost Estimate (As-Spent)**	**$ 85.9**
10	AFUDC	$ 4.2
11	Tax Offset	$ (9.1)
12	**Total Project Cost Estimate (As-Spent)**	**$ 81.0**

15.1.1. Re-file the budget in Table 5-14 assuming FEI does not proceed with the 13 modifications to the heavy wall segments.

Response:

Please refer to the response to RCIA IR1 15.1.