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November 30, 2020

VIA RESS and EMAIL

Ms. Christine Long
Registrar
Ontario Energy Board
2300 Yonge Street, 27th Floor
Toronto, ON M4P 1E4

Dear Ms. Long:

Re: Enbridge Gas Inc. (Enbridge Gas)
Ontario Energy Board (Board) File No.: EB-2020-0192
London Line Replacement Project – Argument-In-Chief

In accordance with the Procedural Order No. 1 dated October 29, 2020, enclosed please find Enbridge Gas's argument-in-chief in the above noted proceeding.

Please contact the undersigned if you have any questions.

Yours truly,

Rakesh Torul
Digitally signed by Rakesh Torul
Date: 2020.11.30 13:59:37 -05'00'

Rakesh Torul
Technical Manager, Regulatory Applications

cc: Charles Keizer, Torys
EB-2020-0192 Intervenors

ONTARIO ENERGY BOARD

IN THE MATTER OF The Ontario Energy Board Act, 1998, S.O. 1998, c.15, Schedule B, and in particular, S.90.(1) and S.97 thereof;

AND IN THE MATTER OF an Application by Enbridge Gas Inc. for an Order granting leave to construct natural gas pipelines and ancillary facilities in County of Lambton, the Township of Dawn-Euphemia, Middlesex County, the Municipality of Southwest Middlesex, the Municipality of Strathroy-Caradoc and the Municipality of Middlesex Centre.

ARGUMENT-IN-CHIEF OF ENBRIDGE GAS INC.

1. This is the argument-in-chief of Enbridge Gas Inc. ("Enbridge Gas") in the above referenced proceeding.

2. Enbridge Gas has requested the following orders from the Ontario Energy Board ("OEB"):

   (a) pursuant to Section 90 (1) of the Ontario Energy Board Act (the "Act"), granting Leave to Construct approximately 51.5 kilometres of Nominal Pipe Size ("NPS") 4 pipeline and 39 kilometres of NPS 6 pipeline to replace the existing London Lines (the "Project") and

   (b) pursuant to Section 97 of the Act, granting approval of the form of easement agreements as referenced in evidence at Exhibit E, Tab 2, Schedule 3 and Exhibit E, Tab 2, Schedule 4.

A. Overview

3. Enbridge Gas has identified the need to replace the existing London Lines (the "Existing Lines"). The Existing Lines comprise the London South Line and London Dominion Line which are two pipelines that are parallel to each other, approximately 60 km and 75 km in length, respectively. The Existing Lines represent some of the oldest pipe in the legacy Union Gas network, accounting for nearly 135 km of the 384 km (35%) of the pre-1950 installation and consists of 62 km of bare steel pipe (18% of the total bare steel pipe population).[1] The Existing Lines are large diameter high pressure distribution pipelines that take gas from the Dawn Hub and operate as a feed to several downstream distribution systems. The Existing Lines serve predominantly residential and commercial markets.[2]

4. The London South Line was originally installed in 1935 and is currently comprised of approximately 15 km of NPS 8 bare steel pipe (grade 165, 7.0 mm wall thickness), approximately 43 km of NPS 10 coated steel pipe (grade 165, 7.0 mm wall thickness), and approximately 1 km of NPS 12 coated steel pipe (grade 290, sections of 5.6 mm and 9.5 mm wall thickness). As discussed further below, the construction practice in place in 1935 used unrestrained compression couplings to connect pipe segments, which have contributed to corrosion and degradation and require particular safety practices. Based on typical pipe segment lengths (12 m or 40 ft), there could be in excess of 6,000 unrestrained compression couplings.[3]

[1] Exhibit B, Tab 2, Schedule 1, p.1
[2] Exhibit B, Tab 2, Schedule 2, p.3
[3] Exhibit B, Tab 1, Schedule 1, p.3

5. The London Dominion Line is currently comprised of approximately 41 km of NPS 8 steel pipe, approximately 31 km of NPS 10 coated steel pipe and approximately 1.5 km of NPS 12 coated steel pipe. Similar to the London South Line, cathodic protection was first introduced in 1965. There is a 10 km section of the London Dominion Line that was originally installed in 1936 (unknown grade, 7.0 mm wall thickness) that is still in service and is bare steel pipe.[4]

6. Through condition and risk assessments identifying loss of containment, corrosion and depth of cover concerns, Enbridge Gas has determined that the degradation in the integrity of the Existing Lines require that the pipelines in question be replaced. Not doing so perpetuates the risk of pipeline failure with varying effects depending on location.[5] Because the Existing Lines are an operational risk, replacing the Existing Lines is the most effective way of managing ongoing safety and reliability.

7. The Project follows the routing of the Existing Lines for the majority of the proposed route to ensure customers and communities along the route that are currently served by the Existing Lines can easily be connected to the new main. The Project involves the construction of 39 km of new NPS 6 pipeline and 51.5 km of new NPS 4 pipeline. Once the proposed pipeline is successfully hydrotested and is operational, the Existing Lines will be abandoned. The abandonment of the pipelines currently in municipal road allowance will follow agreements in the respective municipal franchise agreement. For the pipelines in easement, easement agreements will be followed and landowner input will be sought.

[4] Ibid, p.5
[5] Ibid, p. 14

8. Given the clear and demonstrable need for the Project, as set out at Exhibit B, Tab 2, Schedule 2, the Project is the best alternative among the options considered. The Project is in the public interest and leave to construct the Project should be granted.

B. Project Need: Pipeline Integrity

9. The physical integrity of the Existing Lines is the driver of the Project. To understand the need for the Project, the physical condition of the facilities and the corresponding risk must be understood. Based upon the Canadian Standards Association (CSA) Standard Z662, which provides guidance on when a pipeline operator should address pipeline integrity and condition concerns, Enbridge Gas has determined that the Existing Lines segment should be replaced.[6] The critical elements of the Existing Lines condition are summarized below.

Physical Characteristics

10. As noted above, the London South Line of the Existing Lines was installed in 1935. The construction practice in 1935 included the use of unrestrained compression couplings to connect pipe segments. Compression couplings are mechanical fittings that are not welded onto the main. Compression couplings that are not properly restrained could cause a loss of containment, such as a pipeline leak or failure, due to exposed points of thrust. Compression couplings are known to provide minimal pull-out resistance, and depending on design, could cathodically isolate pipe.[7] Feedback from experienced field personnel at

[6] Ibid, p. 5
[7] Ibid, p.4

Enbridge Gas indicates that the barrels of the compression couplings corrode at a higher rate than the surrounding pipe they connect. This suggests that the compression coupling could be unknowingly isolated from the corrosion protection system.[8]

11. Compression couplings on steel mains that are isolated from the corrosion protection system could result in inadequate cathodic protection, leading to accelerated corrosion and potential loss of containment. Because the Existing Lines have experienced significant corrosion on the barrels of the compression couplings, their integrity is further compromised and leaks can and do occur.[9] It is noteworthy that compression coupling leaks account for 38% of the leak repairs on the Existing Lines between 2011 and 2019.[10]

12. The population records indicate that there could potentially be in excess of 6,000 unrestrained compression couplings on the Existing Lines based upon the use of assumed 40 foot lengths of pipe. The Existing Lines represents 30% of the steel mains constructed with compression couplings within the legacy Union Gas network.[11]

13. The London Dominion Line was originally installed in 1936 but the majority of the line was subsequently replaced in 1952 using reclaimed and refurbished pipe from the 1920s and 1930s vintages (unknown grade, 5.6 mm wall thickness). Records indicate that the pipe used for reclamation had multiple instances of laminations along with surface corrosion resulting in flaking of the pipe. Pipeline

[8] Exhibit B, Tab 1, Schedule 2, p.2
[9] Exhibit B, Tab 1, Schedule 1, p.4
[10] Exhibit B, Tab 2, Schedule 1, p.2
[11] Ibid, p.2

flaking can lead to coating disbondment during its application thereby affecting the integrity of the coating.[12]

External Corrosion - Loss of Containment

14. Among the several active degradation factors affecting the Existing Lines, the most predominant is external corrosion that has resulted in loss of containment. Enbridge Gas classifies loss of containment using Class A (immediate repair), B (repaired within a short time) and C (monitor at regular frequency)[13].

15. Since 2011, records indicate that 29 Class A or Class B Leaks have been repaired, and a leak survey completed in 2020 found an additional 5 active Class C Leaks. The extensive amount of compression couplings also leads to the development of Class C Leaks from ground settlement and frost heave. Although there are currently 5 active Class C Leaks, Enbridge Gas has been monitoring as many as 29 active Class C Leaks since 2013. The Existing Lines between 2013 and 2019 had a leak rate of 0.043 leaks/km/year, which is over 10 times greater than the available average leak rate for the steel main population.[14]

16. Due to the vintage, the quality of steel pipe and the general deteriorating conditions, the Existing Lines have not consistently operated near MOP of 1900 kPa for some time. The Existing Lines currently operate at a MOP of 1415 kPa to reduce the number of leaks.[15] Left unaddressed the deteriorating condition of the Existing Lines will result in additional leaks. The wall loss due to historical

[12] Exhibit B, Tab 1, Schedule 1, p.4
[13] Ibid, p.6
[14] Ibid, p.6; Exhibit I.APPrO.3
[15] Ibid, p.6

corrosion and large number of unrestrained compression couplings, including those with corrosion issues, present an increasing likelihood of loss of containment.[16]

External Corrosion – Wall Loss

17. Wall loss due to corrosion has caused issues when welding work is needed on the Existing Lines, including when connecting new laterals to communities, for new customer service connections and for any required repair work.[17] There are consistently high amounts of corrosion across many lengths of pipe and there is difficulty to find a section of pipe to perform an acceptable weld when work is required to be completed on the Existing Lines. For example, a Class A Leak repair in 2019 found that a first stage cut broke away from the main due to corrosion. Complications arose in trying to find an adequate location to install a stopper fitting to perform the repair, as there were numerous corrosion pits preventing welding of the stopper fitting. In a 2020 circumstance, the Company was attempting to abandon a service when it discovered visible external corrosion pitting. Non-destructive testing analysis by a third party showed 40% wall loss.[18]

Depth of Cover

18. Depth of cover is another significant risk driver. A depth of cover survey completed in June 2020 recorded measurements taken at regular intervals across the entire length of the Existing Lines. The study found 1,067

[16] Ibid, p. 7
[17] Ibid, p. 12
[18] Ibid, p. 13

measurement locations of the total 6,671 measurements taken (16% of the measurements) had a depth of cover measurement of 0.60 m or less.

19. Further analysis of the data shows that the areas where the pipe is within Agricultural land use (approximately 63% of the measurements), 85% of the measurements did not meet the minimum internal standard for depth of cover to protect against heavy cultivation damage.[19]

20. It should be noted that over 36% of the Existing Lines have a depth of cover less than 0.75 m. Based on correlation models used by Enbridge Gas in conjunction with historical third party damages, it is predicted that the likelihood for damage has increased based on the reduced depth of cover for this system. For example, the modeling predicts a 22% increase in likelihood of a third party damage when comparing a depth of cover of 0.75 m versus 0.60 m.[20]

21. The combination of pipelines constructed using unrestrained compression couplings and a reduced depth of cover limits the Enbridge Gas' ability to complete a repair safely, efficiently and cost-effectively. A reduced depth of cover reduces the soil resistance thereby meaning a smaller thrust force can cause compression coupling pullout when the pipeline is exposed.
A compression coupling pullout could cause loss of containment and potential severe health and safety consequences. A consequence of reduced depth of cover is that a larger safe embedment distance from the unrestrained compression coupling is required before being able to safely expose the pipeline. This limits repair location options.[21]

[19] Ibid, p. 9
[20] Ibid, p.9
[21] Ibid, p. 20

Visual Evidence

22. Photos taken during the 2020 Depth of Cover Survey are included at Appendix 1 to these submissions. The photos clearly show examples of the crossings with close proximity to the road, partial submersion at the drains, rusty exposed fittings as well as deteriorating coating referred to above.

Risk Assessment

23. For the Existing Lines, a qualitative risk assessment was completed using the Enbridge Standardized Operational 7X7 risk matrix. The risk assessment followed the Enbridge Framework Standard – Risk Management and the GDS Procedure Hazard Identification and Risk Assessment for Common Register. For the purposes of the risk assessment, the pipeline was segmented into sections of comparable condition. The applicable risk information was documented for each section. This information included possible failure modes, causes, applicable controls and possible consequences. This information was used to assess the likelihood and consequence of each failure mode for each of the selected pipeline segments. The Existing Lines were assessed primarily as a medium risk on the Enbridge Operational Risk Matrix. Several different failure modes were identified, the majority of which were assessed as a medium risk. Some sections, where the twin pipelines cannot be isolated independently to effectively manage customer outages, were assessed as a high risk for customer loss.[22]

24. Customer Loss is a significant consequence, particularly for sections where the twin pipelines cannot be isolated independently to effectively manage customer

[22] Exhibit B, Tab 2, Schedule 1, pp. 4-5

outages on the system. Should the lines experience a loss of containment, the repair would be challenging due to the lack of records that exist for the line. It is not clear what will be uncovered as various pipe materials and coatings comprise the Existing Lines. These unknowns (quality of pipe material, coating, construction methods) create additional complexity and risk.[23]

C. The Project – System Design, Alternatives and Cost

25. As noted, the Project involves construction of 39 km of new NPS 6 pipeline with a wall thickness of 4.8 mm and grade 290 MPa (min) and 51.5 km of new NPS 4 pipeline with a wall thickness of 4.8 mm and grade 290 MPa (min). A new pipeline is also proposed to start at Strathroy Gate Station (Calvert Drive, Municipality of Strathroy-Caradoc). It will be NPS 6 and run for 8.4 km along Sutherland Road. At the intersection of Sutherland Road and Falconbridge Drive, it will tie into the NPS 6 main. This pipeline will provide a back-feed to the London Line corridor by adding a secondary feed from the Dawn to Parkway System via Strathroy Gate Station. This back-feed also provides the opportunity to install a smaller pipe size for the replacement, and provides operational flexibility in the future.

26. When existing facilities are due for replacement due to integrity concerns, a wide range of alternatives are considered. These may include, but are not limited to:

- replacing the existing pipeline with a pipeline operating at the existing MOP;
- replacing the existing pipeline with a pipeline operating at a different MOP;
- replacing the existing pipeline with a different size;

[23] Exhibit B, Tab 1, Schedule 1, p. 15

- reducing high pressure replacement by extending other distribution systems;
- carrying out demand side management.[24]

A summary of alternatives considered is set out at Exhibit B, Tab 2, Schedule 5. This summary has been attached to these submissions at Appendix 2. For the reasons set out there, and set out in detail in Exhibit B, Tab 2, Schedule 2, the Project is the best alternative to replace the Existing Lines.

D. Environmental Matters

27. Stantec Consulting Ltd. (Stantec) was retained by Enbridge Gas to undertake a route evaluation and environmental and socio-economic impact study, which included a cumulative effects assessment, to select the preferred route for the proposed Project. The results of the study are documented in the Environmental Report ("ER") entitled London Lines Replacement Project, July 16, 2020. The ER conforms to the Ontario Energy Board's (Board) *Environmental Guidelines for Location, Construction and Operation of Hydrocarbon Pipelines in Ontario, 7th Edition, 2016* ("Environmental Guidelines"). A copy of the ER can be found at Exhibit C, Tab 2, Schedule 1.

28. A link to the ER was provided to the Ontario Pipeline Coordination Committee ("OPCC") on July 22, 2020. The ER was also provided to the local Conservation Authorities and the Counties of Lambton and Middlesex, the Township of Dawn-Euphemia, Municipality of Southwest Middlesex, Municipality of Strathroy-Caradoc, and the Municipality of Middlesex Centre. The consultation logs of OPCC comments and non-OPCC comments are set out at Exhibit I.STAFF.5, Attachments 1 and 2.

[24] Exhibit B, Tab 2, Schedule 2, p.5

E. Landowner Matters

29. The majority of the Proposed Facilities will be located within existing road allowances in the County of Middlesex, the County of Lambton, the Township of Dawn-Euphemia, the Municipality of Southwest Middlesex, the Municipality of Strathroy-Caradoc, and the Municipality of Middlesex Centre.

30. Enbridge Gas will require approximately 0.584 acres of permanent easement. Enbridge Gas has engaged in negotiations for all necessary permanent Land Rights. Enbridge Gas will require 114.9 acres of temporary land rights for construction and topsoil storage. Options for temporary land rights will be obtained from the directly affected landowners. Enbridge Gas will make efforts to obtain these rights and if unable to obtain these rights, Enbridge Gas can still construct the pipeline within the road allowance. Enbridge Gas will require five fee simple land right purchases. These lands will be required for the proposed new sites, and expansion of existing stations. Current status has been updated in Exhibit I.STAFF.4.

31. A copy of Enbridge Gas's Form of Temporary Land Use Agreement and Transfer of Easement Agreement for the land rights required were previously approved by the Board and can be found at Exhibit E, Tab 2, Schedules 3 and 4 respectively.

F. Indigenous and Métis Nations Consultation

32. As detailed at Exhibit G, Tab 1, Schedule 1 and further updated in Enbridge Gas's responses to Exhibit I.STAFF.10, Enbridge Gas has followed the OEB/Ministry of Energy Northern Development and Mines ("MENDM") processes in relation to Indigenous consultation. To date, there have been no outstanding issues or concerns from the Indigenous communities. Enbridge Gas is

committed to continuing to engage with the communities in question on an ongoing basis and will address any concerns as they arise. Currently, there are no outstanding questions or concerns. Enbridge Gas is working with the MENDM to ensure they have all the information necessary to make their determination.[25]

G. Conclusion

33. The Project is needed to address the existing integrity and degradation issues of the Existing Lines. Without the Project, the Existing Lines will continue to deteriorate and operational risk will be perpetuated and increase overtime. The Project is in the public interest and leave to construct should be approved.

All of which is respectfully submitted, this 30th day of November, 2020

Enbridge Gas Inc.
By its Counsel Torys LLP

Charles Keizer

[25] Exhibit I.STAFF.10

Figure 1: Aerial Crossing with Mechanical Split Sleeve Repair fitting, covering leaking Dresser Coupling, near municipal culvert, Bentpath Line, west of Marthaville Rd). Left is a close-up, right show the crossing in context.

Figure 2: Aerial Crossing in heavy vegetation area (Bentpath Line between Tramway Rd and Esterville Rd). Left is a close-up, right show the crossing in context.

Figure 3: Aerial Crossing, with "restrained" Dresser Coupling (Bentpath Line, between Tramway Rd and Esterville Rd) indicating severe deflection and mis-alignment of the pipe. Left is a close-up, right show the crossing in context.

Figure 4: Aerial crossing near box culvert structure (Bentpath Line, between Huff's Corners Rd and Hale School Rd). Left is a close-up, right show the crossing in context.

Figure 5: Aerial Crossing near municipal drain, potential for pipe to be partially submerged (Mosside Line, West of Burr Rd). Left is a close-up, right show the crossing in context.

Figure 6: Aerial Crossing and bridge used for inspection, prone to partial submersion (Pratt Siding and Knapdale, through private easement). Left is a close-up, right show the crossing in context.

Figure 7: Aerial Crossing with multiple leak repair clamps over corrosion leak on pipe (Old Airport Rd, north of CPR Dr). Left is a close-up, right show the crossing in context.

Figure 8: Aerial Crossing with pipe coating peeling off (Falconbridge, between Taits Rd and McArthur Rd). Left is a close-up, right show the crossing in context.

Figure 9: Aerial Crossing with peeling pipe coating (Falconbridge Dr, east of Christina Rd). Left is a close-up, right show the crossing in context.

SUMMARY OF ALTERNATIVES[1]

Alt #	Alternative Description	Rationale for Decision	Cost ($M)
	Proposed Project Replace with NPS 6/4 3450kPa MOP, dual fed line *(See Section 3.5.2.2 in Exhibit B, Tab 2, Schedule 2)*	Provides replacement capacity for the current London Lines while also providing reliability of supply for emergency and operational scenarios in summer and shoulder month conditions.	132.9
Alt 1	Replace with NPS 12/8 1900 kPa MOP, single fed line *(See Section 3.5.1.1 in Exhibit B, Tab 2, Schedule 2)*	Provides replacement capacity for the current London Lines, but no reliability of supply for emergency and operational scenarios. Cost is 24% higher than the proposed option.	164.7
Alt 2	Replace with NPS 10/8/6 1900 kPa MOP dual fed line *(See Section 3.5.1.2 in Exhibit B, Tab 2, Schedule 2)*	Provides replacement capacity for the current London Lines while also providing reliability of supply for emergency and operational scenarios in summer conditions but not shoulder months when construction is common. Cost is 12% higher than proposed option.	148.2
Alt 3	Replace with NPS 10/8/6 3450 kPa MOP single fed line *(See Section 3.5.2.1 in Exhibit B, Tab 2, Schedule 2)*	Provides replacement capacity for the current London Lines, but no reliability of supply for emergency and operational scenarios. Cost is 11% higher than recommended design.	146.9
Alt 4	Replace with NPS 10/8/4 1900 kPa MOP and NPS 6 420 kPa MOP dual fed line *(See Section 3.5.3.1 in Exhibit B, Tab 2, Schedule 2)*	Provides replacement capacity for the current London Lines, but no reliability of supply for emergency and operational scenarios. Cost is 8% higher than proposed design.	144.1
Alt 5	Replace with NPS 6/4 3450 kPa line, reducing proportion of NPS 6 through supplemental DSM *(See Section 3.5.5 in Exhibit B, Tab 2, Schedule 2)*	Provides capacity to serve 2021 expected demand only, while also providing reliability of supply for emergency and operational scenarios. Savings on pipeline size reduction would be exhausted by less than 2 years of supplemental DSM programming, after which continued supplemental DSM spend or pipeline reinforcement would be required.	130.0

Note: All costs shown in the above table are direct capital and abandonment costs. Interest during construction and indirect overhead costs were not included.

OTHER ALTERNATIVES CONSIDERED

Alt #	Alternative Description	Rationale for Decision
Alt 6	Obtaining supply from non-Enbridge pipelines *(See Section 3.5.4 in Exhibit B, Tab 2, Schedule 2)*	No nearby non-Enbridge pipelines or alternative sources of supply with adequate, reliable capacity to serve the system demands.

[1] Exhibit B, Tab 2, Schedule 5