UNDERTAKING JT2.25

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TR 2, page 139

To respond to FRPO hard copy questions sent to EGD.

RESPONSE

The majority of the responses to this undertaking only address the customer growth requirements of this project. Other project objectives, such as reduced operational risks and enhanced safety and reliability of natural gas delivery would not be achieved with the scenarios presented below. The gas supply benefits would also not be achieved.

FRPO Follow-up Questions

EX I.A1.EGD.FRPO.5

1. Please provide all of the peak hour throughputs and the pressures at the respective stations for the scenarios as requested in the original undertaking.

   Enbridge provides the following response:

   Please see Table 1: FRPO 5 Response with Reduced Operating Pressures (Interruptibles On)

   a. If EGD had assumed that for the purposes of the simulations that Interruptible are still being served, please present the results with Interruptibles off in a separate table.

   Enbridge provides the following response:

   Please see Table 2: FRPO 5 Response with Reduced Operating Pressures (Interruptibles Off)

Witnesses: E. Naczynski
C. Fernandes

2. From the scenarios provided, each after 5a), EGD has provided the results based upon its desire to reduce the pressure at Victoria Square and NPS 26 Set. Please provide the simulation results if the original 2014 set pressures of 450 and 375 respectively were maintained in 2015/16.

   Enbridge provides the following response:

   Please see Table 3: FRPO 5 Response with Original Operating Pressures (Interruptibles On)

Witnesses: E. Naczynski
C. Fernandes

Table 1: FRPO 5 Response with Reduced Operating Pressures (Interruptibles On)

Unsteady State Model Results	A1 FRPO 5 a)			A1 FRPO 5 b)			A1 FRPO 5 c)			A1 FRPO 5 d)			A1 FRPO 5 e)			A1 FRPO 5 f)		
	Current			Current			Segment A Only			Segment B Only			Segment B1 Only			NPS 16 from Markham		
	2014/2015	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT
Victoria Square Set Pressure (psi)	450			375			375			375			375			375		
NPS 26 Set Pressure (psi)	375			275			275			275			275			275		
Station B Result Pressure (psi)	244			148			148			231			193			162		
Albion Rd. District Station ($10^3m^3/hr$)	330	383	275	339	385	275	339	485	275	331	339	275	332	389	275	334	388	275
Albion Rd Gate Station ($10^3m^3/hr$)	na	na	na	na	na	na	832	892	485	na	na	na	na	na	na	na	na	na
Keele/CNR Station ($10^3m^3/hr$)	267	368	275	280	371	275	280	474	275	269	303	275	269	376	275	272	376	275
Downsview Station ($10^3m^3/hr$)	135	267	175	149	266	175	149	266	175	136	267	175	136	267	175	140	267	175
Martin Grove Station ($10^3m^3/hr$)	305	278	175	352	255	175	352	255	175	308	278	175	308	263	175	321	271	175
Buttonville Station (from West inlet) ($10^3m^3/hr$)	na	na	na	na	na	na	na	na	na	276	na	na	na	na	na	na	na	na
Buttonville Station (from North inlet) ($10^3m^3/hr$)	na	na	na	na	na	na	na	na	na	276	na	na	526	na	na	na	na	na
South of Alden Road, flow from DV line ($10^3m^3/hr$)	886	na	na	798	na	na	798	n/a	n/a	613	na	na	367	na	na	754	na	na
Jonesville Station ($10^3m^3/hr$)	155	291	175	167	198	175	167	198	175	156	280	175	156	250	175	157	220	175
Station B ($10^3m^3/hr$)	299	244	175/120	243	148	148/120	243	148	148/120	301	231	175/120	302	193	175/120	269	162	162/120
West Mall ($10^3m^3/hr$)	237	292	175	269	275	175	269	275	175	239	292	175	239	292	175	254	286	175
Bayview ($10^3m^3/hr$)	142	254	175	104	161	161	104	161	161	142	241	175	143	206	175	147	173	175
Peak time	8.07			8:00			8:00			8:13			8:08			8:03		

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Table 2: FRPO 5 Response with Reduced Operating Pressures (Interruptibles Off)

Unsteady State Model Results	A1 FRPO 5 a)			A1 FRPO 5 b)			A1 FRPO 5 c)			A1 FRPO 5 d)			A1 FRPO 5 e)			A1 FRPO 5 f)		
	Current			Current			Segment A Only			Segment B Only			Segment B1 Only			NPS 16 from Markham		
	2014/2015	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT
Victoria Square Set Pressure (psi)	450			375			375			375			375			375		
NPS 26 Set Pressure (psi)	375			275			275			275			275			275		
Station B Result Pressure (psi)	268			156			156			245			219			176		
Albion Rd. District Station ($10^3m^3/hr$)	329.5	386	275	336	387	275	336	460	275	330.8	281	275	332	389	275	331.1	389	275
Albion Rd Gate Station ($10^3m^3/hr$)	na	na	na	na	na	na	486.3	920	485	na	na	na	na	na	na	na	na	na
Keele/CNR Station ($10^3m^3/hr$)	220.5/45.7	373	275	228.6/46.5	374	275/175	228.6/46.5	475	275/175	222.1/46.2	303	275/175	223/46.3	376	275	222.3/46.2	376	275
Downsview Station ($10^3m^3/hr$)	134.4	268	175	143.3	266	175	143.2	266	175	135.2	267	175	135.6	267	175	135.1	267	175
Martin Grove Station ($10^3m^3/hr$)	301.6	281	175	331	266	175	331	266	175	303.8	281	175	304.3	280	175	303.4	280	175
Buttonville Station (from West inlet) ($10^3m^3/hr$)	na	na	na	na	na	na	na	na	na	274.7	na	na	na	na	na	na	na	na
Buttonville Station (from North inlet) ($10^3m^3/hr$)	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
South of Alden Road, flow from DV line ($10^3m^3/hr$)	843	na	na	790.5	na	na	790.5	na	na	570	na	na	349	na	na	736.9	na	na
Jonesville Station ($10^3m^3/hr$)	154.9	305	175	162.1	203	175	162.1	203	175	155.4	285	175	156	264	175	155.6	229	175
Station B ($10^3m^3/hr$)	126.5/146.2	268	175/120	147.4/79.8	156	156/120	147.4/79.8	156	156/120	145.8/128.5	245	175/120	146.6/129.2	219	175/120	146/128.7	176	175/120
West Mall ($10^3m^3/hr$)	231.3	295	175	256.2	283	175	256.2	283	175	232.9	294	175	234	294	175	233.3	294	175
Bayview ($10^3m^3/hr$)	124.9	276	175	112.4	167	175	112.4	167	175	125.5	254	175	126.3	229	175	125.9	188	175
Peak time	8.10			8.00			8.00			8.13			8.07			8.12		

Table 3: FRPO 5 Response with Original Operating Pressures (Interruptibles On)

Unsteady State Model Results	A1 FRPO 5 a)			A1 FRPO 5 b)			A1 FRPO 5 c)			A1 FRPO 5 d)			A1 FRPO 5 e)			A1 FRPO 5 f)		
	Current			Current			Segment A Only			Segment B Only			Segment B1 Only			NPS 16 from Markham		
	2014/2015	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT	2015/2016	IN	OUT
Victoria Square Set Pressure (psi)	450			450			450			450			450			450		
NPS 26 Set Pressure (psi)	375			375			375			375			375			375		
Station B Result Pressure (psi)	244			240			246			293			314			267		
Albion Rd. District Station ($10^3m^3/hr$)	330	383	275	331.5	382	275	332.6	460	275	331.2	365	275	333.1	389	275	332.9	388	275
Albion Rd Gate Station ($10^3m^3/hr$)	na	na	na	na	na	na	539.1	917	485	na	na	na	na	na	na	na	na	na
Keele/CNR Station ($10^3m^3/hr$)	267	368	275	222.9/46.2	367	275/175	223.8/46.3	472	275/175	222.7/46.2	340	275/175	224.1/46.4	376	275	224/46.3	375	275
Downsview Station ($10^3m^3/hr$)	135	267	175	136	267	175	136.6	267	175	136.1	267	175	136.9	267	175	136.8	267	175
Martin Grove Station ($10^3m^3/hr$)	305	278	175	307.6	278	175	308.8	277	175	307.9	278	175	309.2	277	175	309	277	175
Buttonville Station (from West inlet) ($10^3m^3/hr$)	na	na	na	na	na	na	na	na	na	180.4	na	na	na	na	na	na	na	na
Buttonville Station (from North inlet) ($10^3m^3/hr$)	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
South of Alden Road, flow from DV line ($10^3m^3/hr$)	886	na	na	891.6	na	na	895.8	na	na	708.3	na	na	369.3	na	na	815.8	na	na
Jonesville Station ($10^3m^3/hr$)	155	291	175	155.6	288	175	156.2	293	175	155.5	301	175	156.4	353	175	156.4	312	175
Station B ($10^3m^3/hr$)	299	244	175/120	146/142.7	240	175/120	156.4/146.8	246	175/120	155.4/145.8	288	175/120	147.2/156.7	314	175/120	147/156.5	267	175/120
West Mall ($10^3m^3/hr$)	237	292	175	238.8	292	175	239.7	291	175	238.4	292	175	240	291	175	239.8	291	175
Bayview ($10^3m^3/hr$)	142	254	175	142.7	250	175	143.3	256	175	142.3	301	175	143.5	322	175	143.4	277	175
Peak time	8.12			8.12			8.05			8.13			8.02			8.03		

3. It is clear from the evidence and the way this question was answered that EGD would prefer to reduce the pressure on the two respective pipes. FRPO would like to explore a stepped reduction in pressure over time.
   a) In a way acceptable to EGD, please show the pressure reductions in at least 3 steps down toward the desired pressure.

Enbridge provides the following response:

a) The Company does not believe a stepped reduction is acceptable and is seeking to lower the pressures to below 30% SMYS as soon as possible. The scenarios below have been run in order to respond to the question only. This response should not be taken to mean that the Company believes this is acceptable, as this is not the case.

   Pressure reductions were modeled in 2015, 2020 and 2025 in increments of one third of the total reduction and modeled in steady state. The below table shows pressure reductions, corresponding required reinforcements, as well as corresponding pressures at Station B. This scenario does not allow for reduced operational risks and enhanced safety and reliability of natural gas delivery. Furthermore, the gas supply benefits would not be achieved.

   Table 4: Incremental Pressure Reduction Results

Year	Victoria Square Set Point (psi)	NPS26 Set Point (psi)	Reinforcement Segments	Station B Pressure (psi)
2015	450	375	None	215
	425	342	None	Infeasible
	425	342	B (N-S)	268
2020	400	308	B (N-S)	208
	400	308	B (N-S & E-W)	224
	400	308	A & B	326
2025	375	275	A & B	295

4. FRPO, without the benefit of the model, has asked about the benefit of the EGD simulation tools has asked about alternative in linking the Markham south line the Don Valley line as an opportunity to defer Segment B.

a) Please present EGD's next best alternative in a table of flows and pressures.

Enbridge provides the following response:

Growth Only:
An alternative which only addresses the growth portion of the project up to 2025 is the installation of NPS 36 pipe looped to the existing NPS 30 from Sheppard Ave to

Witnesses: E. Naczynski
C. Fernandes

McNicoll Ave. Table 5 shows the steady state modeling results of this scenario. This scenario does not allow for reduced operational risks and enhanced safety and reliability of natural gas delivery. Furthermore, the gas supply benefits would not be achieved.

Table 5: Sheppard to McNicoll Loop 2025 Results

Station	Set Point (psi)	Flow (10^3m^3/hr)
Parkway	485	898
Lisgar NPS 20	175	112
Lisgar NPS 30	275	268
Lisgar NPS 24	485	412
Martin Grove	175	359
West Mall	175	292
Victoria Square	450	987

Station B Pressure (psi)	224

Operational Flexibility + Growth Only:

This alternative would meet the load growth forecast and also provide the downstream operational flexibility needs, including reduced operating pressures to 375 psi on the NPS 30 Don Valley and 275 psi on the NPS 26. A new NPS 36 485 psi pipeline, approximately 15 km length, would be required. The pipeline would start at Victoria Square Gate Station and tie into the existing NPS 36 at Sheppard Ave. An upgrade to Jonesville Station and reconfiguration at Victoria Square Gate Station would also be required. Table 6 shows the steady state modeling results of this scenario. This scenario does not allow supply benefits to be achieved and does not eliminate the east-west bottleneck nor provide entry point diveristy.

Table 6: Victoria Square to Sheppard Ave. and Jonesville Station 2025 Results

Station	Set Point (psi)	Flow (10^3m^3/hr)
Parkway	485	825
Lisgar NPS 20	175	112
Lisgar NPS 30	275	268
Lisgar NPS 24	485	278
Martin Grove	175	359
West Mall	175	292
Victoria Square	485/375	1094

Station B Pressure (psi)	323

Witnesses: E. Naczynski
C. Fernandes

Next Best Complete Solution:
As discussed in Exhibit A, Tab 3, Schedule 7, paragraph 21, a build of Segment B plus another segment that allows a source of supply to connect near the center of the distribution system (either at Albion or Keele/CNR Stations) would meet the distribution system project objectives. This additional segment and source is effectively Segment A in the proposed facilities. If the alternative was sourced from TransCanada's Mainline to the north, this alternative would also need additional short haul capacity to be procured in order to achieve the the supply chain reliability and gas supply benefits. If this solution is sourced from Union's system and supplies Albion Station, it becomes the original proposal for the LTC Application, originating Segment A from Parkway West.

Station flows are same/similar for this alternative as already submitted for the proposed facilities.

b) Please provide the reasons why this alternative was rejected.

Enbridge provides the following response:

The alternatives discussed above do not meet the project objectives and were screened out for that reason. Alternatives that were dependent on increased short haul capacity were screened out due to the lack of availability of short haul capacity from Parkway to Maple.

The alternative of initiating Segment A from Parkway West was no longer necessary following the MOU agreement with TransCanada, which allows for the economic sharing and shortening of Segment A by using TransCanada's existing infrastructure from Parkway West to Bram West and only building the infrastructure required to supply at Albion Station. This alternative would meet all of the project objectives, but has a lower NPV and higher cost than what is proposed.

5. Provide flow equation and describe if squared on pressures and load. (Transcript from June 13, 2013) on page 139 lines 19 to page 140 line 7).

Enbridge provides the following response:

The "Fundamental pipe with flow-depending friction (FM)" equation in the SynerGEE Gas program is used in steady-state modeling. This equation is squared on both pressures and flow rate.

Witnesses: E. Naczynski
C. Fernandes