uniongas
A Spectra Energy Company

October 17, 2016

BY COURIER & RESS

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
Toronto, Ontario
M4P 1E4

RE: EB-2016-0186 – Union Gas Limited ("Union") – Panhandle Reinforcement Project Undertaking Responses

Dear Ms. Walli,

Further to the responses filed on October 13, 2016 to Undertakings received in the Technical Conference held on October 4, 2016, please find attached Union's responses to the remaining Undertakings 6, 7, 8, 18, 19, 22, 23 and 24.

If you have any questions with respect to this submission please contact me at 519-436-5473.

Yours truly,

[original signed by]

Karen Hockin
Manager, Regulatory Initiatives

Encl.

cc: Zora Crnojacki, Board staff
Mark Kitchen, Union Gas
Charles Keizer, Torys
All Intervenors (EB-2016-0186)

UNION GAS LIMITED

Undertaking Response
To Mr. Quinn

TO ADVISE HOW MUCH MORE VOLUME COULD BE MOVED THROUGH SANDWICH NOT HOLDING 115 CONSTANT; I.E., HOW MUCH MORE GAS COULD YOU TAKE IN AT OJIBWAY IF YOU ADDED A SECOND COMPRESSOR UNIT.

The addition of a second compressor unit at the Sandwich Compressor Station (of equivalent size to the existing compressor unit) could increase Union's ability to import gas at Ojibway from 115 TJ/d in the summer to 172 TJ/d. However, this would require Union to significantly increase its reliance on gas supply at Ojibway to support in-franchise customers from the current level of 58 TJ/d to meet the Panhandle System Design Day needs. As stated in Exhibit B.Staff.3 a) and Exhibit JT1.24, Union has attempted to secure more firm pipeline capacity to Ojibway and/or more firm delivered supply but has not been successful. Union cannot reasonably rely on this quantity of gas deliveries to Ojibway without firm assets backstopping the transaction. Union has also not considered whether a second compressor at Sandwich would necessitate loss of critical unit coverage which protects the flow of gas in case one of the two compressors at the Sandwich Compressor Station is not available. It is possible there will be additional complexity associated with the addition of a second compressor at Sandwich.

Relying on this level of gas supply at Ojibway which is not a liquid trading point, but a trans-shipment point between the PEPL system and the Union system, with limited counterparties, would add significant risks related to availability, term and price.

This is not a viable alternative to meet the system growth demands of the Panhandle System for the following reasons:

1) It has been discussed extensively that there is no additional firm PEPL transportation capacity to or supply available at Ojibway (please see Exhibit B.Staff.3 a) and Exhibit JT1.24 on detail of Union's efforts in this regard).

2) Term risk relates to the uncertainty on how long a shipper would have to commit to transportation capacity in the future related to having a Right of First Refusal ("ROFR"). For example, when a contract has ROFR rights and renews, it means that once the primary term of the contract ends, if another party is willing to contract for a longer term, the original contract holder would have to match that term to retain the rights to the capacity. This would then reoccur each time the primary term ended. Therefore, you would not know what term you may need to contract for in the future to retain the capacity.

3) Price risk is twofold. First, the transportation capacity would have a risk around the level of the tolls on the pipeline going forward. To have renewal or ROFR rights,

pipelines will require contracting at maximum tolls. These maximum tolls can change over time. Even if the maximum tolls were locked in for the primary term, the term following the renewal or ROFR period, would likely have different tolls. If new facilities are required to accommodate incremental transportation capacity, the cost of those facilities will likely command incremental tolling (in the US it is standard practice to recover the costs of new facilities on an incremental basis which results in tolls much higher than the existing tolls so the new shipper carries the burden of new pipeline costs and not the existing shippers) not the standard Canadian practice of rolled in tolling.

The second area of price risk is the gas commodity price. Gas prices will change from time to time based on the market factors at the time the purchase is made. If we were to assume that Union would purchase the entire 172/TJ/d (ignoring the 21 TJ/d of C1 renewable capacity and the lack of any additional available PEPL capacity) and assuming PEPL long haul supplies at the forecasted $0.34/GJ premium to Dawn based supplies results in an annual gas price cost premium of approximately $14 million.[1]

4) Availability risk relates to whether or not transportation capacity is available from time to time. Should a contract not have renewal or ROFR rights (i.e. not be a term contract at maximum tolls) then the availability of the transportation capacity would be in question after the initial term of the transportation arrangement.

Please also refer to Exhibit B.IGUA.9 b) where Union addressed issues related to relying on a similar level (195 TJ/d) of delivered gas at Ojibway.

[1] Calculation : 172 TJ/d – 58TJ/d = 114 TJ/d X $.34/GJ X 365 = $14.15 million

UNION GAS LIMITED

Undertaking Response
To Mr. Quinn

TO PROVIDE A HIGH-LEVEL COST ESTIMATE FOR A SECOND COMPRESSOR AT SANDWICH.

An additional compressor unit located at Sandwich Compressor Station of similar size to the existing compressor unit would cost approximately $31 million. Please see Exhibit JT1.6 for additional detail.

Union does not have an estimate of any facilities required on the PEPL System to deliver this gas on a firm basis to Ojibway nor does Union have an estimate of the impact on the upstream PEPL tolls that would result. However, if any facilities were required, PEPL would request long term (10 year minimum) commitments which would reduce Union's flexibility to manage Panhandle System demand in the medium term.

UNION GAS LIMITED

Undertaking Response
To Mr. Quinn

TO PROVIDE THE WINTER FLOW SCHEMATIC SHOWING THE MAXIMUM RECEIPT OF 140 TJS FOR BOTH 2017 AND 2021 USING FORECASTED DEMAND UNDERPINNING THE APPLICATION WITH EXISTING FACILITIES; IN OTHER WORDS, WITHOUT THE PANHANDLE REINFORCEMENT

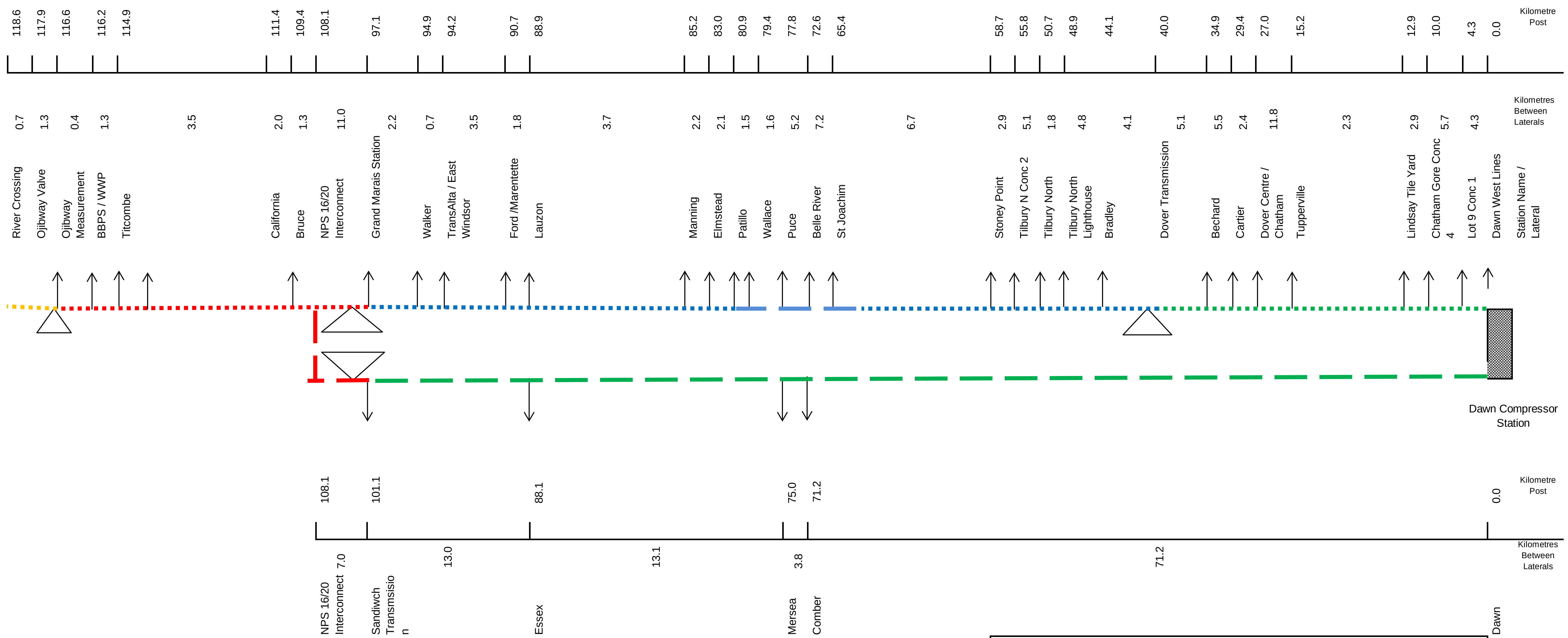
The attached schematics illustrate the Panhandle System capacity with a scenario of 140 TJ/d of firm supply available at Ojibway and no change to the existing Panhandle facilities (i.e. the Panhandle Reinforcement Project is not constructed).

Attachment 1 is a schematic that shows the forecast demands for Winter 2017/2018 Design Day and shows that the forecast demands can be served. This schematic also shows the corresponding pressures along the Panhandle System.

Attachment 2 is a schematic that shows the forecast demands for Winter 2021/2022 Design Day and shows that the forecast demands cannot be served. This schematic also shows the corresponding pressures along the Panhandle System. The pressure constraints into the Leamington/Kingsville market cannot be maintained in this scenario resulting in a system shortfall of 30.5 TJ/d.

As discussed in Exhibit B.Staff.3 a), Exhibit JT1.24 and Exhibit JT1.6, Union has attempted to secure incremental delivered firm supply at Ojibway or incremental firm pipeline capacity to Ojibway but has not been successful. Union cannot rely on being able to obtain this level of firm delivered supply to Ojibway.

Union Gas Panhandle System (Design Day)



Legend

······	NPS 16	green	6040 kPag MOP
▪ ▬	NPS 20	blue	4140 kPag MOP
△	Station	red	3450 kPag MOP
		yellow	2930 kPag MOP

Design Day Demands / Design Day Pressure

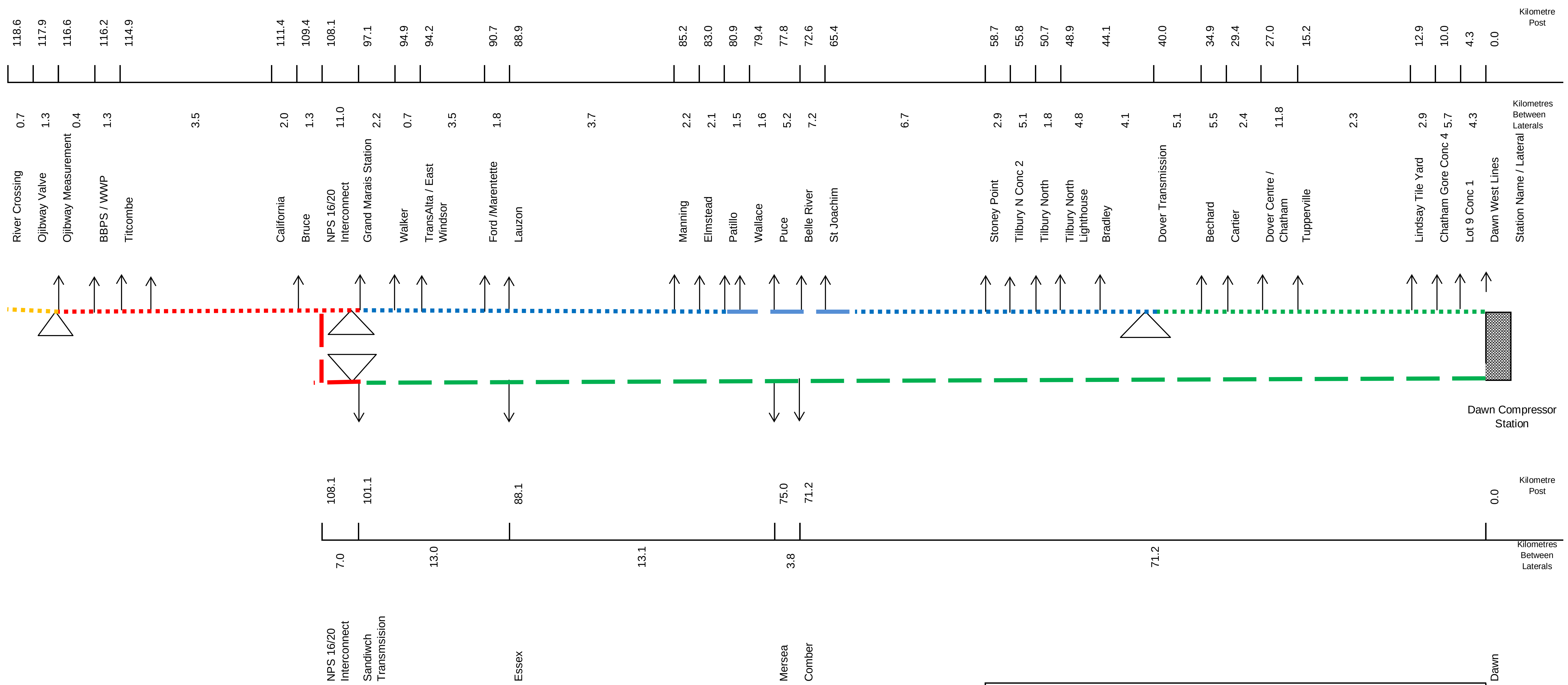
	(GJ/d)	(kPag)
Ojibway Measurement	30664	1868
BBPS / WWP	94345	1827
Titcombe	17817	1867
California	18102	1868
Bruce	6596	1869
Grand Marais Station	46132	1868
Walker	55044	1868
TransAlta / East Windsor	35466	1843
Ford /Marentette	1621	2012
Lauzon	25127	2065
Manning	11551	2246
Elmstead	1298	2247
Patillo	5146	2479
Wallace	57	2492
Puce	1827	2511
Belle River	4174	2632
St Joachim	668	2746
Stoney Point	1288	3084
Tilbury N Conc 2	10	3204
Tilbury North	3203	3481
Tilbury North Lighthouse	201	3553
Bradley	22	3744
Bechard	391	3907
Cartier	38	4150
Dover Centre / Chatham	50375	4630
Tupperville	2234	5290
Lindsay Tile Yard	19	5432
Chatham Gore Conc 4	19	5755
Lot 9 Conc 1	3	5919
Dawn West Lines	7558	6030
Comber	126318	3829
Mersea	42231	2620
Essex	18924	3383
Sandwich Transmission	14957	3760
Total	**623426**	

System Capacity

	(GJ/d)
Total System Capacity	**640,865**
including	
Ojibway Supplies	**140,000**
Fuel	
Total Requirements	**623,426**
Surplus	**17,439**

WINTER DESIGN DAY
PANHANDLE SYSTEM
WINTER 2017/2018
NO ADDITONAL FACILITIES BUILT

Union Gas Panhandle System (Design Day)



Design Day Demands	(GJ/d)	***Design Day Pressure*** (kPag)
Ojibway Measurement	31436	1883
BBPS / WWP	94345	1874
Titcombe	17933	1873
California	18180	1873
Bruce	6604	1869
Grand Marais Station	46215	1867
Walker	63141	1866
TransAlta / East Windsor	35466	1836
Ford /Marentette	3934	1989
Lauzon	25127	2036
Manning	11551	2203
Elmstead	1298	2315
Patillo	5146	2422
Wallace	57	2441
Puce	1827	2453
Belle River	4174	2567
St Joachim	668	2676
Stoney Point	1288	2998
Tilbury N Conc 2	10	3135
Tilbury North	3547	3378
Tilbury North Lighthouse	201	3494
Bradley	22	3804.6
Bechard	391	4114
Cartier	38	4226
Dover Centre / Chatham	64210	4483
Tupperville	2234	5218
Lindsay Tile Yard	19	5341
Chatham Gore Conc 4	19	5496
Lot 9 Conc 1	3	5800
Dawn West Lines	7558	6029
Comber	144084	3055
Mersea	46599	3134
Essex	18942	3094
Sandwich Transmission	14957	2923
Total	671224	

System Capacity	(GJ/d)
Total System Capacity	**640,865**
including	
Ojibway Supplies	**140,000**
Total Requirements	**671,224**
Shortfall	**30,359**

WINTER DESIGN DAY
PANHANDLE SYSTEM
WINTER 2021/2022
NO ADDITIONAL FACILITES BUILT

UNION GAS LIMITED

Undertaking Response
To Mr. Quinn

TO ANSWER 11 AND 12 AS WELL AS POSSIBLE FOCUSING ON THE CURRENT AND SEEING WHAT YOU HAVE FOR THE PAST.

Please see Attachment 1 for current station parameters for the requested stations.

The changes related to the previous Leamington Expansion Projects and Proposed Panhandle Reinforcement Project are:

- Comber Transmission Station's meter was replaced as part of 2016 Leamington Expansion Pipeline Project which increased the unregulated flow from165,000 m3/hr to 200,000 m3/hr.

- County Rd 18 station is a new station and constructed as part of 2016 Leamington Expansion Pipeline Project.

- Mersea Gate Station is scheduled to be rebuilt in 2017 as part of the Panhandle Reinforcement Project. As part of this work, the minimum inlet in to the station will be decreased to 2275 kPa with the station capacity increased to 85,000m3/h. The cost for this upgrade is part of the Proposed project costs at $4.1million (refer to Exhibit A. Tab 7. pg. 1. Line 14.)

These stations, other than Mersea Gate station, are adequately sized to meet the 5 year forecast demands of the Panhandle Reinforcement Project.

The table below shows minimum inlet pressures required in 2021 for each station to provide the forecast flows. Note that, as Comber Transmission and County Rd 18 are upstream of Leamington North Gate, regardless of a lower inlet pressure requirement for County Road 18 station, system pressures must be sufficient to ensure the minimum inlet is met at Leamington North Gate, as the constraint.

Parameter	Comber Transmission	County Rd 18	Leamington North Gate	Mersea Gate	Essex Transmission
2021 Minimum Inlet Pressure (kPa)					
	3500	2110	2275	2172	3000

		A	B	C	D	E
	Parameters and Equipment	Comber Transmission	County Rd 18	Leamington North Gate	Mersea Gate	Essex Transmission
	Inlet Pressure					
1	Maximum (kPa)	6040	6040	6040	6040	6040
2	Minimum (kPa)	3500	2275	2275	2550	3275
	Outlet Pressure					
	Unregulated Outlet					
3	Maximum (kPa)	3450	N/A	N/A	N/A	N/A
4	Minimum (kPa)	3450	N/A	N/A	N/A	N/A
	First Stage Cut					
5	Maximum (kPa)	1310	1830	1830	1830	1830
6	Minimum (kPa)	1310	700	1380	700	1720
	Second Stage Cut					
7	Maximum (kPa)	380	N/A	380	380	380
8	Minimum (kPa)	140	N/A	140	140	140
	Design Flow Capacity					
	Unregulated					
9	(m^3/hr)	200000	N/A	N/A	N/A	N/A
10	(GJ/day)	185280	N/A	N/A	N/A	N/A
	First Stage Cut					
11	(m^3/hr)	37000	102000	68500	16000	29500
12	(GJ/day)	34277	94493	63458	14822	27329
	Second Stage Cut					
13	(m^3/hr)	3000	N/A	40000	7816	20000
14	(GJ/day)	2779	N/A	37056	7241	18528

UNION GAS LIMITED

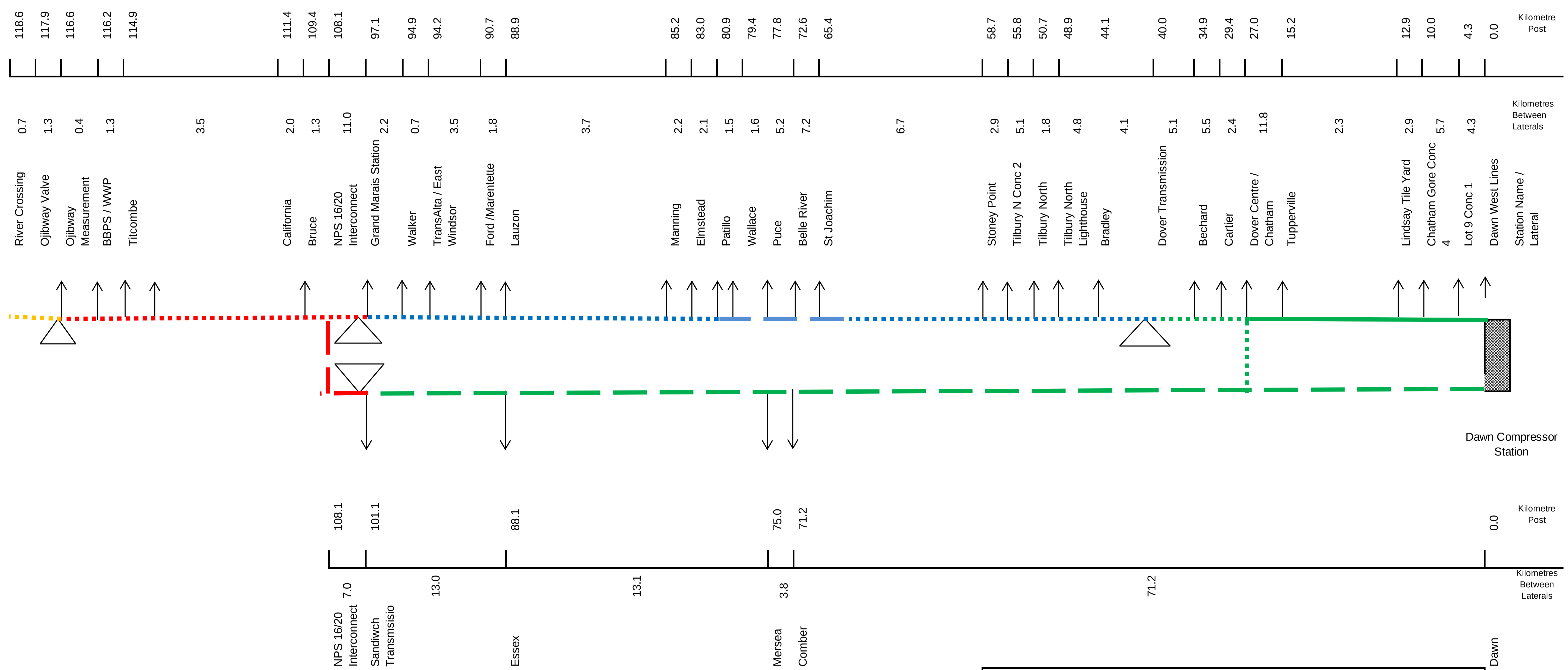
Undertaking Response
To Mr. Quinn

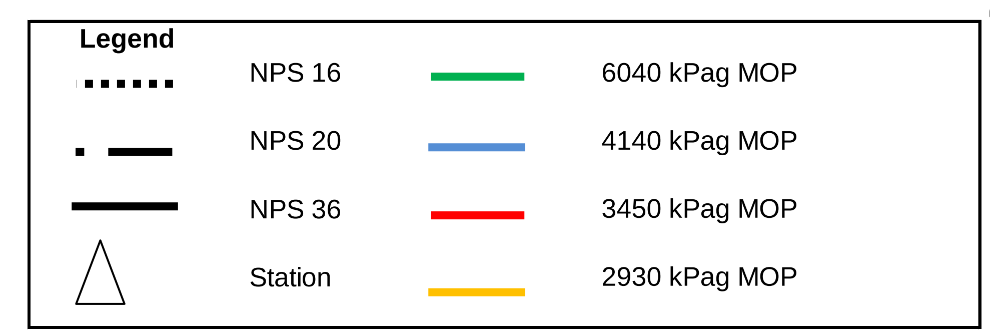
TO SHOW THE SIMULATION THAT GIVES THE SPECIFIED INFORMATION

Attachment 1 illustrates the Panhandle System capacity with 94 TJ/d of supply at Ojibway and the required pipeline and station facilities for this alternative as described in EB-2016-0186, Exhibit A, Tab 6, p.11, lines 12-19.

Attachment 1 also shows the forecast demands for the Winter 2021/2022 Design Day and the corresponding pressures along the Panhandle System. The five year forecast demands can be served.

Union Gas Panhandle System (Design Day)





Design Day Demands	(GJ/d)	***Design Day Pressure*** (kPag)	
Ojibway Measurement	31436	1874	
BBPS / WWP	94345	1870	
Titcombe	17933	1876	
California	18180	1906	
Bruce	6604	1939	
Grand Marais Station	46215	1937	
Walker	63141	1937	
TransAlta / East Windsor	35466	1940	
Ford /Marentette	3934	2083	
Lauzon	25127	2139	
Manning	11551	2327	
Elmstead	1298	2425	
Patillo	5146	2567	
Wallace	57	2590	
Puce	1827	2603	
Belle River	4174	2728	
St Joachim	668	2846	
Stoney Point	1288	3200	
Tilbury N Conc 2	10	3450	
Tilbury North	3547	3607	
Tilbury North Lighthouse	201	3748	
Bradley	22	3825	
Bechard	391		5716
Cartier	38	5875	
Dover Centre / Chatham	64210	5942	
Tupperville	2234	5982	
Lindsay Tile Yard	19	5987	
Chatham Gore Conc 4	19	6002	
Lot 9 Conc 1	3	6019	
Dawn West Lines	7558	6030	
Comber	114422	3807	
Mersea	40016	3702	
New Kingsville	36245	3634	
Essex	18942	3518	
Sandwich Transmission	14957	3385	
Total	**671224**		

System Capacity	(GJ/d)
Total System Capacity	**671,224**
including	
Ojibway Supplies	**94,000**
Total Requirements	**671,224**
Shortfall	**0**

WINTER DESIGN DAY
PANHANDLE SYSTEM
WINTER 2021/2022
94 TJ/d Import at Ojibway with Facilities as per Exhibit A.Tab 6.pg 11.lines 12-19

UNION GAS LIMITED

Undertaking Response
To Ms. Van Soelen

TO BREAK DOWN THE COST OF THE FACILITY INSTALLATION VERSUS THE NECESSARY UPGRADES. ALSO TO ADVISE IF UNION HAS A BREAKDOWN FOR THE ATTRIBUTION OF THE COST TO ALL OF THE VARIOUS REQUIREMENTS THAT ARE INDICATED IN THE CHART

For the LNG alternative, the breakdown of the LNG facility installation costs versus the necessary pipeline reinforcement costs are outlined on page 1 of Exhibit JT1.24.

The breakdown of the costs for the 'New Pipeline with Incremental Deliveries at Ojibway' alternative can be found at Exhibit JT1.24, Attachment 1. Union was also asked to identify how much is attributable to the increase in the Ojibway import contracts versus the replacement of the existing Panhandle System facilities. All of the facilities, plus the Ojibway imports are required to meet the forecast incremental demands.

UNION GAS LIMITED

Undertaking Response
To Ms.Van Soelen

TO PROVIDE THE WORK-UP THAT WAS DONE TO ASSESS THE COST OF THE CNG ALTERNATIVE, INCLUDING ANY ASSUMPTIONS THAT GO INTO THAT COST.

Please see Exhibit JT1.24 page 2 for additional information regarding CNG as an alternative.

UNION GAS LIMITED

Undertaking Response
To Ms. Crnojacki

TO PROVIDE A RESPONSE TO STAFF QUESTIONS 1(A) AND (B) THAT WERE PRE-FILED

Board Staff Pre-filed Question 1

a) *Include Stage 1 economic assessment: NPV values for terms of 20 year and 40 year horizons for year 5 and year 6 and beyond.*

b) *For the infrastructure expansions not subject to this application that Union identified will be needed post 2021 to address forecast demand presented in column on "Post 2021 Facility Requirements" provide estimated Capital and O&M costs based on today's prices and costs.*

Response to a) and b):

Please see Attachment 1 for the amended comparison matrix as requested.

Attachment 1 is a matrix of the feasible alternatives that Union has examined.

LNG and CNG are not viable alternatives. LNG and CNG details are described below.

1. LNG

LNG is not a viable alternative due to both cost and timing criteria.
LNG would, at best, not be available until 2019 which does not meet Union's in-service date of 2017. The costs below are in 2016 dollars and would need to be inflated to reflect a 2019 in-service date. The capital cost of the LNG alternative is based on the following assumptions:

LNG Facilities ($ millions)	
Storage Tank	$104
Liquefaction Systems	$ 46
Vaporization	$ 21
Other Mechanical	$ 10
Electrical & Controls	$ 18
Land	$ 2
All other	$ 34

Total LNG to construct:	$235
Maintain NPS 16 (Capex thru 2022 listed here)	$ 8
Total Capex (Build) LNG (5 years)	$243

Annual Capex Maintenance:	$3/year for years 5-10; $4.5/year for years 11-40
Annual Operating Cost:	approximately $5/year

20 year NPV of Capex and Operating Costs approximately $(294) million
40 year NPV of Capex and Operating Costs approximately $(349) million
The NPV figures include the Capex and O&M costs of maintaining the NPS 16 pipeline

In addition, once the LNG facility is at full utilization (it is sized to meet the capacity of the Proposed Project) incremental pipeline facilities commencing at Dawn will be required to serve additional growth, wherein a portion or the entire Proposed Project would be required in one or more stages. As an indicator, the Proposed Project at $265 million would have a capital cost of approximately $307 million in 2022 at a 3% inflation rate.

2. CNG

CNG was considered on a preliminary basis but was not pursued further due to cost and logistical concerns as described at Exhibit A, Tab 6, p. 7. lines 6-10.

As noted, CNG would require 513 truckloads per day on design day which was assumed to be accomplished with 107 trailers. A requirement in excess of 500 loads per day to meet firm demand is particularly concerning when one considers the drivability in winter conditions.

The 513 loads are based on a daily requirement of 147 TJ with a trailer capacity of 287 GJ/trailer. This requires 54 trucks and 107 CNG trailers. Note that a disproportionate amount of supply is required to raise the pressure on the NPS 20 enough to deliver the gas to the market.

The preliminary CNG cost assumptions ($ millions) are:

Compression /unloading facilities	$ 97
54 Truck and 107 CNG Trailers	$ 62
Sub Total	$159
Maintain NPS 16 (Capex thru 2022 reported here)	$ 8
Total Capex	$167

Capex does not include CNG periodic maintenance cost or periodic cost for replacement vehicles and trailers. Insufficient information is available to quantify these costs.

Operating costs were estimated at $16 million/year related to compression, transporting CNG and, operating the facilities.

20 year NPV of Capex and Operating Costs approximately $(298) million
40 year NPV of Capex and Operating Costs approximately $(363) million

The NPV figures include the cost of maintaining the NPS 16 pipeline.

Board Staff Pre-filed Question 2 a)

Has Union been able to meet a portion of the 48 TJ/d of unmet demand in the Leamington-Kingsville area? Please provide details.

Response:

Please refer to pages 161-162 of the EB-2016-0186 Technical Conference transcript (see response provided by Ms. Caille).

Board Staff Pre-filed Question 2 b)

Has Union considered any short term supply options to serve the 48 TJ/d of unmet demand? Please provide details of the options considered.

Response:

The following is intended to supplement the response provided by Mr. Shorts at page 162 of the EB-2016-0186 Technical Conference transcript.

Union not only contemplated but has actively pursued a number of short and longer term alternatives to meet the forecasted firm service demand increases. These alternatives are detailed at Exhibit B.Staff.3 a).

In summary,

1) Union entered an open season on the Panhandle Eastern Pipeline Limited ("PEPL") system for 23 TJ/d of firm transportation capacity to Ojibway for a 5-year term commencing November 1, 2017. PEPL stated that there was insufficient capacity available to Ojibway and denied Union's request for firm transportation capacity.
2) Union issued a Request for Proposal ("RFP") to a broad range of market participants (100 in total) to secure firm delivered supply or firm transportation capacity to Ojibway starting in November 1, 2016. Union received only one response to the RFP and subsequently contracted for the full 21 TJ/d of firm delivered supply at Ojibway offered by that party for the period November 1, 2016 to October 31, 2019.
3) Union conducted a reverse open season to determine if any existing in-franchise firm customers along the Union Panhandle System did not require all or portions of their contracted firm capacity. No customers responded to the reverse open season request.
4) Union canvassed in-franchise power customers in the Windsor area to inquire about their interest in turning back all or a portion of their contracted firm capacity effective November 1, 2017. No turn back was offered to Union.
5) Other alternatives related to existing C1 transportation customers were investigated. In the end, Union purchased 21 TJ/d of firm delivered supply from the only C1 Ojibway to Dawn transportation customer contracted past November 1, 2017 as noted above. Union understands that this counterparty does not have any further firm PEPL transportation capacity to Ojibway.

Therefore, none of these alternatives will meet the needs of the 48 TJ/d noted let alone the total 106 TJ/d of incremental firm load to meet in-franchise demand for the period November 1, 2017 to November 1, 2021.

Board Staff Pre-filed Question 2 c)

Under what conditions can Union defer the proposed project in the short-term (1-3 years) until there is greater clarity on the Province's proposed cap and trade program?

Response:

The following is intended to supplement the response provided by Ms. Caille at pages 162-163 of the EB-2016-0186 Technical Conference transcript.

Union is not aware of any conditions under which this proposed reinforcement could be deferred in the short-term.

The Proposed Project is required to serve the immediate demand of both residential and contract rate customers. Union has already been refusing incremental firm service to contract rate customers in 2016 and 2017 (and periods beyond), as a result of the constraints on the Panhandle System and, without the proposed reinforcement. Union will not be able to connect the forecasted additional general service customers (ie. new houses in the area) for the winter of 2017/2018. In addition to the commercial, institutional and industrial customers who would not receive service, Union forecasts that approximately 6,000 new residential customers would not be able to receive natural gas service between the winters of 2017/2018 and 2021/2022.

As stated in Exhibit B.Staff.4 part c), Union's forecasted demands will result in the capacity from this proposed project being fully subscribed after five (5) years. It is unlikely there will be any material impact of CCAP, DSM or Cap and Trade on natural gas demand within this time frame. In addition, Union has received many letters of support from the affected municipalities, Ontario Greenhouse Vegetable Growers, the Ontario Federation of Agriculture and customers that further demonstrate the urgent need for the proposed facilities.

Alternative Description	Facility Requirements 2017 For alternatives:+ facilities thru 2021	Costs (million)		In-service Date	~2022 Facility Requirements	Rationale
		Capital	O&M			
Proposed Project New Pipeline from Dawn NPS 36	Replace (lift) 40 km of the existing Panhandle NPS 16 pipeline and replace with a new NPS 36 pipeline between Dawn and Dover Transmission. Rebuild Dover Transmission. Upgrade Dover Center and Mersea Gate Capex $ 265 20 Year NPV with Capex over 5 Years (2017 to 2021) = $(212), 40 years = $(205) 20 Year NPV with Capex over 6 Years (2017 to 2022) = $(239), 40 years = $(232) The cost for the 16" line noted in the O&M column is the NPV of the Capex and O&M. The NPV above includes this.	5 Yr Capex $ 265 6 Yr Capex $ 305	Avoid cost to maintain 16" over 40 yrs ~$16	01-Nov-17	Install approximately 16 km of NPS 12 pipeline into the Town of Kingsville and new Transmission station. The pipeline location has not finalized, for discussion purposes it is referred to as "Graham". Install approximately 12 km NPS 6 Loop starting from McCormick Station ("McCormack") Capex ~$ 40 million	Please see Exhibit A, Tab 6, pages 3 - 6
New Pipeline from Dawn NPS 30	Install 40 km of NPS 30 pipeline, which will loop the existing NPS 20 Panhandle between Dawn and Dover Transmission. Rebuild Dover Transmission. Upgrade Dover Center and Mersea Gate Capex $ 264 + ~$8 Capex to maintain 16" for first 5 years + $28 for Yrs 6 to 40 20 Year NPV with Capex over 5 Years (2017 to 2021) = $(224), 40 years = $(222) 20 Year NPV with Capex over 6 Years (2017 to 2022) = $(251), 40 years = $(248) The cost for the 16" line noted in the O&M column is the NPV of the Capex and O&M. The NPV above includes this.	5 Yr Capex $ 264 6 Yr Capex $ 304	Maintain 16" over 40 years ~$ 16	01-Nov-17	Same as Proposed Project above	Please see Exhibit A, Tab 6, pages 3 - 6
New Pipeline with Incremental Deliveries at Ojibway	Increase Ojibway import contracts to 94 TJ/d Replace (lift) 27 km of the existing Panhandle NPS 16 pipeline with a new NPS 36 pipeline between Dawn and Dover Centre Upgrade Dover Center and Mersea Gate Capex $ 198 + $ 3 Capex to maintain remaining 13km of the 16" for 5 years Install 16 km of NPS 12 pipeline into the Town of Kingsville and new transmission station (2019 "Graham") Capex $ 30 Install 12 km NPS 6 looping starting from McCormick Station (2018 "McCormack") Capex $ 7 20 Year NPV with Capex over 5 Years (2017 to 2021) = $(207), 40 years = $(201) 20 Year NPV with Capex over 6 Years (2017 to 2022) = $(271), 40 years = $(265) The cost for the 16" line noted in the O&M column is the NPV of the Capex and O&M. The NPV above includes this.	5 Yr Capex $ 235 6 Yr Capex $ 334	Cost to maintain 13km of 16" for 5 yrs	01-Nov-17	Replace (lift) remaining 13 km of the existing NPS 16 Panhandle pipeline between Dover Centre and Dover Transmission with a new NPS 36 pipeline Rebuild Dover Transmission Upgrade Dover Centre Total Capex ~ $ 99 million	Please see Exhibit A, Tab 6, pages 7 -15 Please see Exhibit B.FRPO.2c)

Note: All alternatives provide capacity to meet the forecast Winter 2021/22 demand of 106 TJ/d.