ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ASSOCIATION OF POWER PRODUCERS OF ONTARIO INTERROGATORY #10

INTERROGATORY

A.4 What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Reference: EB-2012-0451 Exhibit A Tab 3 Schedule 7 Alternatives

Preamble: Enbridge discusses the alternatives to the proposed project and APPrO would like to better understand these alternatives as they relate to meeting primarily the growth objectives.

a) Enbridge discusses the potential use of compression at Station B as a project alternative. If Enbridge were to consider only the system growth requirements, please describe what minimum compression facilities and the resulting costs would be required to accommodate growth requirements as at 2020 and also the incremental facilities to handle additional growth to 2025.

b) Enbridge indicates that siting compression in an urban area can be problematic, and that this option was less favourable, but presumably, this conclusion may have been arrived at taking into account all of Enbridge's objectives. Please discuss the potential to utilize compression at this location to only meet the growth requirements.

c) Enbridge indicates that use of compression would require new business and labour processes for the Company in this geographic region. Please confirm that the Company has significant expertise in operation and maintenance of compression equipment in its Tecumseh gas storage operation and that such business and labour processes could be adapted accordingly.

Witness: C. Fernandes

RESPONSE

a) The Company did consider compression within the distribution system, but screened out the alternatives early in the process due to the following factors:

   i. The Company does not currently have compression within the distribution system.

   ii. In order to have compression facilities with a reliability that approaches that of pipelines, a minimum of two (dual redundant) compression systems at each location complete would be required.

   iii. Multiple sites for compression would be required in order to meet system requirements, creating significant additional operational complexity.

   iv. Compression is not suited for the rapidly changing, and wide range of gas flows and pressures on the distribution system. Enbridge has experience with compression for stable and steady gas storage and long pipeline operations. Depending on the flows required, a distribution compression scheme would require multiple compression units of different sizes to accommodate the wide range of pressures and flows. With the inherent complexity of such a scheme, reliability may be compromised. Enbridge is not aware of any large distribution company that is successfully using compression in this way.

   A rough estimate of the compression requirements is 15,000 HP for the Don Valley line in order to accommodate growth over the forecast period. The Company did not produce a cost estimate for this at Station B as it did not believe it could site the required compression at this location. Please refer to b) below.

b) The urban location and foot print of Station B make this site unsuitable for compression facilities. The inability to meet air and/or noise emission requirements for an urban environment and the close proximity to sensitive receptors (less than 100 metres away) removed this option in the screening phase.

Witness: C. Fernandes

c) Enbridge does not utilize compression in its distribution system. Enbridge currently uses large reciprocating compressor technology for seasonal storage injections in its Tecumseh gas storage operations, which are located in a rural/industrial area. Some of the processes could be adapted, but many new processes and procedures would need to be developed, as they are for different operating parameters, and in significantly different environments. Personnel could not be expected to be shared easily, given the distances. Lastly, compression within the distribution system would significantly alter the complexity of controlling flows within the system.

Witness: C. Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
BOMA INTERROGATORY #29

INTERROGATORY

Issue: A4 – A, 1, p13

(a) Page 13, Paragraph 37: Please explain fully what benefits of Segment B can be realized without Segment A being put in service, what benefits of Segment B can be realized with Segment A (pipeline portion) being deferred for five years.

(b) What benefits of Segment A can be realized without Segment B being constructed, or being deferred for five years.

(c) Please provide the Agreement among Union, Enbridge, and TCPL, which established the STS service for Enbridge. What STS contract does Enbridge have with TCPL? Please describe the STS service currently used by Enbridge on peak day average winter day, average summer day, and how that would change if Segments A and B were constructed.

(d) A3, 2, p7 - When does TransCanada intend to apply for the Albion-Maple pipeline? What date is construction likely to commence, and when is the line anticipated to be in service?

RESPONSE

a) Segment B would, in isolation, accommodate forecast growth requirements on the XHP network. It would also alleviate the East-West bottleneck on the system, which is currently restricted by the NPS 26 inch line. It would allow for the NPS 26 operating pressure to be lowered, but would not allow for the NPS 30 DV line to be lowered. Without Segment A in service, the gas supply benefits would be significantly reduced, and only allow a minimal amount of gas supply shift from long haul to short haul, as compared to the 600 TJ/d (combined) shown in Exhibit A, Tab 3, Schedule 5.

b) Segment A would, in isolation, allow for some increased diversity of entry points into the system. However, without increased system capacity to alleviate the East-West bottleneck, no gas supply benefits could be achieved. Additionally, due to the NPS 26 bottleneck, minimum system pressures in the downtown core would not be significantly impacted, and therefore growth in demand would violate minimum

Witnesses: J. Denomy
C. Fernandes

system pressures. Finally, Segment A alone would not allow for the lowering of pressures on either the NPS 26 or the NPS 30 DV lines.

c) Please refer to the response to BOMA #1 at Exhibit I.A1.EGD.BOMA.1 for a listing of all current transportation contracts with TransCanada and Union Gas. Please refer to response to CCC #3 at Exhibit A1.EGD.CCC.3 for a description of the service attributes related to the transportation services utilized by Enbridge on the TransCanada Mainline. The construction of Segments A and B would not alter the service attributes associated with the STS service offered by TransCanada.

d) Please reference MOU Amendment 2, dated May 21, 2013, as attached to the response to CME Interrogatory #6 at Exhibit I.A1.EGD.CME.6 for a copy of TransCanada's letter electing Option #2. As stated in the letter, TransCanada will continue to pursue the project keeping to a November 1, 2015 in service date.

Witnesses: J. Denomy
C. Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
CONSUMERS COUNCIL OF CANADA INTERROGATORY #17

INTERROGATORY

4. What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Issue: A.4-CCC-17

Reference: A/T3/S3/pg.11; A/T3/S7/p.13

a) The proposed project does not appear to mitigate the risk arising from the fact that more than 50% of volumes destined for the Toronto core come from one XHP line (Don Valley NPS 30/ station B). Please explain what other options were considered to address this risk.

b) Specifically, please explain what issues other than urban construction problems (as discussed in the evidence) were considered in rejecting the looping or reinforcement of Enbridge's south eastern Lakeshore NPS 20 pipeline.

c) Please provide the cost-benefit analysis that was undertaken for full or partial replacement of the NPS 20 Lakeshore line.

RESPONSE

a) The reference noted refers to Parkway Gate station, from which more than 50% of the volumes for the GTA are supplied. Please see Exhibit A, Tab 3, Schedule 7 for Alternatives considered.

b) Over and above the issues with urban construction, factors considered for replacement of the Lakeshore NPS 20 line were;

Witness: C. Fernandes

- the lack of capability to construct within a dedicated utility corridor, which significantly reduces the chances of third party damages and therefore increases safety and reliability of the distribution system,

- the ability to meet all objectives as stated in Exhibit A, Tab 3, Schedule 1,

- and the cost associated with this routing.

c) A cost-benefit analysis was not undertaken for this alternative. During the screening of alternatives, this alternative was eliminated and no further work was performed.

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO CONSUMERS COUNCIL OF CANADA INTERROGATORY #18

INTERROGATORY

4. What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Issue: A.4-CCC-18

Reference: A/T3/S7/p.14

a) Please provide the cost-benefit analysis that was undertaken in the consideration of the pipeline through Lake Ontario to Station B.

RESPONSE

a) A pipeline through Lake Ontario was considered as an alternative as per Exhibit A, Tab 3, Schedule 7. A detailed cost benefit analysis was not performed, as the alternative was screened out due to the timing challenges with permitting and approvals that would be required. Enbridge did not believe this alternative could be in service until 2017 at the earliest, with a timeframe as potentially long as 2020 in order to navigate the increased stakeholder consultation and permitting requirements of such an endeavor. Since this does not meet the objectives and timing required, the alternative was no longer considered.

Witness: C. Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO CONSUMERS COUNCIL OF CANADA INTERROGATORY #19

INTERROGATORY

4. What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Issue: A.4-CCC-19

Reference: A/T3/S5

a) Please explain more fully the reasons that Enbridge is concerned about the reliability of peaking supplies due to the referenced failure in 2011 (i.e. what was this failure and why is it important to this application).

RESPONSE

The failure to deliver in 2011 refers to an instance where Enbridge called on one of its peaking contracts but did not receive service. Approximately 7,000 GJs of peaking supplies were not delivered on January 22, 2011.

Peaking supplies are utilized to meet demand in peak and near peak demand conditions. Peaking supplies are a delivered service meaning that these contracts deliver natural gas directly to the Enbridge franchise area. However, Enbridge does not know the nature of the transportation contracts underpinning these deliveries. In order to reduce the risk of failures to deliver in the future, Enbridge is proposing to displace peaking supplies to the Enbridge CDA with supplies which would flow utilizing the short haul firm transportation contracts that will be in place when the GTA Project facilities are in service. This results in less unsecured supplies in the supply portfolio and greater security of supply.

Witness: J. Denomy

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
CONSUMERS COUNCIL OF CANADA INTERROGATORY #20

INTERROGATORY

4. What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Issue: A.4-CCC-20

Reference: Reference: A/T3/S5, pgs. 6-8, pg. 11 – Peak Demand

a) Please revise Figures 2 through 4 to show the trend line from the period 2004 through 2012.

b) Please comment on which is likely to be more representative of future trends and why – the longer trend 1999-2012 or the shorter trend 2004-2012.

c) Please revise Table 2 to show the last two years of actual data (2011 and 2012 if available).

RESPONSE

a) Revised figures are provided below.

Witness: J. Denomy

Figure 2: Normalized Peak Day Demand – Central Weather Zone (PJs)

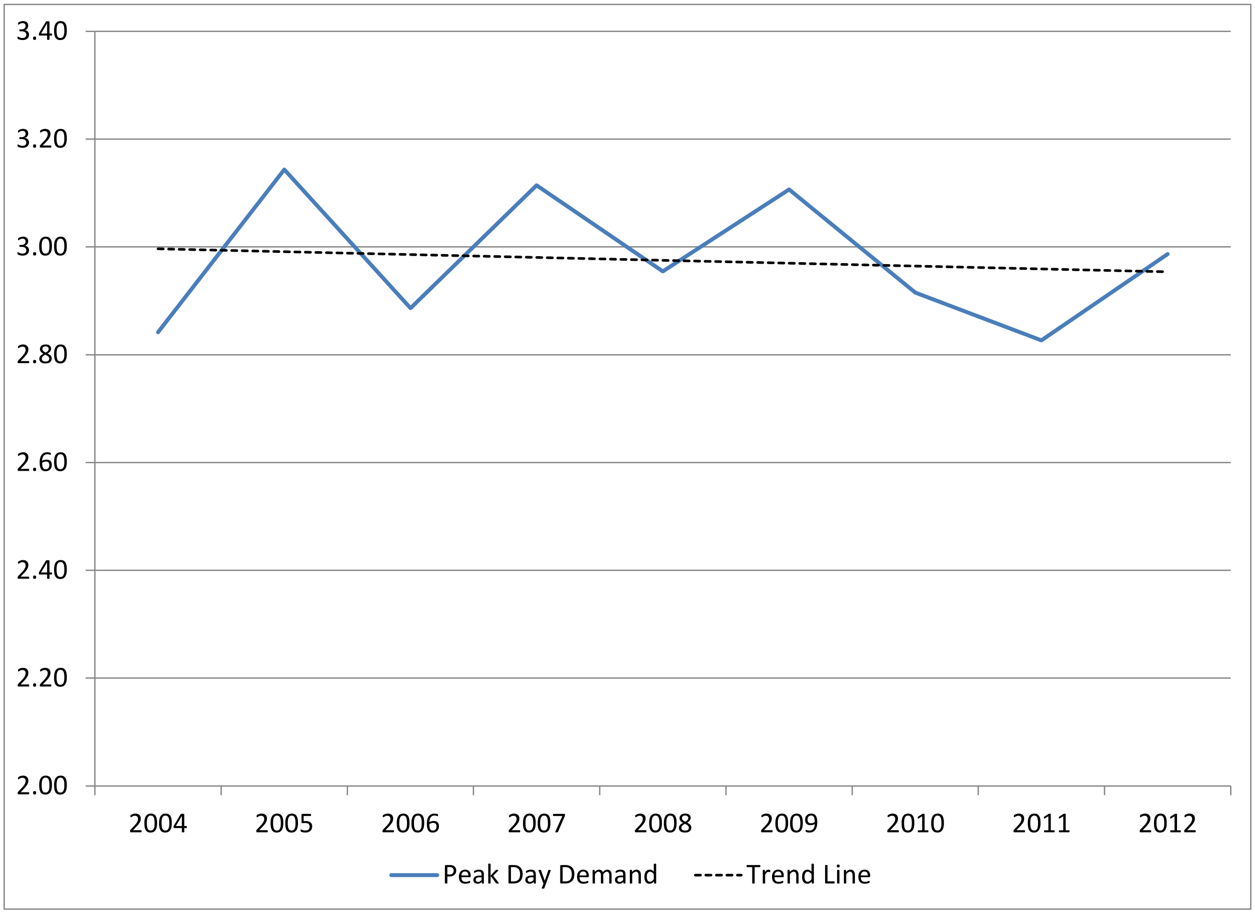


Figure 3: Normalized Peak Day Demand – GTA Project Influence Area (PJs)

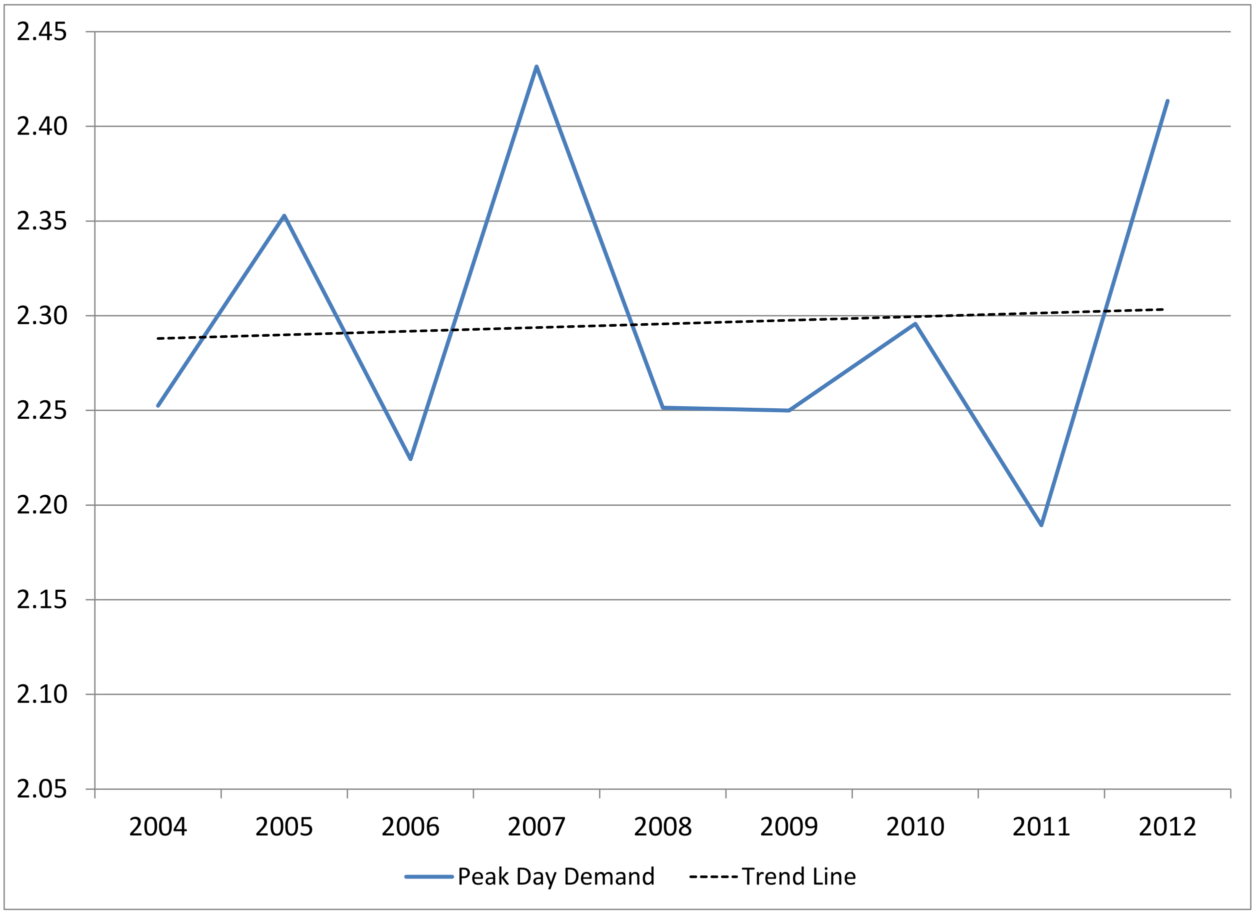
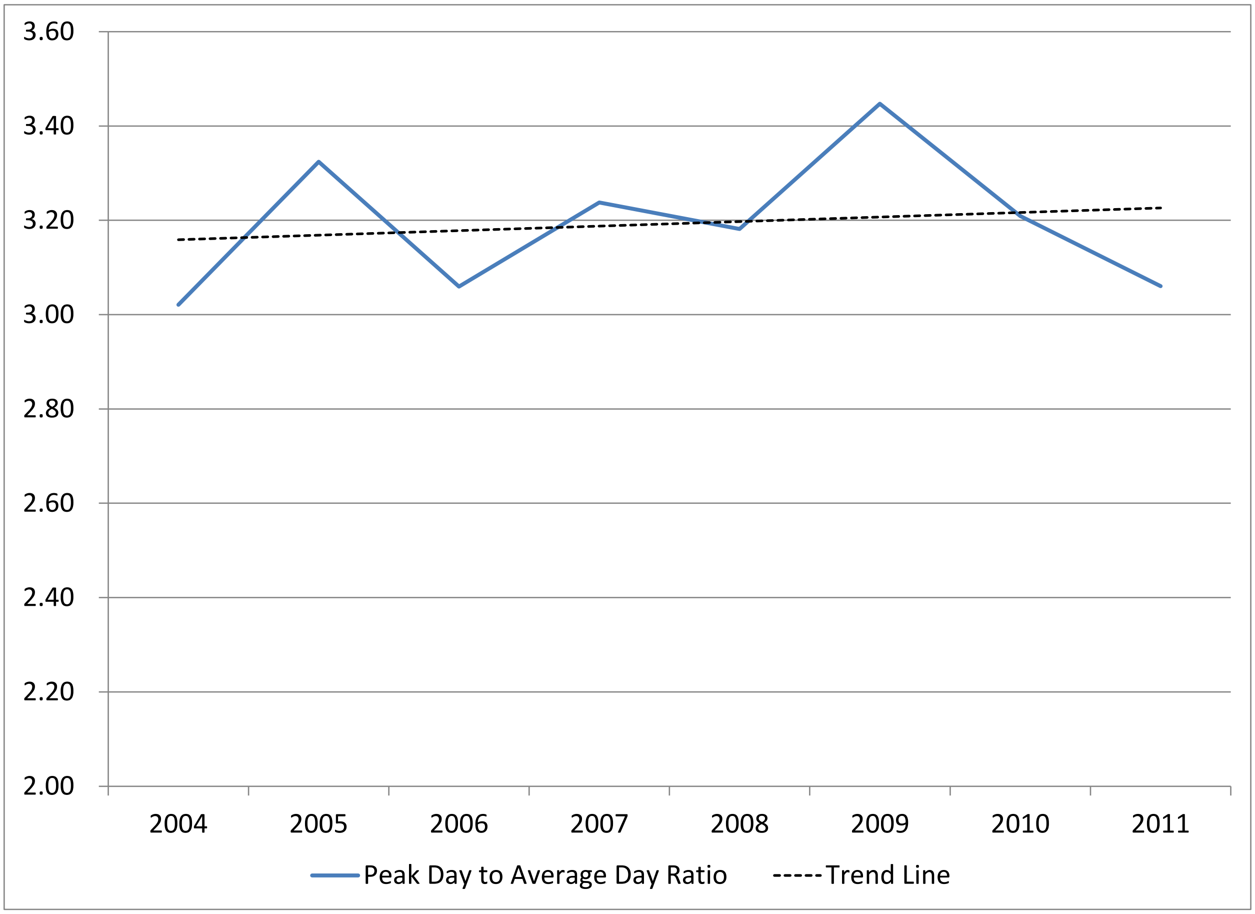


Figure 4: Ratio of Peak Day Demand to Average Day Demand – Central Weather Zone



b) Longer term trends are more likely to be representative of future trends. Longer term trends remove the noise associated with utilizing a shorter sample period. For example, the longer term trends presented in Exhibit A, Tab 3, Schedule 5 better represent the growth experienced in the number of customers Enbridge serves along with fluctuations in the economy that have been experienced over that same period which includes periods of both economic growth and contraction.

c) Historical peak day supply demand balances for the requested years are not relevant as they were derived utilizing a different Design Day Criteria than that which is currently approved by the Board. The relevant comparison is what Enbridge would have to contract for to meet its peak day requirements with and without the GTA Project Facilities approved. Please refer to Exhibit A, Tab 3, Schedule 5, page 28, Table 1 for three peak day contracting scenarios related to the GTA Project. These scenarios outline peak day requirements for 2016 utilizing the updated Design Day Criteria approved in EB-2011-0354.

Witness: J. Denomy

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
CONSUMERS COUNCIL OF CANADA INTERROGATORY #21

INTERROGATORY

4. What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

A.4-CCC-21

Reference: A/T3/S7/pg.2-3

a) Enbridge provide anecdotal evidence that conservation programs may increase peak demands. Please provide the analysis which shows that DSM programs have contributed to a higher peak demand.

RESPONSE

The Company has not conducted studies on the impacts of individual DSM programs on peak demand.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
CONSUMERS COUNCIL OF CANADA INTERROGATORY #22

INTERROGATORY

4. What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

A.4-CCC-22

Reference: A/T3/S5/pg.12

a) There is a discussion in the evidence about potential changes in the availability of STFT service, but no similar discussion about the potential (or lack thereof) for similar products for gas flowing into Ontario from Niagara. Please explain what products or services Enbridge is expecting to be provided for gas flows from Niagara and provide the basis for these assumptions.

RESPONSE

a) Enbridge expects to procure natural gas supply at Niagara Falls and to have this gas flow under a firm transportation contract with TransCanada from the Niagara Falls receipt point to a new distributor delivery area called Parkway Enbridge CDA. Details of this transportation service can be found in the response to CME Interrogatory #6 at Exhibit I.A1.EGD.CME.6.

Witness: J.Denomy

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
CONSUMERS COUNCIL OF CANADA INTERROGATORY #23

INTERROGATORY

4. What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

A.4-CCC-23

Reference: A/T3/S7/pg.3

a) Please provide the financial cost-benefit analysis which shows that adding compression was a less favourable alternative to the proposed project.

RESPONSE

Please refer to response to APPrO Interrogatory #10 found at Exhibit I.A4. EGD.APPRO.10

Witness: C. Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENERGY PROBE RESEARCH FOUNDATION INTERROGATORY #22

INTERROGATORY

Issue A4 What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Ref: EB-2013-0451 Exhibit A, Tab 3, Schedule 7, para. 3 (b)- DSM &

Exhibit A, Tab 3, Schedule 5, Figure 5

Please explain/reconcile the statements (in part b) that indicate certain conservation measures increase peak demand to the referenced Figure 5 that appears to show since 2007 when EGDs DSM programs ramped up:

- the ratio of peak and average consumption declined
- in the same period technologies such as tankless water heaters penetrated the market.

RESPONSE

While Figure 5 shows the peak day to average day ratio decreasing in some periods, the trend line shows peak day demand to average day demand increasing over time as stated in paragraphs 17 and 18 of Exhibit A, Tab 3, Schedule 5. In regards to Energy Probe's comments regarding tankless water heaters, Enbridge does not have the information required to provide commentary on the market penetration of this particular technology.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENERGY PROBE RESEARCH FOUNDATION INTERROGATORY #23

INTERROGATORY

Issue A4 What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Ref: EB-2012-0451 Exhibit A, Tab 3, Schedule 7, para 5 Figure 1

a) Please provide the size of curtailable load relative to Central Region peak day demand for commercial and industrial customers.

b) Please provide a list of factors such as rates, penalties, gas costs and the relative contribution to reductions in curtailable load that have resulted in interruptible customers going finn.

c) Please provide information on EGDs forecast of curtailable load from 2013-2025.

RESPONSE

a) Commercial and Industrial customers taking contracted service are required to establish a Contract Demand volume each year. This represents the maximum volume of gas that the customer can consume at their terminal location on any day during the year. Customers taking gas on General Service (vs. contracted) rates are not bound by a Contract Demand. The total Contract Demand volume for customers located in the CDA during January 2013 was 371,533 GJ.

Customers taking contracted service have the option of a Firm or Interruptible contract. While an Interruptible contract offers a preferred cost structure over Firm, it requires that customers be able to curtail their gas use for all consumption under the Interruptible contract upon notice (4 or 16 hour) from Enbridge. Enbridge considers the Contract Demands of the Interruptible customers in planning for peak day supply. Failing to comply with curtailment puts that customer at risk of financial penalty and requires Enbridge to make other arrangements for supply during the

Witnesses: J. Denomy
B. Manwaring

peak day incident, thereby putting Firm customers at risk of not receiving gas on that day. The Contract Demand volume that is underpinned by Interruptible customers located in the CDA during January 2013 was 174,339 GJ. For Gas Supply planning purposes to meet Peak Day Demand under Design Day conditions, the Company assumes 80% compliance of its Interruptible customers. This is intended to account for customers using something less than 100% of their Contract Demand volume on the Peak Day, as well as the possibility of not all customers getting off the system at the same time during curtailment.

b) The issue of curtailment was discussed at length during the System Reliability proceeding (EB-2010-0231). Recognizing the importance of curtailment volumes as a means of meeting peak day demand, the ensuing Settlement Agreement introduced a number of requirements for customers wishing to contract under Interruptible service including demonstrating their ability to curtail by having alternate fuel capabilities, and strengthening penalties for noncompliance to drive customer behavior to more reliable response to curtailment.

   To make the curtailment program more effective, the Settlement Agreement also directed that the option of Rate 145-72 (72 hour notification) be eliminated as it provided little functionality to Enbridge's ability to manage a Peak Day condition, nor value to the Rate Payer. This resulted in approximately 100 customers returning to Firm service.

   Factors that may influence customers to migrate from Interruptible to Firm service could include; penalties for noncompliance outweighing financial benefit of the rate, changes to Ministry of Environment standards for on-site storage of auxiliary fuel such as underground storage of oil tanks, and cost to maintain a back-up fuel system. There has not been a noticeable trend of customers moving off Interruptible service.

c) Please see response to b) above for a description of the assumptions Enbridge makes with regard to projected curtailment compliance on peak day. The forecast of curtailable load on peak day is developed at a point in time and held constant over the forecast period. Exhibit A, Tab 3, Schedule 5, Page 28, Table 1 provides the current projection for curtailment on peak day.

Witnesses: J. Denomy
B. Manwaring

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENERGY PROBE RESEARCH FOUNDATION INTERROGATORY #24

INTERROGATORY

Issue A4 What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?

Ref: EB-2012-0451 Exhibit A, Tab 4, Schedule 4, Table 3 &

Exhibit A, Tab 3, Schedule 7, Pg. 12 Figure 3

a) Please extend Table 3 to show 2005-2025 Peak Day demand and throughput.

b) Please provide a list of current entry points and their current average and maximum design day maximum flows relative to the total GTA demand.

c) Please provide a modified entry point listing showing the additional capacity from each of the potential alternatives in Figure 3.

d) Provide a perspective on which new entry points could collectively meet the forecast demand in Table 3.

RESPONSE

a) Please see response to Environmental Defence Interrogatory #3 at Exhibit I.A4.EGD.ED.3.

b) Please see Exhibit A, Tab 3, Schedule 3, Attachment 4, page 29 for the current and future breakdown of entry point capacity.

c) This information cannot be provided as specific detailed design and associated costing was not completed for each option.

d) Please see the response for c).

Witnesses: C. Fernandes
E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #1

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide Enbridge's definitions of "residential" and "apartment" customers.

RESPONSE

Please see the following definitions.

Residential customers are dwellings including singles, semis, townhomes and individually metered apartment units (ensuites).

Apartment customers include multi-residential buildings, which are served by a single bulk meter.

Witnesses: F. Ahmad
M. Suarez

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #2

INTERROGATORY

Issue A4: “What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?”

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide for each year from 2000 to 2014 inclusive Enbridge’s **incremental** number of residential, commercial, apartment and industrial customers in the GTA Project Influence Area.

RESPONSE

	Table 1: Incremental Customer Additions by Sector				
	GTA Project Influence Area (2004-2014)				
	Residential	Commercial	Apartment	Industrial	Total GTA
2004	19,743	1,279	47	19	21,088
2005	19,203	1,503	27	6	20,739
2006	16,429	1,963	43	7	18,442
2007	17,028	1,496	3	2	18,529
2008	13,764	1,403	22	0	15,189
2009	9,921	1,198	36	5	11,160
2010	11,468	1,177	75	0	12,720
2011	9,263	917	26	4	10,210
2012	10,792	1,020	28	7	11,847
2013F	12,102	1,156	74	1	13,333
2014F	11,669	1,199	69	3	12,940

The Company has not historically tracked information for sub-areas such as the GTA Project Influence Area. To present historical information for the Influence Area, customer numbers have been derived based on one or more data systems to determine the proportion of GTA Project Influence Area customers to the total customers within Areas 10, 20, and 30 of the Franchise (within which the GTA Influence Area resides).

Witnesses: F. Ahmad
M. Suarez

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #3

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide for each year from 2000 to 2025 inclusive the actual/forecast average: a) peak hour (GJ/hour), b) peak day (GJ/day) and c) annual demands (GJ/year) of Enbridge's **incremental**: i) residential, ii) commercial, iii) apartment and iv) industrial customers in the GTA Project Influence Area. Please also provide the aggregate peak hour, peak day and annual demands of each of these customer classes and all of Enbridge's GTA Project Influence Area customers for each year from 2000 to 2025 inclusive.

RESPONSE

Peak load by sector is not measured on an hourly or daily basis. The Company does derive some of this data for network planning purposes as per I.A4.EGD.ED.12. The information provided below is the historical data used for network planning.

Table 1 (please refer to Attachment) provides a summary of the derived peak load in m^3/hr from 2006 to 2025. This table shows peak load by customer type in the GTA Project Influence Area for both incremental and total load added, as well as total load for all customers in the GTA Project Influence Area.

Table 2 (please refer to Attachment) provides all the same data as Table 1 but has converted the hourly data to daily.

Data has only been provided for 2006 onward as EGD implemented a new load gathering system. Prior to 2004, load gathering was completed on a legacy main frame system and the archived data is not readily accessible. From 2004 to 2006 there were numerous changes in customer classifications which make year to year comparisons

Witness: E. Naczynski

irrelevant due to changing base data. The load presented excludes unbundled customers.

The conversion from m^3 to GJ as found in the EGD rate handbook is 37.69 MJ/m^3.

Witness: E. Naczynski

Table 1

PEAK LOAD (m3/hr)		Derived Historic						Forecast												
		2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Apartment	Base		410758	414932	404701	400992	410716	424455	428717	432326	436452	440674	444881	448893	452855	456806	460711	464600	468490	472380
	Add		4174	-10231	-3709	9723	13740	4262	3609	4126	4223	4207	4012	3962	3950	3905	3890	3890	3890	3890
	Total	410758	414932	404701	400992	410716	424455	428717	432326	436452	440674	444881	448893	452855	456806	460711	464600	468490	472380	476270
Commercial	Base		896792	900775	916271	905314	902621	1112231	1119742	1126892	1134299	1142224	1150310	1157861	1165411	1172925	1180485	1188071	1195658	1203244
	Add		3984	15496	-10957	-2693	209610	7511	7150	7407	7925	8086	7551	7550	7513	7561	7586	7586	7586	7586
	Total	896792	900775	916271	905314	902621	1112231	1119742	1126892	1134299	1142224	1150310	1157861	1165411	1172925	1180485	1188071	1195658	1203244	1210830
Industrial	Base		352178	358798	336968	311336	324351	184774	184791	184807	184906	185008	185052	185094	185135	185175	185229	185282	185335	185388
	Add		6620	-21830	-25632	13015	-139577	17	16	100	102	44	42	41	40	54	53	53	53	53
	Total	352178	358798	336968	311336	324351	184774	184791	184807	184906	185008	185052	185094	185135	185175	185229	185282	185335	185388	185442
Residential	Base		1203076	1225376	1230241	1220411	1205503	1168523	1178633	1189248	1199433	1210117	1221059	1232348	1243700	1255174	1266791	1278559	1290326	1302094
	Add		22301	4865	-9830	-14909	-36979	10110	10615	10185	10684	10941	11290	11352	11474	11617	11768	11768	11768	11768
	Total	1203076	1225376	1230241	1220411	1205503	1168523	1178633	1189248	1199433	1210117	1221059	1232348	1243700	1255174	1266791	1278559	1290326	1302094	1313862
TOTAL ADD			37078	-11700	-50128	5137	46793	21899	21390	21817	22933	23278	22895	22905	22978	23136	23297	23297	23297	23297
TOTAL LOAD		2862804	2899882	2888182	2838054	2843190	2889984	2911883	2933273	2955090	2978023	3001302	3024197	3047102	3070080	3093216	3116513	3139810	3163107	3186403

Table 2

PEAK LOAD (m3/day)		Derived Historic						Forecast												
		2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Apartment	Base		8215167	8298645	8094030	8019841	8214310	8489106	8574342	8646519	8729035	8813487	8897622	8977861	9057107	9136116	9214211	9292008	9369805	9447603
	Adds		83478	-204615	-74189	194470	274795	85236	72177	82516	84452	84135	80239	79246	79009	78095	77797	77797	77797	77797
	Total	8215167	8298645	8094030	8019841	8214310	8489106	8574342	8646519	8729035	8813487	8897622	8977861	9057107	9136116	9214211	9292008	9369805	9447603	9525400
Commercial	Base		17935832	18015504	18325421	18106283	18052415	22244617	22394838	22537842	22685973	22844479	23006204	23157230	23308228	23458493	23609707	23761430	23913152	24064875
	Adds		79673	309916	-219137	-53869	4192202	150221	143004	148131	158505	161725	151026	150999	150265	151214	151723	151723	151723	151723
	Total	17935832	18015504	18325421	18106283	18052415	22244617	22394838	22537842	22685973	22844479	23006204	23157230	23308228	23458493	23609707	23761430	23913152	24064875	24216597
Industrial	Base		7043569	7175964	6739356	6226720	6487024	3695482	3695820	3696135	3698126	3700156	3701039	3701878	3702700	3703507	3704580	3705643	3706706	3707769
	Adds		132396	-436608	-512636	260303	-2791542	338	315	1991	2031	883	839	823	807	1073	1063	1063	1063	1063
	Total	7043569	7175964	6739356	6226720	6487024	3695482	3695820	3696135	3698126	3700156	3701039	3701878	3702700	3703507	3704580	3705643	3706706	3707769	3708832
Residential	Base		24061512	24507526	24604829	24408227	24110055	23370469	23572662	23784959	23988667	24202347	24421171	24646969	24874006	25103483	25335820	25571175	25806530	26041885
	Adds		446014	97304	-196603	-298171	-739587	202193	212297	203708	213680	218824	225798	227037	229477	232336	235355	235355	235355	235355
	Total	24061512	24507526	24604829	24408227	24110055	23370469	23572662	23784959	23988667	24202347	24421171	24646969	24874006	25103483	25335820	25571175	25806530	26041885	26277240
TOTAL ADD			741560	-234003	-1002565	102733	935869	437989	427794	436346	458668	465566	457901	458105	459559	462718	465938	465938	465938	465938
TOTAL LOAD		57256079	57997639	57763636	56761071	56863804	57799673	58237662	58665455	59101801	59560469	60026036	60483936	60942041	61401600	61864318	62330255	62796193	63262131	63728068

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #4

INTERROGATORY

Issue A4: “What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?”

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide for each year from 2000 to 2025 inclusive Enbridge’s actual/forecast total number of residential, commercial, apartment and industrial customers in the GTA Project Influence Area.

RESPONSE

Total Customers by Sector

	Apartment	Commercial	Industrial	Residential
2004	4,424	68,606	4,773	777,117
2005	4,471	69,885	4,792	796,860
2006	4,497	71,388	4,798	816,062
2007	4,540	73,351	4,805	832,492
2008	4,543	74,848	4,807	849,520
2009	4,564	76,250	4,807	863,284
2010	4,600	77,449	4,812	873,205
2011	4,675	78,626	4,812	884,673
2012	4,701	79,543	4,816	893,936
2013	4,729	80,563	4,823	904,728
2014	4,803	81,718	4,824	916,831
2015	4,872	82,918	4,827	928,500
2016	4,943	84,208	4,830	940,776
2017	5,014	85,535	4,833	953,383
2018	5,083	86,785	4,835	966,418
2019	5,152	88,037	4,837	979,565
2020	5,220	89,288	4,839	992,896
2021	5,287	90,549	4,841	1,006,431

The Company uses multiple data management systems for specific purposes. The Company has not historically tracked information for sub-areas such as the GTA Project Influence Area. To present historical information for the GTA Project Influence Area,

Witnesses: F. Ahmad
M. Suarez

customer numbers have been derived based on one or more data systems to determine the proportion of GTA Project Influence Area customers to the total customers within Areas 10, 20, and 30 in the franchise (within which the GTA Influence Area resides). Forecasts of customer growth for the GTA Influence Area are layered on derived historical numbers and are denoted in the shaded areas.

Witnesses: F. Ahmad
M. Suarez

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #5

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide for each year from 2000 to 2025 inclusive the actual/forecast *total peak hour* demands (TJ/hour) and average peak hour demands (GJ/hour) of Enbridge's: a) residential; b) commercial; c) apartment; and d) industrial customers in the GTA Project Influence Area. Please also provide the total peak hour demands for all of these customers for each year from 2000 to 2025 inclusive. Please also provide a further breakdown of the commercial customers by subsets such as offices, retail, hospitals, schools, etc.

RESPONSE

Peak load by sector is not measured on an hourly or daily basis. The Company does derive some of this data for network planning purposes as per the response to Environmental Defence Interrogatory #12 found at Exhibit I.A4.EGD.ED.12.
The information provided below is the historical data as used for network planning.

Table 1 (please see attachment) provides a summary of the historical and forecast derived peak load in m^3/hr from 2006 to 2025. This table shows peak load by customer type for all customers in the GTA Project Influence Area.

The Company does not have further breakdowns of the commercial sector for peak demand.

Data has only been provided for 2006 onward as EGD implemented a new load gathering system. Prior to 2004, load gathering was completed on a legacy main frame system and the archived data is not readily accessible. From 2004 to 2006 there were numerous changes in customer classifications which make year to year comparisons irrelevant due to changing base data. The load presented excludes unbundled customers.

The conversion from m^3 to GJ as found in the EGD rate handbook is 37.69 MJ/m^3

Witness: E. Naczynski

Table 1

PEAK LOAD (m3/hr)	Derived Historic						Forecast												
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Apartment	410758	414932	404701	400992	410716	424455	428717	432326	436452	440674	444881	448893	452855	456806	460711	464600	468490	472380	476270
Commercial	896792	900775	916271	905314	902621	1112231	1119742	1126892	1134299	1142224	1150310	1157861	1165411	1172925	1180485	1188071	1195658	1203244	1210830
Industrial	352178	358798	336968	311336	324351	184774	184791	184807	184906	185008	185052	185094	185135	185175	185229	185282	185335	185388	185442
Residential	1203076	1225376	1230241	1220411	1205503	1168523	1178633	1189248	1199433	1210117	1221059	1232348	1243700	1255174	1266791	1278559	1290326	1302094	1313862
TOTAL LOAD	2862804	2899882	2888182	2838054	2843190	2889984	2911883	2933273	2955090	2978023	3001302	3024197	3047102	3070080	3093216	3116513	3139810	3163107	3186403

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #6

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide for each year from 2000 to 2025 inclusive the actual/forecast hourly demands (TJ/hour) for all customers in the GTA Project Influence Area for the 10 days of each year containing the highest peak hourly demand. Please also provide (a) a breakdown by residential, commercial, apartment and industrial customers, and (b) a further breakdown of the commercial customers by subsets such as offices, retail, hospitals, schools, etc. Please provide the data in an electronic spreadsheet.

RESPONSE

Please the response to Environmental Defence Interrogatory #5 found at Exhibit I.A4.EGD.ED.5.

Witness: E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #7

INTERROGATORY

Issue A4: “What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?”

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide for each year from 2000 to 2025 inclusive the actual/forecast *total peak day* demands (TJ/day) and average peak day demands (GJ/day) of Enbridge’s: a) residential; b) commercial; c) apartment; and d) industrial customers in the GTA Project Influence Area. Please also provide the total peak day demands for all of these customers for each year from 2000 to 2025 inclusive.

RESPONSE

Peak load by sector is not measured on an hourly or daily basis. The Company does derive some of this data for network planning purposes as per the response to Environmental Defence Interrogatory #12 found at Exhibit I.A4.EGD.ED.12. The information provided below is the historical data as used for network planning.

Table 1 (please see attachment) provides a summary of the historical and forecast derived peak load in m^3/d from 2006 to 2025. This table shows peak load by customer type for all customers in the GTA Project Influence Area.

Data has only been provided for 2006 onward as EGD implemented a new load gathering system. Prior to 2004, load gathering was completed on a legacy main frame system and the archived data is not readily accessible. From 2004 to 2006 there were numerous changes in customer classifications which make year to year comparisons irrelevant due to changing base data. The load presented excludes unbundled customers.

The conversion from m^3 to GJ as found in the EGD rate handbook is 37.69 MJ/m^3.

Witness: E. Naczynski

Table 1

PEAK LOAD (m3/day)	Derived Historic						Forecast			
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Apartment	8215167	8298645	8094030	8019841	8214310	8489106	8574342	8646519	8729035	8813487
Commercial	17935832	18015504	18325421	18106283	18052415	22244617	22394838	22537842	22685973	22844479
Industrial	7043569	7175964	6739356	6226720	6487024	3695482	3695820	3696135	3698126	3700156
Residential	24061512	24507526	24604829	24408227	24110055	23370469	23572662	23784959	23988667	24202347
TOTAL LOAD	57256079	57997639	57763636	56761071	56863804	57799673	58237662	58665455	59101801	59560469

PEAK LOAD (m3/day)	Forecast								
	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Apartment	8897622	8977861	9057107	9136116	9214211	9292008	9369805	9447603	9525400
Commercial	23006204	23157230	23308228	23458493	23609707	23761430	23913152	24064875	24216597
Industrial	3701039	3701878	3702700	3703507	3704580	3705643	3706706	3707769	3708832
Residential	24421171	24646969	24874006	25103483	25335820	25571175	25806530	26041885	26277240
TOTAL LOAD	60026036	60483936	60942041	61401600	61864318	62330255	62796193	63262131	63728068

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #8

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 4, Table 1

Please provide for each year from 2000 to 2025 inclusive the actual/forecast *total annual* demands (TJ/year) and average annual demands (GJ/year) of Enbridge's: a) residential; b) commercial; c) apartment; and d) industrial customers in the GTA Project Influence Area. Please also provide the total annual demands for all of these customers for each year from 2000 to 2025 inclusive.

RESPONSE

Pipeline and facilities requirements are based on total peak hourly demand. For the purpose of this application, annual demand by sector is only an input into the economic feasibility analysis. The summary of the economic feasibility input parameters, including average annual demand by sector, are shown at Exhibit E, Tab 1, Schedule 2, pages 8 and 9. The Company's feasibility parameters are pursuant to the Board's Decision in Company's EB-2013-0045 Rate Order.

Witnesses: C. Fernandes
E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #9

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, pages 8 & 9

Enbridge states that the "total forecast peak day demand, shown in Table 3, is the incremental load growth plus the load required by the existing customer base."

a) Does Enbridge's forecast assume that the demand from existing buildings will increase, decrease, or remain constant? Please explain why.

b) For each year from 2014 to 2025, please provide the forecast *total peak hour* demands (TJ/hour) and average peak hour demands (GJ/hour) from: a) the above-described incremental load growth from new customers, and b) Enbridge's existing customer base in the GTA Project Influence Area. Please also break out your results by residential, commercial, apartment and industrial customers.

c) Please also provide the requested data in a table covering only the period from 2015 to 2025. This will assist in comparing the data with Enbridge's load forecast at Exhibit A, Tab 3, Schedule 4, which covers only the 2015 to 2025 period.

RESPONSE

a) The Company utilizes peak hour demand rather than annual demand for network planning purposes. Forecast peak hourly loads for existing customers are assumed to be constant for network planning. Incremental customers by sector are assumed to have lower peak hourly demands based on the year added as per the load gathering process described in the response to Environmental Defence Interrogatory #12 found at Exhibit I.A4.EGD.ED.12. Efficiency gains for the system as a whole are incorporated in the incremental peak demand through the reduction factor as per the response to Environmental Defence Interrogatory #13 found at Exhibit I.A4.EGD.ED.13.

Witness: E. Naczynski

b) Please refer to the response to Environmental Defence Interrogatory #13 found at Exhibit I.A4.EGD.ED.13 for average by municipality and sector and to the response to Environmental Defence Interrogatory #3 and #5 found at ExhibitI.A4.EGD.ED.3 and Exhibit I.A4.EGD.ED.5 for incremental and total loads by sector.

c) Please see response to b) above.

Witness: E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #10

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 5, page 9

Please provide an electronic spreadsheet with the *hourly* demands (TJ/hour) in the GTA Project Influence Area for each hour in 2010, 2011, and 2012. Please provide the data in a single row or column for each year for graphing purposes. Please provide similar forecast data for 2013, 2014, 2015 and 2016.

RESPONSE

Please see the Attachment for hourly demands in the GTA Project Influence Area for each hour of each day in the years 2010 to 2012. Enbridge is unable to provide hourly forecast hourly data for the period 2013 to 2016. The Company's budgeting process does not break out demand by gate station on an hourly basis.

Enbridge has provided the Intervenor with the electronic spreadsheet.

Witness: J. Denomy

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #10

Paper copies of the Attachment are available upon request.

Witness: J. Denomy

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #11

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 5, page 9

Please provide an electronic spreadsheet with the *daily* demands (TJ/day) in the GTA Project Influence Area for each day in 2010, 2011, and 2012. Please provide the data in a single row or column for each year for graphing purposes. Please provide similar forecast data for 2013, 2014, 2015 and 2016.

RESPONSE

Please see the attachment for daily demands in the GTA Project influence area for the period 2010 to 2012. Enbridge is unable to provide forecast daily data for the period 2013 to 2016. The Company's budgeting process does not break out demand by gate station on a daily basis.

Enbridge has provided the Intervenor with the electronic spreadsheet.

Witness: J. Denomy

Gas Day	GTA Project Influence Area Flows (TJ)
1-Jan-10	1,411.4
2-Jan-10	1,822.3
3-Jan-10	1,802.5
4-Jan-10	1,728.8
5-Jan-10	1,605.6
6-Jan-10	1,498.2
7-Jan-10	1,483.6
8-Jan-10	1,700.5
9-Jan-10	1,669.9
10-Jan-10	1,521.7
11-Jan-10	1,523.7
12-Jan-10	1,505.6
13-Jan-10	1,385.5
14-Jan-10	1,161.0
15-Jan-10	1,104.4
16-Jan-10	1,090.6
17-Jan-10	1,122.1
18-Jan-10	1,253.0
19-Jan-10	1,271.2
20-Jan-10	1,410.5
21-Jan-10	1,297.3
22-Jan-10	1,176.8
23-Jan-10	1,132.0
24-Jan-10	1,016.1
25-Jan-10	1,115.7
26-Jan-10	1,301.5
27-Jan-10	1,464.1
28-Jan-10	1,796.4
29-Jan-10	1,895.3
30-Jan-10	1,679.6
31-Jan-10	1,610.4
1-Feb-10	1,555.1
2-Feb-10	1,387.1
3-Feb-10	1,402.8
4-Feb-10	1,360.1
5-Feb-10	1,458.2
6-Feb-10	1,562.9
7-Feb-10	1,518.9
8-Feb-10	1,433.7
9-Feb-10	1,486.4
10-Feb-10	1,579.6
11-Feb-10	1,458.6
12-Feb-10	1,399.0
13-Feb-10	1,349.8
14-Feb-10	1,290.2
15-Feb-10	1,329.0

Gas Day	GTA Project Influence Area Flows (TJ)
16-Feb-10	1,345.9
17-Feb-10	1,322.3
18-Feb-10	1,276.2
19-Feb-10	1,191.3
20-Feb-10	1,129.0
21-Feb-10	1,154.1
22-Feb-10	1,271.0
23-Feb-10	1,247.6
24-Feb-10	1,267.5
25-Feb-10	1,590.4
26-Feb-10	1,300.7
27-Feb-10	1,104.4
28-Feb-10	1,085.8
1-Mar-10	1,162.8
2-Mar-10	1,126.4
3-Mar-10	1,144.1
4-Mar-10	1,171.2
5-Mar-10	1,125.1
6-Mar-10	901.8
7-Mar-10	877.6
8-Mar-10	812.8
9-Mar-10	833.8
10-Mar-10	845.4
11-Mar-10	735.8
12-Mar-10	889.8
13-Mar-10	963.4
14-Mar-10	937.6
15-Mar-10	823.9
16-Mar-10	698.1
17-Mar-10	619.9
18-Mar-10	574.5
19-Mar-10	585.1
20-Mar-10	929.6
21-Mar-10	959.0
22-Mar-10	1,036.7
23-Mar-10	1,072.3
24-Mar-10	766.9
25-Mar-10	1,093.0
26-Mar-10	1,145.1
27-Mar-10	950.0
28-Mar-10	892.0
29-Mar-10	873.9
30-Mar-10	756.9
31-Mar-10	792.2
1-Apr-10	453.5
2-Apr-10	373.0

Gas Day	GTA Project Influence Area Flows (TJ)
3-Apr-10	381.0
4-Apr-10	431.7
5-Apr-10	409.3
6-Apr-10	556.2
7-Apr-10	530.5
8-Apr-10	774.5
9-Apr-10	938.2
10-Apr-10	598.3
11-Apr-10	607.5
12-Apr-10	623.3
13-Apr-10	586.7
14-Apr-10	533.4
15-Apr-10	474.3
16-Apr-10	504.9
17-Apr-10	695.7
18-Apr-10	603.6
19-Apr-10	567.6
20-Apr-10	467.0
21-Apr-10	568.5
22-Apr-10	682.8
23-Apr-10	535.6
24-Apr-10	438.3
25-Apr-10	549.4
26-Apr-10	548.9
27-Apr-10	687.3
28-Apr-10	620.6
29-Apr-10	434.5
30-Apr-10	338.2
1-May-10	287.9
2-May-10	364.2
3-May-10	387.3
4-May-10	367.3
5-May-10	341.4
6-May-10	439.6
7-May-10	520.0
8-May-10	727.7
9-May-10	716.7
10-May-10	593.1
11-May-10	711.2
12-May-10	584.9
13-May-10	609.0
14-May-10	388.7
15-May-10	427.6
16-May-10	378.7
17-May-10	371.7
18-May-10	370.4

Gas Day	GTA Project Influence Area Flows (TJ)
19-May-10	324.2
20-May-10	316.2
21-May-10	320.8
22-May-10	285.1
23-May-10	252.6
24-May-10	321.3
25-May-10	342.9
26-May-10	343.2
27-May-10	333.3
28-May-10	315.5
29-May-10	264.2
30-May-10	312.5
31-May-10	524.5
1-Jun-10	360.2
2-Jun-10	332.5
3-Jun-10	335.4
4-Jun-10	292.3
5-Jun-10	281.4
6-Jun-10	302.9
7-Jun-10	320.6
8-Jun-10	300.9
9-Jun-10	318.0
10-Jun-10	294.7
11-Jun-10	299.3
12-Jun-10	260.3
13-Jun-10	290.0
14-Jun-10	338.9
15-Jun-10	328.4
16-Jun-10	320.3
17-Jun-10	293.1
18-Jun-10	301.5
19-Jun-10	246.3
20-Jun-10	315.9
21-Jun-10	335.9
22-Jun-10	345.4
23-Jun-10	348.0
24-Jun-10	368.4
25-Jun-10	342.4
26-Jun-10	324.2
27-Jun-10	355.3
28-Jun-10	351.8
29-Jun-10	333.4
30-Jun-10	289.1
1-Jul-10	280.7
2-Jul-10	262.2
3-Jul-10	266.7

Gas Day	GTA Project Influence Area Flows (TJ)
4-Jul-10	306.1
5-Jul-10	341.9
6-Jul-10	348.9
7-Jul-10	361.4
8-Jul-10	337.3
9-Jul-10	326.0
10-Jul-10	296.9
11-Jul-10	312.5
12-Jul-10	324.1
13-Jul-10	335.6
14-Jul-10	335.2
15-Jul-10	326.9
16-Jul-10	308.0
17-Jul-10	269.5
18-Jul-10	315.1
19-Jul-10	333.7
20-Jul-10	337.4
21-Jul-10	334.7
22-Jul-10	329.2
23-Jul-10	299.5
24-Jul-10	284.8
25-Jul-10	293.9
26-Jul-10	325.9
27-Jul-10	341.2
28-Jul-10	344.0
29-Jul-10	317.9
30-Jul-10	280.9
31-Jul-10	251.0
1-Aug-10	247.1
2-Aug-10	305.4
3-Aug-10	335.4
4-Aug-10	326.9
5-Aug-10	321.9
6-Aug-10	299.2
7-Aug-10	244.3
8-Aug-10	316.7
9-Aug-10	341.5
10-Aug-10	340.4
11-Aug-10	345.9
12-Aug-10	344.7
13-Aug-10	326.5
14-Aug-10	286.6
15-Aug-10	313.7
16-Aug-10	335.4
17-Aug-10	291.6
18-Aug-10	318.0

Gas Day	GTA Project Influence Area Flows (TJ)
19-Aug-10	335.8
20-Aug-10	302.7
21-Aug-10	286.3
22-Aug-10	296.4
23-Aug-10	285.3
24-Aug-10	287.6
25-Aug-10	327.9
26-Aug-10	330.5
27-Aug-10	316.4
28-Aug-10	268.8
29-Aug-10	311.4
30-Aug-10	335.3
31-Aug-10	335.5
1-Sep-10	338.0
2-Sep-10	338.8
3-Sep-10	299.1
4-Sep-10	262.7
5-Sep-10	253.2
6-Sep-10	286.0
7-Sep-10	293.2
8-Sep-10	309.8
9-Sep-10	350.4
10-Sep-10	324.1
11-Sep-10	265.0
12-Sep-10	290.7
13-Sep-10	309.9
14-Sep-10	324.7
15-Sep-10	351.8
16-Sep-10	394.5
17-Sep-10	348.9
18-Sep-10	301.7
19-Sep-10	346.1
20-Sep-10	373.9
21-Sep-10	335.5
22-Sep-10	354.4
23-Sep-10	322.8
24-Sep-10	304.1
25-Sep-10	292.5
26-Sep-10	331.8
27-Sep-10	378.0
28-Sep-10	375.0
29-Sep-10	358.0
30-Sep-10	358.4
1-Oct-10	404.9
2-Oct-10	427.1
3-Oct-10	542.7

Gas Day	GTA Project Influence Area Flows (TJ)
4-Oct-10	575.3
5-Oct-10	541.2
6-Oct-10	482.5
7-Oct-10	405.4
8-Oct-10	303.8
9-Oct-10	353.9
10-Oct-10	287.7
11-Oct-10	412.7
12-Oct-10	541.6
13-Oct-10	475.0
14-Oct-10	636.0
15-Oct-10	570.7
16-Oct-10	453.4
17-Oct-10	524.6
18-Oct-10	652.2
19-Oct-10	603.5
20-Oct-10	565.0
21-Oct-10	785.2
22-Oct-10	687.7
23-Oct-10	523.0
24-Oct-10	611.6
25-Oct-10	477.8
26-Oct-10	482.5
27-Oct-10	497.6
28-Oct-10	678.2
29-Oct-10	739.5
30-Oct-10	664.3
31-Oct-10	898.4
1-Nov-10	936.3
2-Nov-10	921.0
3-Nov-10	807.7
4-Nov-10	806.8
5-Nov-10	930.0
6-Nov-10	843.4
7-Nov-10	857.0
8-Nov-10	834.2
9-Nov-10	835.1
10-Nov-10	817.2
11-Nov-10	801.9
12-Nov-10	776.1
13-Nov-10	644.0
14-Nov-10	809.3
15-Nov-10	832.4
16-Nov-10	763.8
17-Nov-10	904.6
18-Nov-10	1,005.3

Gas Day	GTA Project Influence Area Flows (TJ)
19-Nov-10	920.2
20-Nov-10	924.7
21-Nov-10	866.6
22-Nov-10	621.6
23-Nov-10	926.3
24-Nov-10	1,064.3
25-Nov-10	1,041.7
26-Nov-10	1,207.7
27-Nov-10	1,028.5
28-Nov-10	1,115.0
29-Nov-10	983.8
30-Nov-10	796.2
1-Dec-10	1,109.8
2-Dec-10	1,193.2
3-Dec-10	1,138.7
4-Dec-10	1,253.6
5-Dec-10	1,288.2
6-Dec-10	1,449.9
7-Dec-10	1,485.1
8-Dec-10	1,618.8
9-Dec-10	1,515.5
10-Dec-10	1,195.6
11-Dec-10	1,006.3
12-Dec-10	1,299.6
13-Dec-10	1,860.2
14-Dec-10	1,750.6
15-Dec-10	1,558.9
16-Dec-10	1,455.3
17-Dec-10	1,371.8
18-Dec-10	1,351.2
19-Dec-10	1,360.8
20-Dec-10	1,422.4
21-Dec-10	1,438.1
22-Dec-10	1,450.4
23-Dec-10	1,412.6
24-Dec-10	1,318.7
25-Dec-10	1,373.5
26-Dec-10	1,520.3
27-Dec-10	1,396.0
28-Dec-10	1,293.0
29-Dec-10	1,296.3
30-Dec-10	1,041.5
31-Dec-10	794.1
1-Jan-11	903.7
2-Jan-11	1,365.4
3-Jan-11	1,271.5

Gas Day	GTA Project Influence Area Flows (TJ)
4-Jan-11	1,263.4
5-Jan-11	1,369.0
6-Jan-11	1,412.2
7-Jan-11	1,430.6
8-Jan-11	1,422.0
9-Jan-11	1,506.2
10-Jan-11	1,552.2
11-Jan-11	1,585.5
12-Jan-11	1,716.2
13-Jan-11	1,614.3
14-Jan-11	1,407.7
15-Jan-11	1,419.1
16-Jan-11	1,734.3
17-Jan-11	1,558.2
18-Jan-11	1,319.3
19-Jan-11	1,669.4
20-Jan-11	1,599.8
21-Jan-11	1,693.8
22-Jan-11	1,706.4
23-Jan-11	1,995.8
24-Jan-11	1,757.1
25-Jan-11	1,398.3
26-Jan-11	1,363.1
27-Jan-11	1,353.6
28-Jan-11	1,387.4
29-Jan-11	1,448.5
30-Jan-11	1,658.3
31-Jan-11	1,857.2
1-Feb-11	1,764.1
2-Feb-11	1,796.1
3-Feb-11	1,624.8
4-Feb-11	1,569.1
5-Feb-11	1,334.4
6-Feb-11	1,290.5
7-Feb-11	1,562.5
8-Feb-11	1,822.8
9-Feb-11	1,759.7
10-Feb-11	1,824.6
11-Feb-11	1,549.8
12-Feb-11	1,359.5
13-Feb-11	1,148.3
14-Feb-11	1,534.8
15-Feb-11	1,466.9
16-Feb-11	1,216.9
17-Feb-11	900.5
18-Feb-11	1,044.2

Gas Day	GTA Project Influence Area Flows (TJ)
19-Feb-11	1,413.6
20-Feb-11	1,375.1
21-Feb-11	1,612.0
22-Feb-11	1,539.1
23-Feb-11	1,304.0
24-Feb-11	1,279.4
25-Feb-11	1,414.3
26-Feb-11	1,273.3
27-Feb-11	1,163.8
28-Feb-11	1,353.6
1-Mar-11	1,255.4
2-Mar-11	1,591.8
3-Mar-11	1,449.0
4-Mar-11	1,122.0
5-Mar-11	1,141.4
6-Mar-11	1,446.2
7-Mar-11	1,473.6
8-Mar-11	1,298.4
9-Mar-11	1,277.3
10-Mar-11	1,113.6
11-Mar-11	1,170.5
12-Mar-11	1,102.3
13-Mar-11	1,243.3
14-Mar-11	1,191.2
15-Mar-11	1,035.5
16-Mar-11	975.5
17-Mar-11	744.1
18-Mar-11	861.5
19-Mar-11	1,021.8
20-Mar-11	1,011.6
21-Mar-11	976.5
22-Mar-11	1,105.0
23-Mar-11	1,381.1
24-Mar-11	1,374.5
25-Mar-11	1,392.8
26-Mar-11	1,325.1
27-Mar-11	1,340.4
28-Mar-11	1,270.0
29-Mar-11	1,104.8
30-Mar-11	972.3
31-Mar-11	1,060.5
1-Apr-11	882.6
2-Apr-11	823.1
3-Apr-11	895.5
4-Apr-11	845.4
5-Apr-11	1,112.3

Gas Day	GTA Project Influence Area Flows (TJ)
6-Apr-11	1,019.5
7-Apr-11	931.4
8-Apr-11	876.3
9-Apr-11	615.8
10-Apr-11	581.3
11-Apr-11	597.6
12-Apr-11	686.0
13-Apr-11	750.5
14-Apr-11	761.3
15-Apr-11	900.7
16-Apr-11	911.9
17-Apr-11	1,041.4
18-Apr-11	1,064.6
19-Apr-11	1,023.7
20-Apr-11	1,042.1
21-Apr-11	905.9
22-Apr-11	783.7
23-Apr-11	511.1
24-Apr-11	606.2
25-Apr-11	680.0
26-Apr-11	693.1
27-Apr-11	456.4
28-Apr-11	668.0
29-Apr-11	735.4
30-Apr-11	504.6
1-May-11	611.3
2-May-11	646.2
3-May-11	831.5
4-May-11	659.4
5-May-11	542.9
6-May-11	559.6
7-May-11	460.2
8-May-11	468.0
9-May-11	444.7
10-May-11	499.8
11-May-11	437.4
12-May-11	434.1
13-May-11	360.9
14-May-11	396.6
15-May-11	597.8
16-May-11	661.1
17-May-11	577.3
18-May-11	463.6
19-May-11	375.5
20-May-11	306.9
21-May-11	277.2

Gas Day	GTA Project Influence Area Flows (TJ)
22-May-11	247.3
23-May-11	318.2
24-May-11	379.6
25-May-11	375.6
26-May-11	389.5
27-May-11	431.9
28-May-11	359.2
29-May-11	347.3
30-May-11	372.3
31-May-11	359.6
1-Jun-11	364.8
2-Jun-11	361.1
3-Jun-11	341.3
4-Jun-11	302.8
5-Jun-11	330.9
6-Jun-11	357.0
7-Jun-11	360.3
8-Jun-11	349.1
9-Jun-11	347.6
10-Jun-11	300.1
11-Jun-11	278.3
12-Jun-11	319.6
13-Jun-11	352.9
14-Jun-11	333.0
15-Jun-11	332.2
16-Jun-11	339.8
17-Jun-11	291.5
18-Jun-11	265.9
19-Jun-11	291.3
20-Jun-11	303.9
21-Jun-11	313.9
22-Jun-11	306.1
23-Jun-11	301.2
24-Jun-11	274.0
25-Jun-11	262.9
26-Jun-11	306.1
27-Jun-11	308.7
28-Jun-11	331.9
29-Jun-11	312.2
30-Jun-11	289.7
1-Jul-11	245.8
2-Jul-11	238.7
3-Jul-11	268.1
4-Jul-11	303.4
5-Jul-11	322.4
6-Jul-11	322.8

Gas Day	GTA Project Influence Area Flows (TJ)
7-Jul-11	294.5
8-Jul-11	279.3
9-Jul-11	250.9
10-Jul-11	277.3
11-Jul-11	338.6
12-Jul-11	326.5
13-Jul-11	298.4
14-Jul-11	307.4
15-Jul-11	320.4
16-Jul-11	275.5
17-Jul-11	309.8
18-Jul-11	328.8
19-Jul-11	326.0
20-Jul-11	342.8
21-Jul-11	331.3
22-Jul-11	301.9
23-Jul-11	276.2
24-Jul-11	253.2
25-Jul-11	307.6
26-Jul-11	298.1
27-Jul-11	308.5
28-Jul-11	337.4
29-Jul-11	325.9
30-Jul-11	286.2
31-Jul-11	266.8
1-Aug-11	306.3
2-Aug-11	328.4
3-Aug-11	320.9
4-Aug-11	335.1
5-Aug-11	340.5
6-Aug-11	293.5
7-Aug-11	328.7
8-Aug-11	347.4
9-Aug-11	334.7
10-Aug-11	314.7
11-Aug-11	327.2
12-Aug-11	307.1
13-Aug-11	273.1
14-Aug-11	295.7
15-Aug-11	307.5
16-Aug-11	323.9
17-Aug-11	330.0
18-Aug-11	350.3
19-Aug-11	339.0
20-Aug-11	275.1
21-Aug-11	290.3

Gas Day	GTA Project Influence Area Flows (TJ)
22-Aug-11	318.9
23-Aug-11	330.8
24-Aug-11	343.6
25-Aug-11	358.1
26-Aug-11	302.6
27-Aug-11	264.0
28-Aug-11	268.7
29-Aug-11	281.6
30-Aug-11	280.4
31-Aug-11	294.7
1-Sep-11	312.8
2-Sep-11	287.6
3-Sep-11	247.8
4-Sep-11	231.8
5-Sep-11	272.1
6-Sep-11	305.9
7-Sep-11	309.7
8-Sep-11	273.0
9-Sep-11	303.1
10-Sep-11	236.6
11-Sep-11	268.9
12-Sep-11	313.4
13-Sep-11	330.2
14-Sep-11	309.3
15-Sep-11	351.8
16-Sep-11	318.4
17-Sep-11	312.5
18-Sep-11	281.8
19-Sep-11	299.2
20-Sep-11	296.1
21-Sep-11	269.7
22-Sep-11	302.1
23-Sep-11	284.0
24-Sep-11	229.7
25-Sep-11	280.4
26-Sep-11	286.6
27-Sep-11	280.2
28-Sep-11	300.6
29-Sep-11	311.8
30-Sep-11	347.9
1-Oct-11	433.8
2-Oct-11	523.6
3-Oct-11	445.6
4-Oct-11	377.6
5-Oct-11	401.8
6-Oct-11	393.6

Gas Day	GTA Project Influence Area Flows (TJ)
7-Oct-11	313.9
8-Oct-11	270.0
9-Oct-11	249.6
10-Oct-11	288.3
11-Oct-11	326.3
12-Oct-11	354.2
13-Oct-11	332.1
14-Oct-11	382.0
15-Oct-11	510.9
16-Oct-11	562.1
17-Oct-11	594.9
18-Oct-11	568.3
19-Oct-11	621.5
20-Oct-11	626.9
21-Oct-11	662.9
22-Oct-11	659.6
23-Oct-11	565.1
24-Oct-11	661.1
25-Oct-11	714.4
26-Oct-11	855.3
27-Oct-11	970.7
28-Oct-11	779.7
29-Oct-11	794.6
30-Oct-11	749.1
31-Oct-11	762.6
1-Nov-11	725.8
2-Nov-11	592.9
3-Nov-11	816.7
4-Nov-11	850.8
5-Nov-11	793.8
6-Nov-11	635.4
7-Nov-11	560.2
8-Nov-11	617.2
9-Nov-11	645.0
10-Nov-11	861.3
11-Nov-11	880.3
12-Nov-11	615.8
13-Nov-11	546.4
14-Nov-11	657.4
15-Nov-11	670.0
16-Nov-11	865.8
17-Nov-11	1,028.0
18-Nov-11	923.3
19-Nov-11	607.3
20-Nov-11	849.6
21-Nov-11	1,093.0

Gas Day	GTA Project Influence Area Flows (TJ)
22-Nov-11	1,151.7
23-Nov-11	1,007.5
24-Nov-11	916.7
25-Nov-11	650.9
26-Nov-11	599.5
27-Nov-11	684.9
28-Nov-11	847.6
29-Nov-11	952.8
30-Nov-11	1,137.6
1-Dec-11	997.1
2-Dec-11	1,101.6
3-Dec-11	856.9
4-Dec-11	763.5
5-Dec-11	962.2
6-Dec-11	1,113.9
7-Dec-11	1,186.5
8-Dec-11	1,135.6
9-Dec-11	1,211.2
10-Dec-11	1,276.8
11-Dec-11	1,133.9
12-Dec-11	1,109.3
13-Dec-11	994.3
14-Dec-11	901.5
15-Dec-11	867.8
16-Dec-11	1,109.7
17-Dec-11	1,303.6
18-Dec-11	1,153.8
19-Dec-11	1,147.4
20-Dec-11	1,184.7
21-Dec-11	1,029.3
22-Dec-11	1,022.1
23-Dec-11	1,297.6
24-Dec-11	1,109.0
25-Dec-11	962.4
26-Dec-11	989.1
27-Dec-11	1,145.0
28-Dec-11	1,529.0
29-Dec-11	1,390.5
30-Dec-11	1,206.9
31-Dec-11	996.7
1-Jan-12	1,043.7
2-Jan-12	1,551.8
3-Jan-12	1,883.3
4-Jan-12	1,419.2
5-Jan-12	1,240.9
6-Jan-12	960.2

Gas Day	GTA Project Influence Area Flows (TJ)
7-Jan-12	1,000.4
8-Jan-12	1,168.8
9-Jan-12	1,111.1
10-Jan-12	1,093.3
11-Jan-12	1,094.2
12-Jan-12	1,133.9
13-Jan-12	1,490.4
14-Jan-12	1,807.9
15-Jan-12	1,641.8
16-Jan-12	1,223.6
17-Jan-12	1,317.6
18-Jan-12	1,538.1
19-Jan-12	1,652.7
20-Jan-12	1,640.3
21-Jan-12	1,431.8
22-Jan-12	1,278.6
23-Jan-12	1,174.2
24-Jan-12	1,354.0
25-Jan-12	1,358.4
26-Jan-12	1,265.9
27-Jan-12	1,192.5
28-Jan-12	1,294.6
29-Jan-12	1,344.5
30-Jan-12	1,337.8
31-Jan-12	926.9
1-Feb-12	1,118.1
2-Feb-12	1,282.4
3-Feb-12	1,188.3
4-Feb-12	1,114.2
5-Feb-12	1,114.8
6-Feb-12	1,054.6
7-Feb-12	1,371.5
8-Feb-12	1,298.2
9-Feb-12	1,216.2
10-Feb-12	1,383.2
11-Feb-12	1,626.5
12-Feb-12	1,461.5
13-Feb-12	1,272.3
14-Feb-12	1,221.2
15-Feb-12	1,163.0
16-Feb-12	1,107.2
17-Feb-12	1,161.6
18-Feb-12	1,201.4
19-Feb-12	1,307.3
20-Feb-12	1,202.8
21-Feb-12	1,173.9

Gas Day	GTA Project Influence Area Flows (TJ)
22-Feb-12	1,082.5
23-Feb-12	1,068.5
24-Feb-12	1,207.0
25-Feb-12	1,343.5
26-Feb-12	1,224.2
27-Feb-12	1,178.5
28-Feb-12	1,168.9
29-Feb-12	1,258.5
1-Mar-12	1,089.5
2-Mar-12	955.0
3-Mar-12	1,138.1
4-Mar-12	1,465.3
5-Mar-12	1,505.4
6-Mar-12	1,141.4
7-Mar-12	670.6
8-Mar-12	1,011.7
9-Mar-12	1,326.9
10-Mar-12	1,120.3
11-Mar-12	716.6
12-Mar-12	702.1
13-Mar-12	656.1
14-Mar-12	627.8
15-Mar-12	613.8
16-Mar-12	477.7
17-Mar-12	610.9
18-Mar-12	449.4
19-Mar-12	398.2
20-Mar-12	401.5
21-Mar-12	399.9
22-Mar-12	376.8
23-Mar-12	471.4
24-Mar-12	589.0
25-Mar-12	624.8
26-Mar-12	1,103.0
27-Mar-12	913.3
28-Mar-12	767.2
29-Mar-12	1,047.6
30-Mar-12	973.0
31-Mar-12	801.1
1-Apr-12	911.9
2-Apr-12	803.1
3-Apr-12	737.8
4-Apr-12	801.2
5-Apr-12	800.2
6-Apr-12	696.5
7-Apr-12	589.6

Gas Day	GTA Project Influence Area Flows (TJ)
8-Apr-12	678.3
9-Apr-12	726.9
10-Apr-12	862.5
11-Apr-12	785.2
12-Apr-12	697.0
13-Apr-12	556.0
14-Apr-12	488.2
15-Apr-12	414.0
16-Apr-12	431.3
17-Apr-12	695.6
18-Apr-12	662.0
19-Apr-12	428.8
20-Apr-12	486.4
21-Apr-12	696.1
22-Apr-12	691.0
23-Apr-12	970.2
24-Apr-12	863.2
25-Apr-12	648.9
26-Apr-12	832.1
27-Apr-12	835.2
28-Apr-12	703.0
29-Apr-12	649.2
30-Apr-12	774.9
1-May-12	587.9
2-May-12	478.4
3-May-12	365.2
4-May-12	353.5
5-May-12	391.2
6-May-12	370.5
7-May-12	422.8
8-May-12	395.6
9-May-12	485.7
10-May-12	480.4
11-May-12	351.5
12-May-12	293.7
13-May-12	333.4
14-May-12	333.4
15-May-12	317.4
16-May-12	417.8
17-May-12	391.0
18-May-12	348.3
19-May-12	271.1
20-May-12	253.2
21-May-12	302.6
22-May-12	308.6
23-May-12	311.3

Gas Day	GTA Project Influence Area Flows (TJ)
24-May-12	299.4
25-May-12	289.3
26-May-12	273.6
27-May-12	289.1
28-May-12	298.7
29-May-12	316.4
30-May-12	336.7
31-May-12	331.6
1-Jun-12	359.6
2-Jun-12	327.8
3-Jun-12	350.7
4-Jun-12	372.4
5-Jun-12	322.3
6-Jun-12	324.3
7-Jun-12	334.7
8-Jun-12	303.5
9-Jun-12	277.8
10-Jun-12	293.5
11-Jun-12	300.3
12-Jun-12	331.6
13-Jun-12	329.6
14-Jun-12	328.5
15-Jun-12	291.3
16-Jun-12	258.8
17-Jun-12	279.6
18-Jun-12	305.0
19-Jun-12	294.7
20-Jun-12	285.2
21-Jun-12	288.8
22-Jun-12	277.8
23-Jun-12	247.5
24-Jun-12	276.5
25-Jun-12	319.4
26-Jun-12	299.8
27-Jun-12	310.0
28-Jun-12	305.0
29-Jun-12	292.4
30-Jun-12	259.4
1-Jul-12	262.0
2-Jul-12	315.6
3-Jul-12	330.6
4-Jul-12	357.0
5-Jul-12	378.3
6-Jul-12	330.1
7-Jul-12	296.9
8-Jul-12	309.6

Gas Day	GTA Project Influence Area Flows (TJ)
9-Jul-12	334.0
10-Jul-12	344.7
11-Jul-12	355.8
12-Jul-12	376.0
13-Jul-12	324.5
14-Jul-12	286.7
15-Jul-12	352.0
16-Jul-12	364.9
17-Jul-12	366.0
18-Jul-12	373.2
19-Jul-12	340.2
20-Jul-12	322.3
21-Jul-12	292.9
22-Jul-12	348.8
23-Jul-12	359.6
24-Jul-12	366.6
25-Jul-12	334.4
26-Jul-12	337.2
27-Jul-12	335.6
28-Jul-12	266.5
29-Jul-12	308.2
30-Jul-12	347.2
31-Jul-12	331.4
1-Aug-12	350.2
2-Aug-12	365.1
3-Aug-12	343.4
4-Aug-12	288.6
5-Aug-12	268.4
6-Aug-12	301.7
7-Aug-12	350.8
8-Aug-12	361.5
9-Aug-12	328.5
10-Aug-12	309.9
11-Aug-12	296.4
12-Aug-12	313.0
13-Aug-12	359.5
14-Aug-12	328.4
15-Aug-12	334.9
16-Aug-12	333.0
17-Aug-12	316.6
18-Aug-12	298.1
19-Aug-12	280.6
20-Aug-12	312.7
21-Aug-12	332.1
22-Aug-12	352.8
23-Aug-12	349.3

Gas Day	GTA Project Influence Area Flows (TJ)
24-Aug-12	328.5
25-Aug-12	275.9
26-Aug-12	297.6
27-Aug-12	348.5
28-Aug-12	346.8
29-Aug-12	311.0
30-Aug-12	352.4
31-Aug-12	321.1
1-Sep-12	266.6
2-Sep-12	252.6
3-Sep-12	332.1
4-Sep-12	377.0
5-Sep-12	381.2
6-Sep-12	370.8
7-Sep-12	331.7
8-Sep-12	281.9
9-Sep-12	326.5
10-Sep-12	386.0
11-Sep-12	363.2
12-Sep-12	350.5
13-Sep-12	363.9
14-Sep-12	327.4
15-Sep-12	287.0
16-Sep-12	282.5
17-Sep-12	294.7
18-Sep-12	375.7
19-Sep-12	347.3
20-Sep-12	358.8
21-Sep-12	307.1
22-Sep-12	324.9
23-Sep-12	423.0
24-Sep-12	429.7
25-Sep-12	359.8
26-Sep-12	422.5
27-Sep-12	431.8
28-Sep-12	398.1
29-Sep-12	332.9
30-Sep-12	357.6
1-Oct-12	346.1
2-Oct-12	345.3
3-Oct-12	330.5
4-Oct-12	316.8
5-Oct-12	347.5
6-Oct-12	460.8
7-Oct-12	558.0
8-Oct-12	560.7

Gas Day	GTA Project Influence Area Flows (TJ)
9-Oct-12	553.3
10-Oct-12	726.4
11-Oct-12	746.5
12-Oct-12	769.3
13-Oct-12	647.6
14-Oct-12	430.9
15-Oct-12	665.3
16-Oct-12	650.7
17-Oct-12	570.1
18-Oct-12	547.5
19-Oct-12	515.2
20-Oct-12	569.0
21-Oct-12	528.3
22-Oct-12	468.9
23-Oct-12	638.6
24-Oct-12	601.1
25-Oct-12	417.6
26-Oct-12	595.9
27-Oct-12	716.4
28-Oct-12	870.5
29-Oct-12	955.3
30-Oct-12	698.0
31-Oct-12	766.5
1-Nov-12	887.6
2-Nov-12	927.1
3-Nov-12	890.8
4-Nov-12	1,009.7
5-Nov-12	1,167.9
6-Nov-12	1,135.9
7-Nov-12	1,060.7
8-Nov-12	969.7
9-Nov-12	804.1
10-Nov-12	719.5
11-Nov-12	515.2
12-Nov-12	740.7
13-Nov-12	1,007.2
14-Nov-12	952.3
15-Nov-12	971.6
16-Nov-12	804.2
17-Nov-12	791.6
18-Nov-12	815.6
19-Nov-12	831.1
20-Nov-12	803.7
21-Nov-12	803.3
22-Nov-12	636.2
23-Nov-12	875.1

Gas Day	GTA Project Influence Area Flows (TJ)
24-Nov-12	1,016.1
25-Nov-12	1,058.1
26-Nov-12	1,165.2
27-Nov-12	1,155.9
28-Nov-12	1,179.2
29-Nov-12	1,081.7
30-Nov-12	1,378.9
1-Dec-12	1,047.2
2-Dec-12	794.0
3-Dec-12	800.5
4-Dec-12	775.4
5-Dec-12	1,270.0
6-Dec-12	1,139.5
7-Dec-12	908.6
8-Dec-12	1,020.4
9-Dec-12	1,122.0
10-Dec-12	1,150.0
11-Dec-12	1,279.0
12-Dec-12	1,186.1
13-Dec-12	1,042.5
14-Dec-12	1,030.2
15-Dec-12	1,078.2
16-Dec-12	861.6
17-Dec-12	886.6
18-Dec-12	992.3
19-Dec-12	1,052.9
20-Dec-12	1,105.2
21-Dec-12	1,165.9
22-Dec-12	1,156.8
23-Dec-12	1,168.4
24-Dec-12	1,088.8
25-Dec-12	1,086.8
26-Dec-12	1,371.8
27-Dec-12	1,406.4
28-Dec-12	1,284.2
29-Dec-12	1,299.1
30-Dec-12	1,248.2
31-Dec-12	1,211.4

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #12

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 1

Please fully describe the methodology and assumptions for Enbridge's annual residential, commercial, apartment and industrial customer load growth forecasts from 2013 to 2025 inclusive in the GTA Project Influence Area. Please provide all written analyses and spreadsheets justifying the forecast.

RESPONSE

The Company does not measure peak hourly or daily consumption for the vast majority of its customers. Peak hourly load growth is derived from actual customer consumption volumes extracted from Enbridge's billing system. The customer consumption volumes are used to derive the peak hourly consumption forecast.

An extract of 24 months of actual customer consumption volumes and corresponding temperature readings are used in a mathematical regression to determine the base load and heat load for each customer. The base load and heat load are aggregated to sector (residential, apartment, commercial, industrial) within each municipality every year. These two values collectively result in peak hourly consumption estimates that are applied accordingly within the study area for the forecast period. A summary of peak hour consumptions broken down by customer sector and municipality is included in the response to Environmental Defence Interrogatory #13 found at Exhibit I.A4.EGD.ED.13. The customer additions forecast has been provided in the response to Environmental Defence Interrogatory #2 found at Exhibit I.A4.EGD.ED.2. A summary of total load in the influence area and by customer sector is included in the response to Environmental Defence Interrogatory #13 found at Exhibit I.A4.EGD.ED.13.

The network analysis model also factors in the declining average use consumption trend. The declining average use is calculated through a mathematical regression using

Witness: E. Naczynski

the last five years of derived peak hourly consumption estimates by municipality by, customer sector. This declining average use values are then applied to forecast customer additions throughout the study period. The network analysis models are refreshed on an annual basis to factor in updated values for peak hourly consumption.

For the purposes of the GTA Project an additional reduction factor was also applied to the future load additions. This reduction factor is explained in Environmental Defence Interrogatory #13 found at Exhibit I.A4.EGD.ED.13 part c).

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #13

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, pages 7 & 8

a) Please provide the peak hourly consumption data, by municipality and customer type, that was used to forecast to future demand.

b) Please provide the temperature information and the regression analysis that was used to determine peak hourly gas consumption at 41 DD.

c) Please provide the reduction factor that was used to account for efficiency gains through DSM and customer losses through building demolition. Please provide a breakout of these two components of the reduction factor and fully explain how they were calculated.

d) Does the DSM reduction factor just include DSM reductions due to Enbridge's DSM programs? Or does it also include DSM reductions due to other factors such as changes to building codes, the BOMA BESt Program, REALpac 20 By 15 Energy Benchmarking Program etc.? If not, please estimate the impact of all the other DSM programs and policies on the total annual demand and peak hourly demand for natural gas in the GTA Project Influence Area for each year between 2013 and 2025 inclusive. Please also explain how and to what extent, if any, the reductions from other DSM programs and policies are accounted for in Enbridge's forecast.

RESPONSE

a) Peak load by sector is not measured on an hourly or daily basis. The Company does derive some of this data for network planning purposes as per the response to Environmental Defence Interrogatory #12 found at Exhibit I.A4.EGD.ED.12. The information provided below is the historical data as used for network planning.

Witnesses: C. Fernandes
E. Naczynski

Table 1 (please refer to Attachment) provides a summary of the derived peak hourly load in m^3/hr from 2006 to 2025. This table shows peak load by customer type and municipality in the GTA Project Influence Area.

Data has only been provided for 2006 onward as EGD implemented a new load gathering system. Prior to 2004, load gathering was completed on a legacy main frame system and the archived data is not readily accessible. From 2004 to 2006 there were numerous changes in customer classifications which make year to year comparisons irrelevant due to changing base data. The load presented excludes unbundled customers.

b) Please refer to Exhibit D2, Tab 4, Schedule 2 found in the Company's approved rate application EB-2011-0354.

c) The reduction factor is designed to capture reduction of peak load due to energy efficiency measures. Energy efficiency typically accounts for resource reduction over a long unit of time, such as an annualized basis. It is not analyzed on time periods as short as a day nor an hour. Additionally, customer usage is not typically measured in short time intervals, with the typical customer having billing data available on a monthly basis. The reduction factor was developed using gate station daily demand trends in the GTA to account for the lower peak values aggregated from the network planning process as described in the response to Environmental Defence Interrogatory #12 found at Exhibit I.A4.EGD.ED.12.

Using monthly historical data, the reduction factor multiplier was found to be 0.65. This was applied to the aggregated incremental loads and was applied to specifically reduce the overall peak system load to incorporate the impact of efficiency measures across the GTA Project Influence Area.

d) Please refer to answer c) above.

Witnesses: C. Fernandes
E. Naczynski

Average of Peak Hourly Load (DD41)																			
Row Labels	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Apartment																			
BRAMPTON	81.88	80.78	84.99	79.6	79.42	85.05	81.71	81.23	80.78	80.37	79.98	79.62	79.28	78.96	78.66	78.38	78.38	78.38	78.38
CONCORD		265.34	163.81	205.69	205.06	214.05													
DON MILLS	125.85	149.81	148.35	142.97															
DOWNSVIEW	94.7	96.18	91.37	106.91															
EAST YORK	158.76	161.83	77.92	38.35	75.91	71.85													
ETOBICOKE	125.66	122.62	118.28	120.28	78.92	78.77													
MAPLE	158.26	158.2	157.27	156.29	111.88	127.26													
MARKHAM	124.11	113.24	111.99	116.38	119.63	110.62													
MISSISSAUGA	130.93	134.37	130.25	124.45	101.99	101.72	94.39	94	93.64	93.3	92.99	92.7	92.43	92.17	91.93	91.7	91.7	91.7	91.7
NORTH YORK	85.59	88.75	87.06	76.88	103.83	114.82	105.22	104.42	103.95	103.51	103.11	102.72	102.37	102.03	101.71	101.41	101.41	101.41	101.41
RICHMOND HILL	79.69	79.81	77.36	75.6	111.85	116.57	88.77	88.59	88.42	88.26	88.11	87.98	87.85	87.73	87.61	87.5	87.5	87.5	87.5
SCARBOROUGH	148.88	147.78	143.63	141.86	112.88	117.79	103.38	100.03	99.94	99.43	98.95	98.5	98.07	97.67	97.3	96.94	96.94	96.94	96.94
THORNHILL	152.22	152.68	150.38	162.44	157.32	162.23													
TORONTO	81.96	83.2	84.1	84.28	79.85	83.01	76.72	78.91	78.35	77.83	77.35	76.89	76.47	76.07	75.69	75.33	75.33	75.33	75.33
TORONTO ISLAND	55.89	54.39	55.7	56.81	60.01	60.41													
UNIONVILLE																			
VAUGHAN							22.41	21.72	21.09	20.5	19.96	19.45	18.97	18.52	18.09	17.68	17.68	17.68	17.68
WESTON	114.84	112.01	110.18	109.65															
WILLOWDALE	179.64	176.62	174.44	168.05															
WOODBRIDGE	40.28	37.33	27.59	31.12	28.06	23.81													
YORK					40.5	39.14													
Commercial																			
BRAMPTON	49.8	47.26	42.46	39.31	22.95	20.95	9.98	9.94	9.9	9.86	9.82	9.79	9.76	9.73	9.7	9.68	9.68	9.68	9.68
CONCORD	15.18	18.74	18.58	23.91	30.05	18.49													
DON MILLS	62.22	60.02	57.05	55.55															
DOWNSVIEW	31.75	32.57	34.34	31.73															
EAST YORK	17.57	9.8	11.54	8.56	12.32	12.83													
ETOBICOKE	34.63	32.54	35.35	33.79	12.49	12.62	10.38	12.37	12.42	12.46	12.5	12.54	12.58	12.61	12.64	12.67	12.67	12.67	12.67
MAPLE	7.65	9.51	9.32	8.33	10.62	11.95													
MARKHAM	12.8	20.7	28.81	29.19	11.81	15.1	7.16	7.13	7.09	7.07	7.04	7.01	6.99	6.97	6.94	6.92	6.92	6.92	6.92
MISSISSAUGA	38.64	38.18	36.69	36.55	20.25	22.67	10.37	10.34	10.31	10.28	10.26	10.24	10.21	10.19	10.17	10.16	10.16	10.16	10.16
NORTH YORK	36.33	34.2	34.26	16.98	14.42	17.18	12.33	14.17	14.13	14.08	14.04	14	13.97	13.94	13.9	13.87	13.87	13.87	13.87
RICHMOND HILL	7.95	7.59	6.9	6.65	6.41	6.5	6.73	6.72	6.71	6.71	6.7	6.7	6.69	6.69	6.68	6.68	6.68	6.68	6.68
SCARBOROUGH	23.82	19.42	20.25	19.19	47.22	47.07	8.25	8.23	8.21	8.19	8.18	8.16	8.15	8.13	8.12	8.11	8.11	8.11	8.11
THORNHILL	5.78	6.08	4.99	4.55	8.27	8.47													
TORONTO	33.57	35.26	41.11	38.51	29.94	38.49	12.32	7.39	7.24	7.1	6.97	6.85	6.74	6.63	6.53	6.44	6.44	6.44	6.44
TORONTO ISLAND	10.61	12.43	13.71	13.78	18.6	18.27													
UNIONVILLE	7.23	8.3	10.57	8.74	8.42	4.54													
VAUGHAN	1.89	1.92	1.92	2.21			7.24	7.24	7.24	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23
WESTON	26.03	24.34	24.77	25.78															
WILLOWDALE	35.97	34.05	33.45	32.77															
WOODBRIDGE	12.28	11.58	9.59	7.7	8.27	8.02													
YORK	5.49	5.95	7.72	5.72	9.42	16.27													
Industrial																			
BRAMPTON	104.83	90.88	97.42	82.88	168.43	137.47													
CONCORD	101.1	130.36	110.36	106.88	78.4	60.22													
DON MILLS	45.64	50.6	50.36	48.49															
DOWNSVIEW	54.48	57.72	64.45	88.69															
EAST YORK				13.14	55.8	40.16													
ETOBICOKE	101.4	70.32	68.94	69.98	60.91	49.18	41.95	38.25	37.95	37.48	37.03	36.62	36.23	35.86	35.51	35.18	35.18	35.18	35.18
MAPLE	91.57	94.27	77.61	74.97	119.3	41.49													
MARKHAM	297.2	312.92	359.39	360.81	308.81	68.52	83.48	84.75	85.92	87	88.01	88.96	89.84	90.68	91.47	92.22	92.22	92.22	92.22
MISSISSAUGA	102.48	108.25	104.58	104.17	101.39	46.35													
NORTH YORK	16.81	17.04	16.05	19.69	83.02	47.82													
RICHMOND HILL	73.39	75.94	68.18	66.59	67.73	49.26	0	0	0	0	0	0	0	0	0	0	0	0	0
SCARBOROUGH	46.78	47.6	50.01	47.4	40.63	23.33													
THORNHILL	136.17	148.51	102.33	45.55	32.14	48.24													
TORONTO	75.57	64.15	59.23	64.42	55.47	21.37													
WESTON	347.16	321.05	340.46	334.06															
WILLOWDALE	149.96	126.16	181.42	218.45															
WOODBRIDGE	104.02	97.54	106.49	107.26	105.14	104.84													
YORK	13.35	11.59	12.02	10.14	53.83	14.18													

Average of Peak Hourly Load (DD41)																			
Row Labels	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Inter_Com																			
BRAMPTON			2185.06	1146.61	1193.75														
DON MILLS	256.35			165.94															
DOWNSVIEW	1492.95	2029.11	1904.63	1626.44															
EAST YORK			236.33	243.78	181.65														
ETOBICOKE	623.17	373.78	349.58	342.12	326.71														
MISSISSAUGA	1285.75	550.59	457.92	524.89	535.78														
NORTH YORK	445.86	445.92	453.52	454.99	741.49														
SCARBOROUGH	293.41	446.61	337.78	296.44	298.24														
TORONTO	1317.42	1473.4	1409.66	1325.66	1530.19														
WESTON	573.57	613.87	594.6	575															
WILLOWDALE	909.2	884.09	927.9	980.78															
YORK					479.59														
Inter_Ind																			
BRAMPTON	1207.33	1237.02	794.43	708.95	608.64														
DON MILLS	1052.71	1078.51	1055.11	1048.14															
DOWNSVIEW	2040.88	2002.28	1867.53	1736.69															
ETOBICOKE	1746.26	1762.39	1626.84	1541.01	1597.35														
MARKHAM	271.74			52.77	164.92														
MISSISSAUGA	949.19	1380.33	1109.12	994.51	1295.49														
NORTH YORK					1412.31														
SCARBOROUGH	1182.59	1647.33	1706.39	1177.17	1163.72														
TORONTO	2100.95	2079.89	1866.13	2339.19	2219.33														
WESTON	547.62	632.71	629.59																
Residential																			
BRAMPTON	1.32	1.31	1.33	1.3	1.26	1.22	1.26	1.25	1.25	1.25	1.24	1.24	1.24	1.24	1.23	1.23	1.23	1.23	1.23
CONCORD	1.34	1.33	1.31	1.28	1.31	1.02													
DON MILLS	1.92	1.95	1.92	2.03															
DOWNSVIEW	1.17	1.07	1.1	1.12															
EAST YORK	1.18	1.16	1.17	1.28	1.19	1.19													
ETOBICOKE	1.47	1.5	1.39	1.38	1.51	1.4	1.47	1.42	1.42	1.42	1.41	1.41	1.41	1.4	1.4	1.4	1.4	1.4	1.4
MAPLE	3.43	2.19	2.42	2.51	1.3	1.27													
MARKHAM	1.45	1.43	1.52	1.55	1.35	1.23	1.34	1.33	1.33	1.32	1.32	1.31	1.31	1.3	1.3	1.3	1.3	1.3	1.3
MISSISSAUGA	1.46	1.43	1.46	1.44	1.37	1.31	1.25	1.25	1.25	1.24	1.24	1.24	1.23	1.23	1.23	1.23	1.23	1.23	1.23
NORTH YORK	1.65	1.69	1.63	1.53	1.49	1.42	1.43	1.43	1.42	1.42	1.42	1.41	1.41	1.41	1.4	1.4	1.4	1.4	1.4
RICHMOND HILL	1.47	1.46	1.42	1.22	1.48	1.43	1.44	1.44	1.43	1.42	1.42	1.41	1.41	1.4	1.4	1.4	1.4	1.4	1.4
SCARBOROUGH	1.43	1.4	1.34	1.28	1.44	1.31	1.28	1.27	1.27	1.27	1.26	1.26	1.26	1.25	1.25	1.25	1.25	1.25	1.25
THORNHILL	1.42	1.34	1.38	1.2	1.47	1.36													
TORONTO	1.67	1.65	1.6	1.57	1.53	1.44	1.43	1.47	1.47	1.47	1.47	1.47	1.47	1.48	1.48	1.48	1.48	1.48	1.48
TORONTO ISLAND	1.06	1.09	1.06	1.05	1.01	0.98													
UNIONVILLE	1.91	1.94	1.93	1.91	1.85	1.67													
VAUGHAN	1.04	1.04	1.03	1		1.38	1.47	1.46	1.46	1.45	1.45	1.44	1.44	1.43	1.43	1.43	1.43	1.43	1.43
VICTORIA SQUARE																			
WESTON	1.38	1.37	1.32	1.14															
WILLOW BEACH	0	0.99	0.81	0.66															
WILLOWDALE	2	2.13	2.11	2.03															
WOODBRIDGE	1.59	1.31	1.52	1.5	1.49	1.42													
YORK	1.55	1.52	1.44	1.45	1.43	1.41													

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #14

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 8

a) For each year from 2014 to 2025 inclusive, please state the forecast impact of DSM on peak hourly demand and total annual demand in the GTA Project Influence Area, both yearly and cumulative, based on the "reduction factor" used by Enbridge in its forecast. For each year, please also estimate Enbridge's DSM budget needed to achieve the DSM reductions assumed in the forecast.

b) Please state the amount of DSM, in addition to that assumed in Enbridge's forecast, that would be needed to meet Enbridge's customers' needs in the GTA Project Influence Area in each year from 2014 to 2025 inclusive (i.e. to ensure that minimum system requirements with respect to capacity and pressure are met) without the proposed new Enbridge pipelines.

c) Has Enbridge estimated the potential for incremental DSM in addition to the amount assumed in its forecast? If yes, please state this potential for each year from 2014 to 2025 inclusive. Please also provide all the reports, studies and analyses that support these estimates and state when this research was commenced and was completed.

d) For each of the above, please also provide the requested data in a table or tables covering only the period from 2015 to 2025. This will assist in comparing the data with Enbridge's load forecast at Exhibit A, Tab 3, Schedule 4, which covers only the 2015 to 2025 period

RESPONSE

a) Enbridge reports DSM using annual figures and does not communicate, measure, or interpret DSM reductions on a peak day or peak hour basis. For illustrative

Witnesses: T. Maclean
F. Oliver-Glasford
J. Ramsay

purposes, the Company has converted its annual results into peak hour and peak day reductions using several theoretical assumptions. The assumptions include:

- the use of a linear conversion ratio to derive peak day from annual figures and peak hour from peak day;
    - o In practice the conversion ratio will not be linear and will vary between DSM measures and customer segments
- the use of a factor to apportion the amount of the whole franchise-wide DSM which is attributable to the GTA Project Influence Area; and
- static cost effectiveness as conservation budgets increase (i.e. each incremental m^3 saved is priced at the same as the first m^3).

Because of the theoretical and simplified nature of the assumptions built into the numbers, the charts below should only be used to illustrate the relative magnitude of the data.

Franchise-wide DSM		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Peak Hour Demand Reductions (10^3m^3)	Yearly	24	25	25	25	25	25	25	25	25	25	25	25	25
	Cumulatively	24	49	73	98	122	147	171	196	221	245	270	294	319
Peak Day Demand Reductions (10^3m^3)	Yearly	600	614	614	614	614	614	614	614	614	614	614	614	614
	Cumulatively	600	1,214	1,828	2,442	3,056	3,670	4,284	4,898	5,513	6,127	6,741	7,355	7,969
Annual Demand Reductions (10^3m^3)	Yearly	74,353	76,049	76,049	76,049	76,049	76,049	76,049	76,049	76,049	76,049	76,049	76,049	76,049
	Cumulatively	74,353	150,402	226,451	302,501	378,550	454,599	530,648	606,697	682,747	758,796	834,845	910,894	986,943
Annual Province-wide DSM Budget		$32,380,295	$32,966,700	$33,626,034	$34,298,555	$34,984,526	$35,684,216	$36,397,901	$37,125,859	$37,868,376	$38,625,743	$39,398,258	$40,186,223	$40,989,948

GTA Influence Area DSM		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Peak Hour Demand Reductions (10^3m^3)	Yearly	12	12	12	12	12	12	12	12	12	12	12	12	12
	Cumulatively	12	23	35	47	59	70	82	94	106	118	129	141	153
Peak Day Demand Reductions (10^3m^3)	Yearly	288	295	295	295	295	295	295	295	295	295	295	295	295
	Cumulatively	288	583	877	1,172	1,467	1,762	2,056	2,351	2,646	2,941	3,236	3,530	3,825
Annual Demand Reductions (10^3m^3)	Yearly	35,689	36,504	36,504	36,504	36,504	36,504	36,504	36,504	36,504	36,504	36,504	36,504	36,504
	Cumulatively	35,689	72,193	108,697	145,200	181,704	218,207	254,711	291,215	327,718	364,222	400,726	437,229	473,733
GTA Influence Area DSM Budget		$15,542,541	$15,824,016	$16,140,496	$16,463,306	$16,792,572	$17,128,424	$17,470,992	$17,820,412	$18,176,820	$18,540,357	$18,911,164	$19,289,387	$19,675,175

As shown in the GTA Project Influence Area DSM table above, the impact of the Company's forecasted 2014 DSM reduction on peak hour demand is 12 10^3m^3/hr.

In comparison, the peak load demand reduction as calculated using the reduction factor impact is 13 10^3m^3/hr.

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b) In the table below are estimates of the DSM reductions that would be necessary in the GTA Project Influence Area in order to meet the Company's customers' growth needs from 2014 to 2025 inclusive (i.e. to meet a 'growth only' scenario) without the pipelines proposed, holding all other factors constant.

Enbridge asserts that the enormous DSM reductions required to meet customers' needs without the proposed pipeline far exceed any realistic or achievable level.

The data below assumes that the realm of available natural gas savings in the GTA Project Influence Area is unlimited and that cost effectiveness is static. The Company knows this not to be the case. Furthermore, significant portions of the Company's results are achieved through industrial customers of whom there are limited quantities. It is for these reasons among others that conservation was discounted as a non-viable option to offset the GTA Project.

DSM Required to Offset Growth in the GTA Project Influence Area		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Additional Annual DSM Needed in GTA (10^3m^3)		77,811	77,811	77,811	77,811	77,811	77,811	77,811	77,811	77,811	77,811	77,811	77,811
Total Franchise-wide Annual DSM Needed (10^3m^3)		153,860	153,860	153,860	153,860	153,860	153,860	153,860	153,860	153,860	153,860	153,860	153,860
Total DSM Budget Needed	Yearly	**$66,697,115**	**$68,031,057**	**$69,391,679**	**$70,779,512**	**$72,195,102**	**$73,639,004**	**$75,111,785**	**$76,614,020**	**$78,146,301**	**$79,709,227**	**$81,303,411**	**$82,929,479**
	Cumulatively	**$66,697,115**	**$134,728,173**	**$204,119,851**	**$274,899,363**	**$347,094,466**	**$420,733,470**	**$495,845,255**	**$572,459,275**	**$650,605,576**	**$730,314,802**	**$811,618,214**	**$894,547,693**

c) The Company completed a DSM Potential Study in 2009. (The study commenced in 2008.) The Potential Study covered the period 2008 through 2017 using the base year of 2007. The Study Report was filed with the 2012 DSM Plan (EB-2011-0295, Exhibit B, Tab 2, Schedule 7).

d) Please see the table above for 2015 to 2025.

Witnesses: T. Maclean
F. Oliver-Glasford
J. Ramsay

MARBEK
Resource Consultants Ltd.

Natural Gas
Energy Efficiency Potential: Update 2008

Residential, Commercial and Industrial Sectors
Synthesis Report

Submitted to:

Enbridge Gas Distribution

Submitted by:

Marbek Resource Consultants Ltd.

September 2009

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Note: Report analysis substantially completed in December 2008.

List of Exhibits

1. INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

Enbridge Gas Distribution (Enbridge) is the largest natural gas utility in Canada with 1.9 million residential, commercial and industrial customers. Enbridge is a regulated utility with a Service Area in central and eastern Ontario that includes the cities of Toronto and Ottawa and the Niagara Region. Enbridge distributes approximately 13 billion m^3 of natural gas to its customers annually.

Since 1995, Enbridge has been delivering demand side management (DSM) programs to its customers following a decision of the provincial regulator, the Ontario Energy Board (OEB). Enbridge offers DSM programs to all customer rate classes and across all sectors.

Enbridge has been participating in a market of increasing DSM program maturity. This market is continually evolving in its engagement with energy efficiency through growing voluntary initiatives and more stringent codes and standards. In addition, changes in the economy have started to have negative impact on the commercial and industrial marketplace in Enbridge's Service Area.

In the DSM Generic Proceeding held in 2006, Enbridge committed to creating an updated Market Potential Study for input into the next DSM plan. When completed, the results of this Natural Gas Energy Efficiency Potential Study will provide a foundation that Enbridge can use to guide the development of its longer-term DSM strategy, including new programs. More specifically, this includes support for Enbridge's filing to the OEB regulatory application for the next multi-year DSM plan by:

- Estimating the achievable and economic potential for DSM measures across all applicable technologies, markets and sectors in Enbridge's Service Area
- Giving shape to, and refining ongoing energy-efficiency work by Enbridge in order to develop its next multi-year DSM plan, and
- Provide information that is actionable and can be easily converted to plan and program development.

1.2 STUDY SCOPE

This current study (Update 2008) is an update of the earlier Natural Gas Efficiency Potential Study that was completed for Enbridge in 2006. Consequently, to the extent possible, this study employs the same methodology, sector definitions, facility archetypes and geographical coverage as in the previous study. Additional details are provided below:

- **Sector Coverage:** The study addresses three sectors: Residential, Commercial[1] and Industrial.

[1] Throughout this report the term "Commercial" also includes institutional sectors, such as schools, hospitals, etc., unless otherwise noted.

- **Geographical Coverage**: The study results are presented for the total Enbridge Service Area and for two service regions: Central and Eastern. The study results are presented at the level of individual service region due to differences in building stock and weather conditions (heating degree days) that exist in the two regions.

  The Central service region is dominated by the Greater Toronto Area, but also includes customers in the Niagara region. Major municipalities in the Central service region include: Metropolitan Toronto (01), Mississauga (21), Richmond Hill (35), Whitby (45), and Niagara (76). The Eastern region is dominated by the City of Ottawa. Major municipalities in the Eastern service region include: Peterborough (47), Barrie (53), and Ottawa (65).

- **Study Period**: This study covers a 10-year period. The Base Year is the calendar year 2007, with milestone periods at five-year increments: 2012 and 2017. The Base Year of 2007 was selected, as this was the most recent calendar year for which complete customer data were available.

- **Technologies:** The study addresses the full range of natural gas energy efficiency measures together with selected renewable energy technologies that are currently commercially available, or are expected to be available within the first 5 years of this study period.

  The study also provides a high-level treatment of selected emerging technologies. Although it is not expected that these emerging technologies will significantly affect results in this study period, they provide insight into possible future directions that may influence the market for higher efficiency products.

1.2.1 Caveats

Readers are reminded of the following caveats when reviewing the results presented in this report:

- Energy Efficiency Potential studies, such as this one, provide a “big picture” assessment of the scope of energy efficiency opportunities within a specific service area. They are particularly valuable in identifying the level of aggregate savings, the key measures involved, their costs and the relative priority of individual sub markets and technologies. Because these studies must assess literally hundreds of combinations of technologies and sub markets, the assessment is necessarily high level. As such, these study results are intended to provide a foundation for detailed program design, but it must be emphasized that detailed program design requires substantial additional analysis.

- During the completion of this study, the world economy entered a period of unprecedented uncertainty that may have significant impact on the results of this study, particularly in the short term. For example, key factors underlying Enbridge’s load forecast and the study’s Reference Case such as gross domestic product (GDP), energy prices, new construction etc. may change. The net effect of these changes would be lower levels of future natural gas consumption. Similarly, the participation rates estimated during the Achievable Potential workshops do not explicitly take into account changes in consumer outlook as a result of the economic downturn. Although neither the extent nor the duration of the economic downturn is known at this time, the expected impact would be lower consumer spending and, hence, lower program participation rates than those presented in this report. The precise magnitude of the reduced program participation is unknown at this time.

- The analysis was conducted based on the current and expected future participation of other industry partners such as the federal government, led by Natural Resources Canada, the Ontario government, and the Ontario Power Authority (OPA). At the time of this writing, the future energy efficiency strategies and complementary programs to be pursued by these agencies is not certain. Over the duration of this forecast, impacts due to the changing roles of industry partners should be assessed from time to time and, in particular, should be included within Enbridge's following multi-year plan.

- The inclusion of natural conservation in the study's Reference Case does address some, but not necessarily all, free rider and spillover impacts. A more detailed assessment of free rider impacts is practical only as part of a detailed program design, which is beyond the scope of this study.

- As in any study of this type, the results presented in this report are based on a large number of important assumptions. Assumptions such as those related to the current and forecast costs of natural gas, the current penetration of energy efficient technologies, the rate of future economic growth and customer willingness to implement new energy efficiency measures are particularly influential. Wherever possible, the assumptions used in this study are consistent with those used by Enbridge and are based on best available information, which in many cases includes the professional judgement of the consultant team, client personnel and/or local experts. The reader should use the results presented in this report as best available estimates; major assumptions, information sources and caveats are noted throughout the report.

1.3 DEFINITIONS

This study employs numerous terms that are unique to analyses such as this one and consequently it is important to ensure that all readers have a clear understanding of what each term means when applied to this study. Below is a brief description of some of the most important terms.

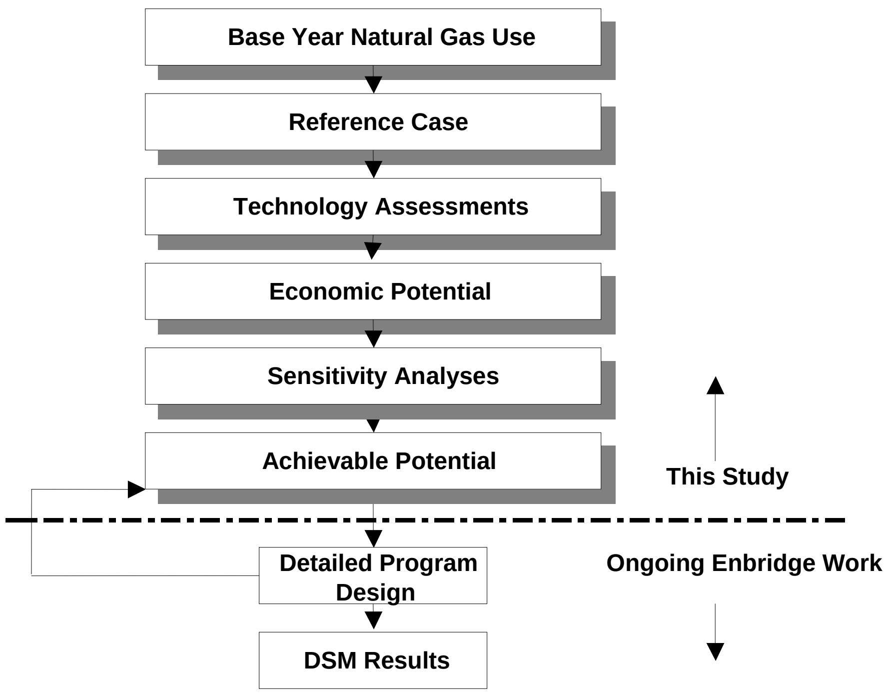
Base Year Natural Gas Use	The Base Year is the starting point for the analysis. It provides a detailed description of "where" and "how" natural gas is currently used in each sector. The bottom up profile of energy use patterns and market shares of energy using technologies was calibrated to actual Enbridge customer sales data.
Reference Case Forecast	The Reference Case is a projection of natural gas consumption to 2017, in the absence of any new Enbridge DSM market interventions after 2008. It is the baseline against which the scenarios of energy savings are calculated. The Reference case forecast incorporates an estimation of "natural conservation", namely, changes in end use efficiency over the study period that are projected to occur in the absence of new market interventions by Enbridge.
Measure Total Resource Cost	The Measure TRC calculates the net benefits that result from an investment in an efficiency technology or measure. The measure TRC is equal to its full or incremental capital cost (depending on application) plus any change (positive or negative) in the combined annual energy, water and equipment O&M costs. This calculation includes, among others, the following inputs: the avoided natural gas, electricity and water supply costs, the life of the technology, and the selected discount rate, which in this analysis has been set at 9.14%. The Measure Total Resource Cost (TRC) test is the primary determinant of whether a measure is included in the economic potential.
Economic Potential Forecast	The Economic Potential Forecast is the level of natural consumption that would occur if all equipment and building envelopes were upgraded to the level that is cost-effective from Enbridge's perspective. All the energy efficiency technologies and measures that have a positive measure TRC are incorporated into the Economic Potential Forecast. These technologies and measures are applied at either natural stock turnover rates or at designated years for immediate application.

Achievable Potential The Achievable Potential is the proportion of the natural gas savings identified in the Economic Potential Forecast that could realistically be achieved within the study period. Achievable Potential recognizes that it is practically difficult to induce customers to purchase and install all the efficiency technologies that meet the criteria defined by the Economic Potential Forecast.

1.4 APPROACH

To meet the objectives outlined above, the study was conducted through an iterative process that involved a number of well-defined steps. At the completion of each step, the client reviewed the results and, as applicable, revisions were identified and incorporated into the interim results. The study then progressed to the next step. A summary of the steps is presented in Exhibit 1.1 and briefly discussed below.

Exhibit 1.1: Major Study Steps



Step 1: Develop Base Year Calibration Using Actual Enbridge Sales Data

The Base Year (2007) is the starting point for the analysis. It provides a detailed description of "where" and "how" natural gas is currently used, based on actual natural gas sales.

The consultants compiled the best available data and used sector-specific macro models to estimate natural gas use; they then compared the results to the Enbridge's actual billing data to verify their accuracy.

Step 2: Develop Reference Case

The Reference Case uses the same sector-specific macro models to estimate the expected level of natural gas consumption that would occur over the study period with no new (post-2007) Enbridge DSM initiatives. The Reference Case includes projected increases in natural gas consumption based on expected rates of population and economic growth, using the growth rates included in the Enbridge 2007 load forecast. The Reference Case also makes an estimate for some “natural” conservation, that is, conservation that occurs without Enbridge DSM programs. The Reference Case provides the point of comparison for the calculation of Technical, Economic and Achievable natural gas saving potentials.

Step 3: Assess DSM Technologies

The consultants researched a wide range of commercially available DSM technologies and measures that can enable the Enbridge customers to use natural gas more efficiently. For each DSM technology or measure, the consultants calculated a value for the net benefits per year per cubic meter (m^3) of saved natural gas, referred to as the measure Total Resource Cost (TRC).

This approach allowed the consultants to compare the measure TRC benefits with other natural gas efficiency technologies and measures, and to determine whether or not to include the DSM measure in the Economic Potential Forecast. Only technologies and measures with positive TRC benefits were included in the Economic Potential Forecast.

Step 4: Estimate Economic Natural Gas Savings Potential

The Economic Potential Forecast incorporates all “cost-effective” DSM measures reviewed in Step 3. To forecast the potential natural gas savings that are defined as economic, the consultants used the sector-specific macro models to calculate the level of natural gas consumption that would occur if Enbridge’s customers installed all “cost-effective” technologies. “Cost effective” for the purposes of this study means that the measure has a positive measure TRC.

Step 5: Conduct Sensitivity Analysis

The results presented in the Economic Potential Forecast are sensitive to the assumptions employed. Consequently, in consultation with Enbridge personnel, the Economic Potential results were subjected to a sensitivity analysis around two assumptions:

- **Technology Costs:** The Economic Potential Forecast was re-run using the most energy efficient technologies and measures assessed in Step 3, regardless of their current capital and installation costs (i.e., the most efficient technologies were included, even if they had a negative measure TRC value).[2] However, to ensure a measure of practical reality and basis for comparison with the preceding economic potential results, the technology adoption rates employed in this analysis are the same as those defined in the preceding economic potential forecast.

[2] In Enbridge’s previous (2004) DSM Potential study, this analysis was reported as a separate Section entitled Technical Potential. The method and assumptions applied to current sensitivity analysis are the same as in the previous (2004) Technical Potential analysis.

- **Value of GHG Emissions**: The natural gas avoided cost values that were used to determine the measure TRC results presented in Step 4 do not include a value for greenhouse gas (GHG) emissions. However, the Government of Ontario has committed to aggressive GHG reduction targets. In this future context, it is not unreasonable to expect that future measure TRC calculations may incorporate a greenhouse gas (GHG) adder that accounts for carbon dioxide emissions resulting from natural gas consumption. Consequently, the measure TRC calculations were re-run using an avoided supply cost value that incorporates a GHG adder.

  The value of the GHG adder was set at \$15/tonne CO_2e (per tonne of CO_2 equivalent emissions) for the period 2007 to 2012 and \$20 /tonne CO_2e for the period 2013-2017. An emissions coefficient of 0.001903 tonnes CO_2e/m^3 (1903 g CO_2e/m^3) is used to account for carbon dioxide emissions resulting from natural gas consumption, while an emissions coefficient of 0.000220 tonnes CO_2e/kWh (220 g CO_2e/kWh) represents the average carbon dioxide emissions from electricity production in Ontario.[3, 4]

Step 6: Estimate Achievable Natural Gas Savings Potential

The Achievable Potential is the proportion of the savings identified in the Economic Potential Forecast that could realistically be achieved within the study period. The study assessed achievable natural gas savings potential from two perspectives:

- ***Potential Savings in Future Natural Gas Consumption:*** For this perspective, the study calculated the change in natural gas consumption levels that could occur in a given milestone year due to the aggregate impact of **all** measures implemented over the period from the Base Year (2007) to the Milestone Year (2012 or 2017). This perspective provides Enbridge Gas with an estimate of future natural gas consumption under different levels of DSM investment.

  This portion of the analysis calculated savings relative to the Reference Case (i.e., no new DSM), which is consistent with the approach used to estimate savings under the Economic Potential forecast and the sensitivity analyses described above in Steps 4 and 5.

- ***Potential DSM Program TRC Benefits***: For this perspective, the study calculated the potential natural gas savings in accordance with the provisions defined by the Ontario Energy Board (OEB) and employed by Enbridge when submitting its DSM plan to the OEB. This perspective emphasizes the estimation of net TRC benefits and the annual natural gas savings presented are due to those measures installed in (only) a given milestone year (i.e., 2012 or 2017).

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[3] Based on emission factors and Global Warming Potentials (GWPs) presented in Environment Canada, National Inventory Report (1990-2005): Greenhouse Gas Sources and Sinks in Canada", pgs. 23 and 583, April 2007.

[4] Based on Ontario emission factors presented in Environment Canada, National Inventory Report (1990-2005): Greenhouse Gas Sources and Sinks in Canada", pg. 521, April 2007.

Within each of the above perspectives, the analysis of Achievable Potential was assessed under four different Marketing scenarios:

- One Financially Unconstrained scenario
- Three Financially Constrained scenarios, each limited by a different annual program budget, which for this study were set at $20 million, $40 million and $60 million.

Data on the costs and savings for each measure were combined with participation rates identified in the achievable workshops to generate measure-by-measure estimates of potential savings. These results were then compiled into a table and ranked according to TRC benefits per program dollar from least cost to most costly. From this table it was then possible to identify the most cost effective portfolio of measures at the $20 million, $40 million, $60 million and Financially Unconstrained budget levels together with the annual natural gas savings and net TRC benefits associated with each program budget level.[5]

The potential savings in future natural gas consumption were then calculated by selecting only those measures contained in the above table that passed at each budget level and milestone year. That package of measures was then applied in each of the sector models and the results were compared with those in the Reference Case and Economic Potential forecasts.

Further information on each of the Marketing scenarios is provided in each of the sector specific sections of this report.

1.5 STUDY ORGANIZATION AND REPORTS

The study was organized and conducted by sector using a common methodology, as outlined above. Following this introductory section, the remainder of this Synthesis Report is organized as follows:

- Section 2 presents the combined natural gas savings for the three sectors.
- Section 3 presents a summary of the natural gas savings for the Residential sector.
- Section 4 presents a summary of the natural gas savings for the Commercial sector.
- Section 5 presents a summary of the natural gas savings for the Industrial sector.

[5] There are numerous possible approaches to the selection of program measures; this approach was selected for simplicity and clarity.

2. SUMMARY OF STUDY FINDINGS

The study findings confirm the existence of significant remaining cost-effective natural gas DSM opportunities in the Residential, Commercial and Industrial sectors within Enbridge's service area.

2.1 TOTAL NATURAL GAS SAVING POTENTIAL

As presented previously in Section 1, the study estimated natural gas savings potential from two perspectives.

- **Potential Savings in Future Natural Gas Consumption –** This perspective estimates the reductions in future natural gas consumption based on the aggregate impact of DSM measures implemented over the study's 10-year time period.
- **Potential DSM Program TRC Benefits –** This perspective estimates the total lifetime savings due to those measures installed in (only) a given milestone year (i.e., 2012 or 2017). This is the method employed in the calculation of net TRC benefits and is part of the DSM program portfolio design process.

The savings associated with each perspective are summarized below.

2.1.1 Potential Savings in Future Natural Gas Consumption

Exhibits 2.1 and 2.2 provide a summary of the total annual natural gas consumption levels contained in each of the forecasts addressed by the study.[6]

Exhibits 2.3 and 2.4 provide a summary of the potential natural gas savings under each of the potential scenarios; in each case savings are presented in both volumetric (m^3) and percentage terms. In each case the savings shown are annual and are based on the aggregate impact of measures installed in prior years within the period when compared to the Reference Case consumption levels.

As illustrated in Exhibits 2.1 to 2.4, inclusive, Achievable Potential savings increase only marginally beyond the $40M scenario. Based on the Achievable Potential workshop results, few additional savings were identified in the $60M scenario and Financially Unconstrained scenarios, while maintaining a positive TRC.

[6] Note: Actual results may not be linear as shown in Exhibits 2.1 and 2.2.

Exhibit 2.1: Graphic of Forecast Results for the Total Enbridge Service Area – Annual Natural Gas Consumption

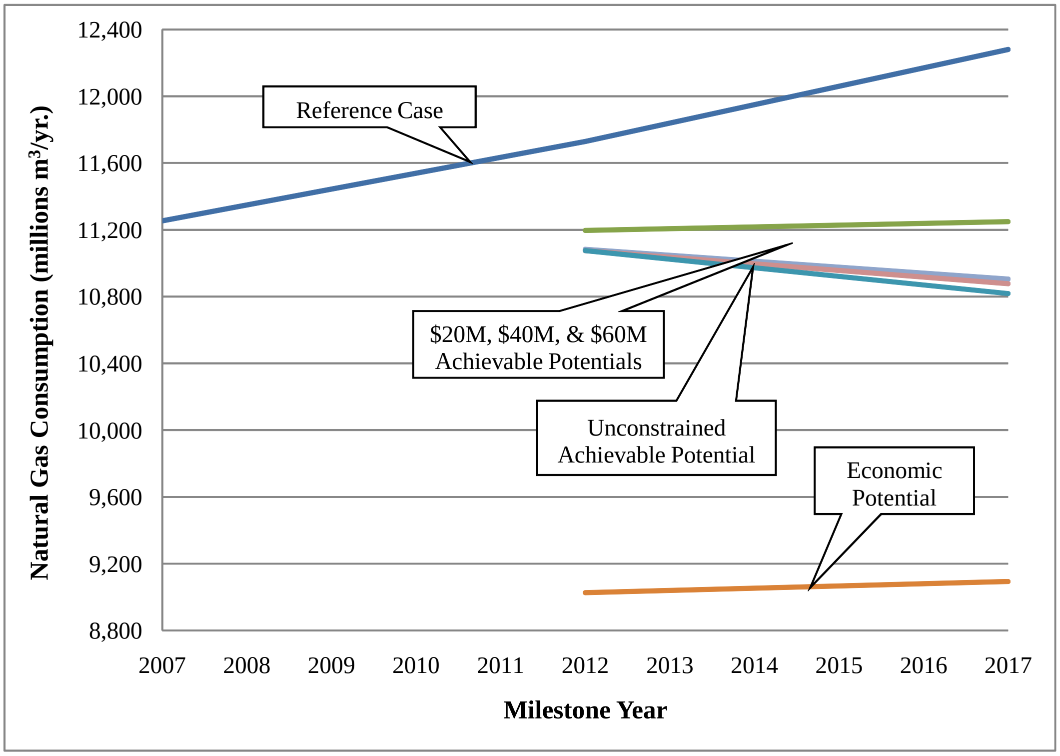


Exhibit 2.2: Total Annual Natural Gas Consumption, by Milestone Year and Forecast Scenario, 3 Sectors

Milestone Year	Total Annual Natural Gas Consumption, All Sectors (million m^3/yr.)					
	Reference Case	Economic Potential	Achievable Potential			
			$20M Scenario	$40M Scenario	$60M Scenario	Financially Unconstrained
2007	11,254					
2012	11,728	9,026	11,197	11,083	11,076	11,076
2017	12,280	9,093	11,249	10,905	10,877	10,818

Exhibit 2.3: Total Natural Gas Savings, in the Milestone Years and Forecast Scenario Relative to Reference Case and Economic Potential Forecasts, 3 Sectors

Milestone Year	Natural Gas Savings, All Sectors (million m³/yr. vs. Ref Case, % vs. Ref. Case and Econ. Potential)				
	Economic Potential	Achievable Potential Scenarios			
		$20M Scenario	$40M Scenario	$60M Scenario	Financially Unconstrained
2012	2,703	532	645	652	652
2017	3,188	1,032	1,375	1,404	1,463
Savings as % of Reference Case Consumption					
2012	23%	5%	6%	6%	6%
2017	26%	8%	11%	11%	12%
Savings as % of Economic Potential Savings					
2012		20%	24%	24%	24%
2017		32%	43%	44%	46%

Note**:** Natural gas savings in the milestone years represent the potential reduction in gas use in that year as a result of DSM measures implemented in the period. Achievable Potential savings increase only marginally beyond the $40M scenario. Based on the Achievable Potential workshop results, few additional savings were identified in the $60M scenario and Financially Unconstrained scenarios, while maintaining a positive TRC.

Exhibit 2.4: Distribution of Natural Gas Savings, by Sector and Scenario in 2017, 3 Sectors

Sector	Natural Gas Savings, 2017 (million m³/yr. vs. Ref Case, % of Econ. Potential Savings)				
	Economic Potential	Achievable Potential Scenarios			
		$20M Scenario	$40M Scenario	$60M Scenario	Financially Unconstrained
Residential	842	237	268	296	355
Commercial	1,427	440	715	715	715
Industrial	919	355	392	392	392
Total	3,188	1,032	1,375	1,404	1,463
Achievable Savings as % of Economic Potential Savings					
Residential		28%	32%	35%	42%
Commercial		31%	50%	50%	50%
Industrial		39%	43%	43%	43%
Total		32%	43%	44%	46%

Note**:** Natural gas savings in the milestone years represent the potential reduction in gas use in that year as a result of DSM measures implemented in the period. Achievable Potential savings increase only marginally beyond the $40M scenario. Based on the Achievable Potential workshop results, few additional savings were identified in the $60M scenario and Financially Unconstrained scenarios, while maintaining a positive TRC.

2.1.2 Potential DSM Program TRC Benefits

Exhibit 2.5 presents a summary of the forecast TRC benefits, annual program costs and natural gas savings in 2017 for each of the achievable scenarios, by scenario and sector. As noted previously, the natural gas savings shown in Exhibit 2.5 are calculated in accordance with OEB requirements for the filing of DSM plans. Therefore, the savings shown are only for the measures installed in 2017; they do not include the savings in 2017 that occur as a result of measures installed in prior years within the period.

Exhibit 2.5: Forecast Annual Achievable Program Costs[7], Savings[8] and TRC Benefits, by Scenario For Installations Completed in (only) 2017, 3 Sectors

Scenario	Forecast Achievable Program Costs and Savings, 2017				
	Annual Program Cost (millions $)	Gas Savings (million m^3/yr.)	TRC Benefits (million $)	Program Cost per Unit ($/$m^3$)	Program Cost per Unit ($/TRC$)
Residential (50% of Funding)					
$20M Annually	10.0	21.1	46.4	0.47	0.22
$40M Annually	20.0	27.0	47.2	0.74	0.42
$60M Annually	30.0	32.4	47.9	0.92	0.63
Financially Unconstrained	36.2	35.0	48.0	1.03	0.75
Commercial (30% of Funding)					
$20M Annually	6.0	48.9	168.1	0.12	0.04
$40M Annually	10.9	66.8	202.5	0.16	0.05
$60M Annually	10.9	66.8	202.5	*	*
Financially Unconstrained	10.9	66.8	202.5	*	*
Industrial (20% of Funding)					
$20M Annually	4.0	44.3	44.0	0.09	0.09
$40M Annually	4.4	48.0	44.3	0.09	0.10
$60M Annually	4.4	48.0	44.3	*	*
Financially Unconstrained	4.4	48.0	44.3	*	*
Total (3 Sectors)					
$20M Annually	20.0	114.3	258.5	0.18	0.08
$40M Annually	35.3	141.8	294.0	0.25	0.12
$60M Annually	45.3	147.3	294.7	**	**
Financially Unconstrained	51.5	149.8	294.8	**	**

** Based on the participation rates identified during the Achievable workshop results, all eligible measures are implemented at the program spending level shown.*
*** Values are not calculated as they are skewed by the Commercial and Industrial sector limits.*

2.2 OBSERVATIONS AND IMPLICATIONS

As illustrated in the preceding exhibits, despite a decade of successful DSM program implementation, there remains significant cost-effective DSM potential within Enbridge's service area. This remaining opportunity reflects, in part, continued technology cost and performance improvements over the period. Key study observations are highlighted below.

❑ Economic Potential

The study estimated economic potential savings to be approximately 3,188 million m^3 by 2017, which is approximately 26% relative to the Reference Case. This value is significantly larger than the value estimated in Enbridge's 2004 study; the change reflects a significant

[7] Program costs do not include salary and overhead costs.

[8] The savings shown in Exhibit 2.5 are only for the measures installed in 2017; they do not include the savings in 2017 that occur as a result of measures installed in prior years within the period.

increase in the Commercial sector savings opportunities, which is due to a combination of better information (that enabled better opportunity identification) and technology cost and performance improvements that widened the scope of technologies that passed the economic screen.

- **Achievable Potential Savings - Future Natural Gas Consumption**

Relative to the Reference Case forecast for 2017, the Achievable Potential savings range from about 1,375 million m^3 in the $20 million scenario to approximately 1,463 m^3 in the Financially Unconstrained scenario, which represent 43% and 46%, respectively, of the economic potential savings.

In the residential and commercial sectors, two related factors contribute to the gap between the economic and achievable potential results. First, many of the energy efficiency measures are applicable as existing equipment turns over or new facilities are constructed. This means that during the first few years when programs were deemed to be in the start-up phase, a significant number of lost opportunities occur. Secondly, the study period is relatively short; hence, both the amount of stock turn-over that occurs in the period and the number of years to achieve results is shortened.

- **Potential DSM Program TRC Benefits**

TRC benefits, annual program costs and natural gas savings identified in this study remain in the same orders of magnitude as Enbridge's recent experience, with a general trend towards increasing costs per unit of gas savings.

- Residential sector program costs identified in this study under the $20 million DSM scenario are $0.47/$m^3$ as shown in Exhibit 2.5. This compares with 2007 actual costs that were in the range of $0.32 (gross) to $0.51 per m^3 (net).[9] Residential program costs per unit of gas savings and TRC benefits are significantly greater than in either the Commercial or Industrial sectors. This is also consistent with recent Enbridge results.

- Commercial sector program costs identified in this study under the $20 million DSM scenario are $0.12/$m^3$ as shown in Exhibit 2.5. This compares with 2007 actual costs that were in the range of $0.14 (gross) to $0.11 per m^3 (net). Commercial sector program costs per dollar of TRC benefits are the lowest among the three sectors; however, the sector runs out of cost-effective measures before reaching the limits set within the $40 million or $60 million scenarios. This situation reflects the views of the achievable workshop participants who indicated that participation rates in this sector were limited by market barriers, such as supply chain capacity, split incentives etc., that were particularly challenging.

- Industrial sector program costs identified in this study under the $20 million DSM scenario are $0.09/$m^3$ as shown in Exhibit 2.5. This compares with 2007 actual costs that were in the range of $0.11 (gross) to $0.06 per m^3 (net). Industrial sector program costs are also much lower per unit of gas savings and TRC benefits than in the

[9] Enbridge, 2007 LRAM Post Audit Results.

Residential sector. However, as in the Commercial sector, the Industrial sector also runs out of cost-effective measures before reaching the limits set within the $40 million or $60 million scenarios.

- **Key Technologies and Measures**

In the Residential sector, the measures that provide the most significant contribution to annual savings differ somewhat by milestone year. Measures that offer particularly significant natural gas savings potential in both milestone years include air sealing in older homes, programmable thermostats, and high-performance windows. Measures such as ultra low-flow showerheads provide large savings in 2012 but not in 2017 as they are assumed to have fully penetrated the market by 2017.

In the Commercial sector, recommissioning represents the largest contribution to annual savings in both milestone years. Other measures that offer particularly significant natural gas savings potential in both milestone years include hot water conservation measures and efficient new construction.

In the Industrial sector, three measure bundles provide particularly attractive savings opportunities. They are: upgrading to more efficient boilers and heaters, such as condensing boilers and direct contact hot water heaters; retrofitting ovens, dryers, kilns and furnaces to improve efficiency, such as exhaust gas heat recovery, high efficiency burners, insulation and advanced heating and process controls; and, system wide integrated control systems.

- **Key Markets and Trends**

As the DSM market matures within Enbridge's service area, niche or target markets are becoming increasingly important. Measures that may not pass the TRC test in a "typical" or "average" application often will pass in niche applications. For example:

- Air sealing and insulation in older homes (built before 1980) is one example that was included in this study, as data were available. Similarly, additional domestic hot water measures may be feasible in homes with a larger number of occupants. For example, drain water heat recovery systems and DHW recirculation systems become more economically attractive with larger household sizes. These latter measures have not been included in the current results as suitable data were not available.

Similarly, the sector specific results presented in the following sections indicate that market transformation approaches warrant additional consideration, particularly in the Residential and Commercial sectors. Alternately, opportunities such as those listed below suggest that the composition of the TRC calculation itself may need to be revisited to better consider non-energy benefits. For example:

- In the Residential sector, the technology cost sensitivity analysis showed that there remains an additional untapped potential savings by 2017 of about 1,100 million m^3 from technically mature measures that do not currently pass the TRC screen. The largest share of these additional potential savings is from air sealing and envelope insulation in existing homes. These measures do not pass the TRC screen as currently defined.

However, they provide non-energy benefits such as increased comfort and reduced noise that are not currently captured in the TRC calculation. In addition, industry specialists emphasized that as insulation levels increase, proper air and moisture sealing is becoming increasingly essential to the long-term structural integrity of Ontario's housing stock. This situation presents both an opportunity and a possible technical issue that may be better addressed through a market transformation approach.

- In the Commercial sector, the technology cost sensitivity analysis showed that there remains an additional untapped potential savings by 2017 of about 269 million m^3 from technically mature measures that do not currently pass the TRC screen. The largest share of these additional potential savings are from air sealing and envelope upgrades, including wall insulation and more energy efficient glazing measures in existing buildings. These measures do not pass the TRC screen as currently defined. However, as in the residential sector, the measures provide non-energy benefits such as increased comfort and reduced noise that are not currently captured in the TRC calculation.

In addition, industry specialists emphasized that some emerging technologies, such as solar preheated make-up air may be better addressed in a market transformation context, as they provide "soft" benefits, such as visible contribution to corporate greening goals, which are not included in the TRC calculation.

3. RESIDENTIAL SECTOR

The Residential sector includes single-family detached homes, attached duplex, row and multi-family dwellings and apartments as well as a small number of other dwellings.

3.1 APPROACH

The detailed end-use analysis of energy efficiency opportunities in the Residential sector employed two linked modelling platforms: **HOT2000,** a commercially-supported residential building energy-use simulation software, and **RSEEM** (Residential Sector Energy End-use Model), a Marbek in-house spreadsheet-based macro model.

The major steps in the general approach to the study are outlined in Section 1.4 above (Approach). Specific procedures for the Residential sector were as follows:

- **Modelling of Base Year –** The consultants used the Enbridge customer data to break down the Residential sector by four factors:

  - Type of dwelling (single detached, attached, apartment, etc.)
  - Heating category (natural gas or electric heat)
  - The age of the building
  - Service region.

  To estimate the natural gas used for space heating, the consultants factored in building characteristics such as insulation levels, floor space and air tightness using a variety of data sources, including the Ontario Energuide for Houses database, Enbridge billing data, local climate data and discussions with local contractors. They also used the results of Enbridge customer surveys that provided data on type of heating system, number and age of household appliances, renovation activity, etc. Based on the available data sources, the consultants calculated an average natural gas use by end use for each dwelling type. The consultant’s models produced a close match with actual Enbridge sales data.

- **Reference Case Calculations -** For the Residential sector, the consultants developed profiles of new buildings for each type of dwelling. They estimated the growth in building stock using the same data as that contained in the Enbridge most recent load forecast and estimated the amount of natural gas used by both the existing building stock and the projected new buildings and appliances. As with the Base Year calibration, the consultants’ projection closely matches Enbridge’s own 2007 forecast of future Natural gas requirements.

- **Assessment of DSM Measures –** To estimate the economic and achievable energy savings potentials, the consultants assessed a wide range of commercially available energy efficiency measures and technologies such as:
  - Thermal upgrades to the walls, roofs and windows of existing buildings
  - More efficient space heating equipment and controls
  - Measures to reduce hot water usage
  - Improved designs for new buildings
  - Addition of solar thermal technologies.

3.2 RESIDENTIAL NATURAL GAS SAVINGS POTENTIAL

A summary of the levels of annual natural gas consumption and potential natural gas savings contained in each of the Residential sector forecasts addressed by the study are presented in Exhibits 3.1 to 3.3, and are discussed briefly in the sub sections that follows.

Exhibit 3.1: Graphic of Forecast Results for the Total Enbridge Service Area – Annual Natural Gas Consumption, Residential Sector (million m^3/yr.)

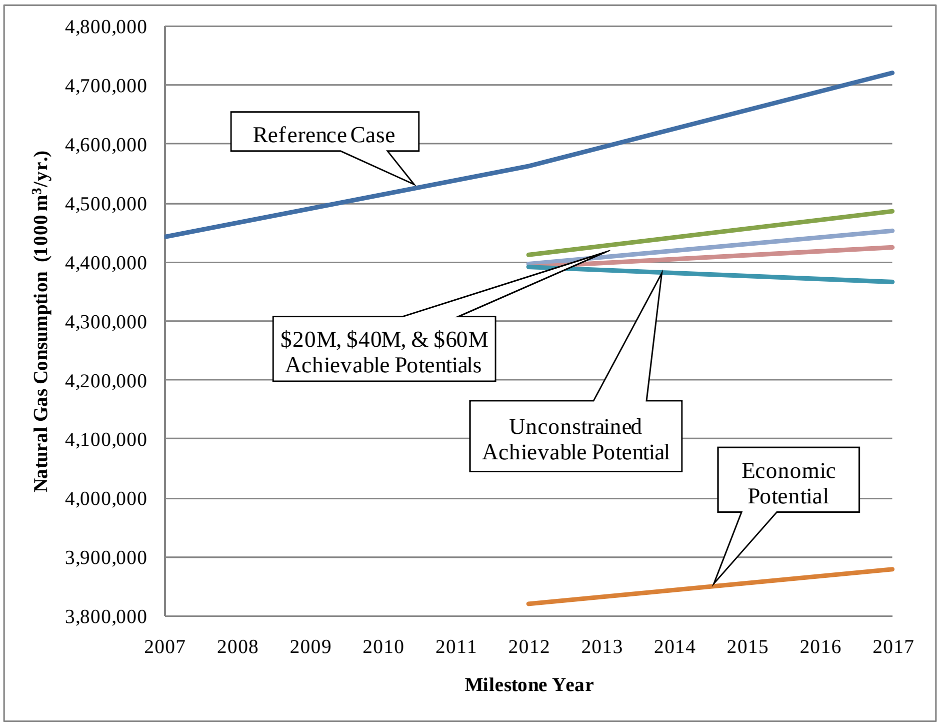


Exhibit 3.2: Summary of Forecast Results for the Total Enbridge Service Area – Annual Natural Gas Consumption, Residential Sector (million m^3/yr.)

Milestone Year	Annual Consumption in Residential Sector (million m^3/yr.)					
	Reference Case	Economic Potential	Achievable Potential			
			$20M Scenario	$40M Scenario	$60M Scenario	Financially Unconstrained
2007	4,442					
2012	4,563	3,820	4,413	4,399	4,392	4,392
2017	4,722	3,880	4,486	4,455	4,426	4,367

Exhibit 3.3: Summary of Forecast Results for the Total Enbridge Service Area – Natural Gas Savings in Milestone Years, Residential Sector (million m^3/yr. and % Relative to Economic Potential Scenario)

Milestone Year	Natural Gas Savings (million m^3/yr. Relative to Ref Case, % Relative to Economic Potential)				
	Economic Potential	Achievable Potential			
		$20M Scenario	$40M Scenario	$60M Scenario	Financially Unconstrained
2012	743	150	165	172	172
2017	842	237	268	296	355
2012		20%	22%	23%	23%
2017		28%	32%	35%	42%

Note**:** Natural gas savings in the milestone years represent the potential reduction in gas use in that year as a result of DSM measures implemented in the period.

3.3 BASE YEAR NATURAL GAS USE

In the Base Year of 2007, the Residential sector in Enbridge's total service area consumed about 4,442,437,000 m^3. Exhibit 3.4 shows that approximately 80% of the natural gas consumption in the residential sector occurs in the Single Family Detached dwellings, and of this amount, the pre-1980 vintage accounts for about 60%. The Duplex/Row/Multi category of housing accounts for approximately 11% of residential natural gas consumption, while Mobile/Other housing accounts for the remaining 9%.

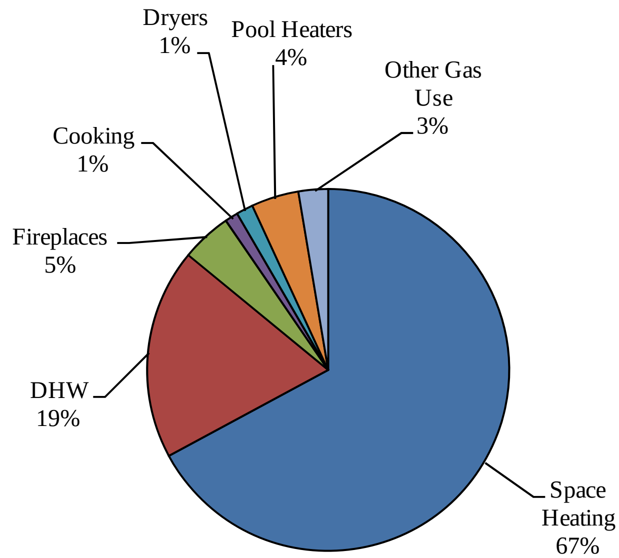
The Central Service region accounts for nearly 80% of the residential natural gas consumption in the Enbridge Gas Service Area.

Exhibit 3.4: Base Year Residential Sector Natural Gas Use for the Total Enbridge Service Area (1000 m^3/yr)

Segment	Space Heating	DHW	Fireplaces	Cooking	Dryers	Pool Heaters	Other Gas Use	Totals
	1000 m^3/yr.	1000 m^3/yr.	1000 m^3/yr.	1000 m^3/yr.	1000 m^3/yr.	1000 m^3/yr.	1000 m^3/yr.	1000 m^3/yr.
Detached - without gas space heat		16,301	6,310	998	1,326	4,602	2,274	31,812
Detached - pre-1980s	1,519,765	333,235	66,771	22,360	28,196	95,809	47,371	2,113,507
Detached - 1981 to 1993	387,972	133,595	37,598	7,401	10,165	52,379	18,177	647,287
Detached - 1993 to Present	431,296	155,765	64,147	10,478	13,958	35,210	21,556	732,409
Duplex/Row/Multi - no space htg		3,017	503	158	196		436	4,311
Duplex/Row/Multi - pre-1980s	243,499	53,418	4,672	2,996	3,553		7,711	315,849
Duplex/Row/Multi - 1980 or newer	160,787	64,827	10,058	3,383	4,249		9,068	252,372
Other	243,553	73,155	9,174	3,914	4,746		10,347	344,891
TOTAL	2,986,872	833,314	199,234	51,688	66,389	188,000	116,940	4,442,437

As illustrated in Exhibit 3.5 space heating accounts for about 67% of total residential natural gas use. Domestic hot water (DHW) accounts for about 19% of the total natural gas use, followed by fireplaces (5%) and pool heaters (4%). Dryers, cooking ranges and selected other uses, such as barbeques and patio heaters, account for the remaining natural gas consumption.

Exhibit 3.5: Base Year Residential Sector Natural Gas Use for the Total Enbridge Gas Service Area, by End Use



3.4 REFERENCE CASE

In the absence of new DSM initiatives, the study estimates that natural gas consumption in the Residential sector will grow from 4,442,437,000 m$^{3/}$yr in 2007 to about 4,772,205 m$^{3/}$yr in 2017. This represents an overall growth of about 7.4% in the period and compares very closely with Enbridge's own forecast, which also includes consideration of the impacts of "natural conservation."

Exhibit 3.6 (overleaf) shows the forecast levels of Residential sector natural gas consumption for the entire Enbridge service area. The results are presented for each milestone year and end use.

Exhibit 3.6: Residential Sector Reference Case Natural Gas Use for the Total Enbridge Service Area, by Dwelling Type, End use and Milestone Year (1000 m^3/yr)

Dwelling Type	Milestone Year	Residential							
		Total	Space Heating	DHW	Fireplaces	Cooking	Dryers	Pool Heaters	Other Gas Use
Detached - without gas space heat	2007	31,812	0	16,301	6,310	998	1,326	4,602	2,274
	2012	32,174	0	16,571	5,728	1,065	1,413	4,951	2,446
	2017	32,625	0	16,777	5,348	1,126	1,493	5,275	2,606
Detached - pre-1980s	2007	2,113,507	1,519,765	333,235	66,771	22,360	28,196	95,809	47,371
	2012	2,007,253	1,440,802	316,074	57,232	22,180	27,785	95,809	47,371
	2017	1,936,122	1,394,135	299,192	50,078	22,002	27,535	95,809	47,371
Detached - 1981 to 1993	2007	647,287	387,972	133,595	37,598	7,401	10,165	52,379	18,177
	2012	615,655	367,814	126,715	32,227	7,341	11,002	52,379	18,177
	2017	592,787	355,900	119,947	28,198	7,282	10,903	52,379	18,177
Detached - 1993 to Present	2007	732,409	431,296	155,765	64,147	10,478	13,958	35,210	21,556
	2012	885,149	521,900	190,506	68,062	13,545	17,018	45,972	28,147
	2017	1,018,378	595,486	222,344	73,340	16,389	20,576	55,971	34,271
Duplex/Row/Multi - no space htg	2007	4,311	0	3,017	503	158	196	0	436
	2012	5,317	0	3,739	540	207	254	0	577
	2017	6,507	0	4,577	609	263	322	0	736
Duplex/Row/Multi - pre-1980s	2007	315,849	243,499	53,418	4,672	2,996	3,553	0	7,711
	2012	299,608	230,848	50,667	4,005	2,972	3,406	0	7,711
	2017	288,870	223,371	47,961	3,504	2,948	3,376	0	7,711
Duplex/Row/Multi - 1980 or newer	2007	252,372	160,787	64,827	10,058	3,383	4,249	0	9,068
	2012	370,211	234,735	96,261	12,628	5,344	6,758	0	14,486
	2017	494,219	308,157	132,258	16,077	7,563	9,558	0	20,606
Other	2007	344,891	243,553	73,155	9,174	3,914	4,746	0	10,347
	2012	347,865	244,816	74,359	8,327	4,181	5,051	0	11,131
	2017	352,699	248,030	75,272	7,774	4,428	5,336	0	11,858
TOTAL	2007	4,442,437	2,986,872	833,314	199,234	51,688	66,389	188,000	116,940
	2012	4,563,233	3,040,914	874,892	188,748	56,835	72,687	199,111	130,046
	2017	4,722,205	3,125,079	918,328	184,928	62,000	79,099	209,434	143,337

3.5 ASSESSMENT OF ENERGY EFFICIENCY MEASURES

The study assessed a total of approximately 50 potential energy efficiency measures. A summary of the screening results for the energy-efficiency measures is presented in Exhibit 3.7. Due to the number of measures assessed, Exhibit 3.7 shows only the results for those options that pass the screen in the Central service region.

Exhibit 3.7: Summary of Measure TRC Screening Results Residential Sector Energy-efficiency Options – Central Region

Measure	Measure Description	Full/Incr.	Simple Payback (Years)	Measure TRC ($)	Benefit/Cost Ratio
Ceiling Insulation	Attached (Existing)	Full	7.5	$17	1.04
High-Performance Windows (ENERGY STAR®)	Single Detached (Existing)	Incr.	6.0	$148	1.30
High-Performance Windows (ENERGY STAR®)	Attached (Existing)	Incr.	4.1	$304	1.87
High-Performance Windows (ENERGY STAR®)	Single Detached (New)	Incr.	3.6	$371	2.24
High-Performance Windows (ENERGY STAR®)	Attached (New)	Incr.	2.4	$445	3.23
Super High-Performance Windows	Single Detached (Existing)	Incr.	7.7	$22	1.02
Super High-Performance Windows	Attached (Existing)	Incr.	6.5	$141	1.20
Super High-Performance Windows	Single Detached (New)	Incr.	5.4	$281	1.47
Super High-Performance Windows	Attached (New)	Incr.	3.6	$460	2.15
Air Sealing and Insulation (Old Homes)	Single Detached (Existing)	Full	7.5	$58	1.03
Air Sealing and Insulation (Old Homes)	Attached (Existing)	Full	7.4	$67	1.04
Programmable Thermostats	Single Detached (Existing)	Full	0.5	$502	11.04
Programmable Thermostats	Attached (Existing)	Full	0.6	$442	9.84
Programmable Thermostats	Single Detached (New)	Incr.	0.7	$359	8.18
Programmable Thermostats	Attached (New)	Incr.	0.8	$313	7.27
Solar Orphans Program	Single Detached (Existing)	Full	3.9	$47	1.09
Solar Orphans Program	Attached (Existing)	Full	4.1	$29	1.06
High-Efficiency Fireplaces	Single Detached (Existing)	Incr.	2.4	$133	2.33
High-Efficiency Fireplaces	Attached (Existing)	Incr.	3.3	$65	1.65
High-Efficiency Fireplaces	Single Detached (New)	Incr.	3.5	$56	1.56
High-Efficiency Fireplaces	Attached (New)	Incr.	5.0	$10	1.10
Solar Preheated Make-Up Air	Single Detached (Existing)	Full	5.5	$214	1.16
Solar Preheated Make-Up Air	Attached (Existing)	Full	6.1	$66	1.05
Ultra Low-Flow Showerheads	Single Detached (Existing)	Full	0.2	$246	17.38
Ultra Low-Flow Showerheads	Attached (Existing)	Full	0.3	$215	15.31
Ultra Low-Flow Showerheads	Single Detached (New)	Full	0.3	$230	16.36
Ultra Low-Flow Showerheads	Attached (New)	Full	0.3	$200	14.32
Hot Water Pipe Insulation	Single Detached (Existing)	Full	0.1	$47	48.12
Hot Water Pipe Insulation	Attached (Existing)	Full	0.1	$46	46.52
DHW Temperature Reduction	Single Detached (Existing)	Full	0.0	$27	N/A
DHW Temperature Reduction	Attached (Existing)	Full	0.0	$26	N/A
Efficient Top Loading Clothes Washers	Single Detached (Existing)	Incr.	2.4	$315	2.26
Efficient Top Loading Clothes Washers	Attached (Existing)	Incr.	2.6	$259	2.03
Efficient Top Loading Clothes Washers	Single Detached (New)	Incr.	2.5	$289	2.16
Efficient Top Loading Clothes Washers	Attached (New)	Incr.	2.8	$234	1.94
Efficient Dishwashers	Single Detached (Existing)	Incr.	1.4	$125	3.50
Efficient Dishwashers	Attached (Existing)	Incr.	1.5	$114	3.29

Measure	Measure Description	Full/Incr.	Simple Payback (Years)	Measure TRC ($)	Benefit/Cost Ratio
Efficient Dishwashers	Single Detached (New)	Incr.	1.5	$111	3.22
Efficient Dishwashers	Attached (New)	Incr.	1.6	$101	3.01
Efficient Front Loading Clothes Washers	Single Detached (Existing)	Incr.	4.2	$141	1.28
Efficient Front Loading Clothes Washers	Attached (Existing)	Incr.	4.6	$79	1.16
Efficient Front Loading Clothes Washers	Single Detached (New)	Incr.	4.4	$111	1.22
Efficient Front Loading Clothes Washers	Attached (New)	Incr.	4.9	$51	1.10
Swimming Pool Covers	Single Detached (Existing)	Full	2.6	$833	1.69
Swimming Pool Covers	Single Detached (New)	Full	2.6	$833	1.69
Solar Pool Heaters	Single Detached (Existing)	Full	1.8	$4,824	3.61
Solar Pool Heaters	Single Detached (New)	Full	1.8	$4,824	3.61

3.6 ECONOMIC POTENTIAL FORECAST

Under the conditions of the Economic Potential Forecast,[10] the study estimated that natural gas consumption in the Residential sector would decline to about 3,880 million $m^{3/}$yr by 2017 for the total Enbridge service area. Annual savings relative to the Reference Case are about 842 million $m^{3/}$yr by 2017, or about 18%. Further details are provided in Exhibits 3.8 and 3.9, which show the results for both milestone years by dwelling type and end use, respectively.

Exhibit 3.8: Natural Gas Savings for the Total Enbridge Service Area by Dwelling Type and Milestone Year, Reference Case vs. Economic Potential (1000 m^3/yr.)

Dwelling Type	Milestone Year 2012	Milestone Year 2017	% Savings 2017 Re: Ref Case	% Savings 2017 Re: Total
	1000 m^3/yr.	1000 m^3/yr.		
Detached - without gas space heat	7,861	9,463	29%	1%
Detached - pre-1980s	401,529	417,743	22%	50%
Detached - 1981 to 1993	89,071	98,928	17%	12%
Detached - 1993 to Present	117,434	155,442	15%	18%
Duplex/Row/Multi - no space htg	989	1,521	23%	0%
Duplex/Row/Multi - pre-1980s	52,851	55,330	19%	7%
Duplex/Row/Multi - 1980 or newer	45,322	67,309	14%	8%
Other	28,303	36,159	10%	4%
Total	743,361	841,895	18%	100%

Note: Any difference in totals is due to rounding.

[10] The level of natural gas consumption that would occur if all equipment and building envelopes were upgraded to the level that is cost-effective. In this study, "cost-effective" means that the technology upgrade passes the measure Total Resource Cost (TRC) test, as discussed previously in Section 1.4.

Exhibit 3.9: Natural Gas Savings for the Total Enbridge Service Area by End Use and Milestone Year, Reference Case vs. Economic Potential (1000 m^3/yr.)

End Use	Milestone Year		% Savings 2017	
	2012	2017	Re: Ref Case	Re: Total
	1000 m^3/yr.			
Space Heating	374,454	385,062	12%	46%
DHW	207,214	278,239	30%	33%
Fireplaces	5,413	9,805	5%	1%
Dryers	8,759	17,403	22%	2%
Pool Heaters	147,521	151,387	72%	18%
Total	743,361	841,895	18%	100%

Note: DHW savings include savings from reduced DHW consumption by efficient clothes washers and dishwashers. Any difference in totals is due to rounding.

3.6.1 Sensitivity Analysis

The Economic Potential results were subjected to a sensitivity analysis around two of the assumptions employed: Technology Cost and inclusion of a value for GHG emissions (as described in Step 5, in Section 1.4). The two sensitivity analyses offer the following insights:

- In the residential sector, there are a substantial number of measures that do not currently pass the economic screen but do offer substantial additional savings potential. Most of these measures provide improved thermal performance in existing dwellings.

  The Technology Cost sensitivity analysis identified potential savings of about 1,907 million m^3 in 2017; this compares with identified savings potential of about 734 million m^3 in 2017 under the Economic Potential forecast. Hence, the identified Technical savings potential is about a 2.6 times that identified in the Economic Potential forecast.

- The GHG adder makes a relatively small difference to the overall avoided cost of energy, and therefore, only a few additional measures pass the economic screen. Potential savings are increased by only a modest amount.

3.7 ACHIEVABLE POTENTIAL

As noted previously, Achievable Potential was assessed from two perspectives:

- Potential Savings in Future Natural Gas Consumption: Savings in one year due to the aggregate impact of measures implemented over the time period of Base Year (2007) to Milestone Year (2012 and 2017). This method calculates the net change in future natural gas supply requirements.

- Potential DSM Program TRC Benefits.[11] Savings due to (only) those measures implemented in one year. This method is used in calculation of the net TRC benefits.

Within each of the above perspectives, the analysis of Achievable Potential was assessed under four different Marketing scenarios:

- One Financially Unconstrained scenario
- Three Financially Constrained scenarios, each limited by a different level of program budget availability.

Further detail related to each of the Marketing scenarios is provided below followed by a summary of results.

3.7.1 Financially Unconstrained DSM Marketing Scenario

The Financially Unconstrained scenario provides an overview of the level of potential natural gas savings that could be achieved if a comprehensive portfolio of DSM programs was launched without any constraint on the availability of program funding, except for the requirement to maintain a positive TRC.

Although the results of this scenario are not constrained by program funding, the results do incorporate consideration of the market constraints identified during the Achievable Potential workshop, such as product and service availability and customer transaction costs.

This scenario, therefore, provides a high-level estimate of the upper level of natural gas savings that could be achieved by Enbridge's residential customers over the nine-year period beginning in 2009 and ending in 2017. It also provides Enbridge's residential DSM program personnel with a view of the relative potential contribution of individual sub sectors, end uses, technologies and service regions.

[11] The annual savings presented do not explicitly address the potential impact of free riders at the level of individual program measure. However, the Reference Case 3 does include an estimate of the impact of natural conservation over the study period, by end use (i.e., an estimate of natural gas savings that would occur in the absence of additional Enbridge DSM programs). Hence, the inclusion of natural conservation in the study's Reference Case does address some, but not necessarily all, free rider and spillover impacts. A more detailed assessment of free rider and spillover impacts is practical only as part of a detailed program design, which is beyond the scope of this study.

Major Assumptions: Financially Unconstrained Scenario

- All measures that pass the measure TRC screen are included
- No program financial limit is set, except that all measures must continue to pass the measure TRC screen
- Participation rates for each measure are based on the workshop results, which consider both market barriers and potential promotional strategies.

Exhibit 3.10 provides details on the program costs assumed for each measure.

Exhibit 3.10: Summary of Program Cost Assumptions, Financially Unconstrained Scenario[12]

Upgrade Technology/Measures	Fixed Program Costs ($/yr.)	Measure Basis	Measure Cost ($)[A]	Incentive Level (% of cost)	Payback After Incentive (yrs.)
High-Performance Windows	25,000	Incr.	500	100%	0.0
Super High-Performance Windows	25,000	Incr.	950	100%	0.0
Air Sealing and Insulation (Old Homes)	75,000	Full	2,000	45%	4.1
Attic/Ceiling Insulation		Full	600	45%	4.8
Programmable Thermostats	60,000	Full	50	36%	0.3
Solar Pre-Heated Make-Up Air	75,000	Full	1,300	75%	1.4
Ultra Low-Flow Showerheads	40,000	Full	15	100%	0.0
Efficient Dishwashers	30,000	Incr.	50	100%	0.0
Efficient Top Loading Clothes Washers		Incr.	250	40%	1.4
Efficient Front Loading Clothes Washers		Incr.	500	20%	3.3
DHW Temperature Reduction	50,000	Full	N/A	100%	0.0
Hot Water Pipe Insulation	1,000	Full	1	0%	0.1
High-Efficiency Fireplaces	50,000	Incr.	100	15%	2.0
Swimming Pool Covers	30,000	Full	1,200	5%	2.4
Solar Pool Heaters		Full	1,850	5%	1.7
Solar Orphans Program	20,000	Full	500	18%	3.2

[A] Where measure cost varies by region and/or housing type, the cost for existing single detached homes in the Central service region is shown

3.7.2 Financially Constrained DSM Marketing Scenarios

These DSM scenarios provide estimates of the potential impacts of increasingly larger annual DSM budgets that, as noted previously, were set at $20, $40 and $60 million annually. Within each of these budgets, 50% of the funding is allocated to the Residential sector for the purposes of this analysis; thus, the annual Residential sector budgets are $10, $20 and $30 million annually.

The Financially Constrained scenarios include the following DSM costs:

[12] Salary and related overhead costs are not included in program cost estimates. Also, the incentive levels are capped at 100% of the indicated measure cost.

- **Fixed Program Costs:** This includes costs for items such as newspaper advertisement, preparation of information and marketing materials, training workshops, contractor certifications, etc. These are program cost elements that would not be expected to vary significantly if the number of installations of the measure changed. Estimates for these cost items were provided by Enbridge personnel based on current and previous experience with similar DSM measures. In each case, these costs are expressed as dollars of program spending per year. Salary and related overhead costs are not included.

- **Incentive Costs:** These costs would include any costs that vary directly according to the number of installations of the measure. In each case, these costs are expressed as a percentage of the installed cost of the measure.

Exhibit 3.11 provides details on the program costs assumed for each measure.

Exhibit 3.11: Summary of Program Cost Assumptions, Financially Constrained Scenarios[13]

Upgrade Technology/Measures	Fixed Program Costs ($/yr.)	Measure Basis	Measure Cost ($)[A]	Incentive Level (% of cost)	Payback After Incentive (yrs.)
High-Performance Windows	25,000	Incr.	500	100%	0.0
Super High-Performance Windows	25,000	Incr.	950	100%	0.0
Air Sealing and Insulation (Old Homes)	75,000	Full	2,000	25%	5.6
Attic/Ceiling Insulation		Full	600	25%	6.5
Programmable Thermostats	60,000	Full	50	21%	0.4
Solar Pre-Heated Make-Up Air	75,000	Full	1,300	25%	4.1
Ultra Low-Flow Showerheads	40,000	Full	15	100%	0.0
Efficient Dishwashers	15,000	Incr.	50	100%	0.0
Efficient Top Loading Clothes Washers		Incr.	250	30%	1.6
Efficient Front Loading Clothes Washers		Incr.	500	15%	3.5
DHW Temperature Reduction	50,000	Full	N/A	100%	0.0
Hot Water Pipe Insulation	1,000	Full	1	0%	0.1
High-Efficiency Fireplaces	30,000	Incr.	100	10%	2.1
Swimming Pool Covers	10,000	Full	1,200	3%	2.5
Solar Pool Heaters		Full	1,850	3%	1.7
Solar Orphans Program	7,000	Full	500	18%	3.2

[A] Where measure cost varies by region and/or housing type, the cost for existing single detached homes in the Central service region is shown

[13] Salary and related overhead costs are not included in program cost estimates. Also, the incentive levels are capped at 100% of the indicated measure cost.

3.7.3 Achievable Potential Savings - Future Natural Gas Consumption[14]

Exhibits 3.12 to 3.14, inclusive, present a summary of the Achievable Potential savings in future natural gas consumption relative to the Reference Case levels. For illustration, the results of the Financially Unconstrained scenario are shown. Selected highlights are provided below.

- Exhibit 3.12 shows that total Residential sector natural gas savings in 2017 are estimated to be approximately 355 million m^3/yr. This represents a savings of approximately 8%, relative to the Reference Case and is equal to approximately 42% of the savings identified in the Economic Potential Forecast. The Central service region accounts for about 83% of the identified potential. In this scenario, the rate of introduction of full cost measures is limited by market constraints; as a result the potential savings in 2012 were estimated to be approximately 172 million m^3/yr., or about 23% of the savings identified in the Economic Potential Forecast, where full cost measures are introduced immediately.

- Exhibit 3.13 shows the results by dwelling type. As illustrated, single-family detached dwellings account for nearly 80% of the identified potential and over 60% of these potential savings are in dwellings built prior to 1980.

- Exhibit 3.14 shows the results by end use. As illustrated, measures that reduce space heating and domestic hot water loads account for approximately 87% of the identified potential, followed by pool heaters (10%), fireplaces (1%) and clothes dryers (1%). Additional detail on the specific measures that contribute to these end-use savings is provided in the following sections.

Exhibit 3.12: Natural Gas Savings by Service Region and Milestone Year, Financially Unconstrained Scenario (1000 m^3/yr.)

Milestone Year	Central Region	Eastern Region	Total	% Savings Relative to Ref Case
	1000 m^3/yr.			
2012	139,540	32,190	171,730	4%
2017	295,727	59,429	355,156	8%
% Savings 2017 Re: Reference Case	8%	6%	8%	
% Savings 2017 Re: Total	83%	17%	100%	

Note: Any difference in totals is due to rounding.

[14] See definition of savings as provided in Step 6, page 7.

Exhibit 3.13: Natural Gas Savings by Dwelling Type and Milestone Year for the Total Enbridge Service Area, Financially Unconstrained Scenario (1000 m^3/yr.)

Dwelling Type	Milestone Year		% Savings 2017	
	2012	2017	Re: Ref Case	Re: Total
	1000 m^3/yr.			
Detached - without gas space heat	1,953	3,377	10%	1%
Detached - pre-1980s	75,646	168,649	9%	47%
Detached - 1981 to 1993	21,456	38,739	7%	11%
Detached - 1993 to Present	34,633	67,577	7%	19%
Duplex/Row/Multi - no space htg	392	735	11%	0%
Duplex/Row/Multi - pre-1980s	10,222	22,395	8%	6%
Duplex/Row/Multi - 1980 or newer	16,649	34,500	7%	10%
Other	10,779	19,184	5%	5%
Total	171,730	355,156	8%	100%

Exhibit 3.14: Natural Gas Savings by End Use and Milestone Year for the Total Enbridge Service Area, Financially Unconstrained Scenario (1000 m^3/yr.)

End Use	Milestone Year		% Savings 2017	
	2012	2017	Re: Ref Case	Re: Total
	1000 m^3/yr.			
Space Heating	72,598	182,794	6%	51%
DHW	78,910	128,798	14%	36%
Fireplaces	1,497	3,931	2%	1%
Dryers	876	2,605	3%	1%
Pool Heaters	17,849	37,028	18%	10%
Total	171,730	355,156	8%	100%

Note: DHW savings include savings from reduced DHW consumption by efficient clothes washers and dishwashers. Any difference in totals is due to rounding.

3.7.4 Potential DSM Program TRC Benefits

Exhibits 3:15, 3.16 and 3.17 present the results for the milestone year 2017. As illustrated, annual Residential sector program spending of approximately $10 million in 2017 would result in the installation of measures providing approximately 21 million m^3/year in natural gas savings[15] and approximately $46 million in TRC net benefits. The exhibits also illustrate that even under the conditions defined by the Financially Unconstrained scenario, the Residential sector runs out of eligible cost-effective measures. Additional details are provided in the following exhibits.

- Exhibit 3.15 presents the 2017 results by upgrade technology or measure, including both the Current Marketing Level of customer participation and the increment from the Current Marketing Level to the Financially Unconstrained Marketing scenario. For each measure, annual natural gas savings potential, net TRC benefits and annual program costs are presented both individually and cumulatively. The measures are sorted in order of increasing program cost per dollar of TRC benefits. The 10

15 Note: the savings shown are only for the measures installed in 2017; they do not include the savings in 2017 that occur as a result of measures installed in prior periods.

measures contributing the most TRC benefits are assigned letters, matching the labels on Exhibits 3.14 and 3.15.

- Exhibit 3.16 presents the 2017 results graphically, with program costs on the vertical axis and net TRC benefits on the horizontal axis. All of the measures that pass the measure TRC screen are included here but balloons are added to indicate the location of the top ten measures (in terms of TRC benefits) on the curve. Three annual budget levels for residential program spending are shown as horizontal lines, for reference.

- Exhibit 3.17 presents the 2017 results graphically, with program costs on the vertical axis and annual natural gas savings potential on the horizontal axis. As with Exhibit 3.16, all of the measures which are included in the Achievable Potential analysis are shown here and balloons are added to indicate the positions of substantial measures on the curve. Sorting of the measures is based on program costs per unit TRC benefit.

Exhibit 3.15: Summary of 2017 Achievable Results** by Measure, for the Total Enbridge Service Area

Reference (Marked on Graphs)	Upgrade Technology/Measures	Scenario	Annual Natural Gas Savings Potential (1000 m^3/yr.)		Net TRC Benefits ($)		Annual Program Costs ($)		Program Costs per Unit	
				Cumulative		Cumulative		Cumulative	per Natural Gas Savings ($/$m^3$)	per TRC Benefits ($/$)
	DHW Temperature Reduction	F. Unconstrained	7	7	$ 11,550	$ 11,550	$ -	$ -	N/A	N/A
A	Hot Water Pipe Insulation	F. Unconstrained	217	224	$ 560,411	$ 571,961	$ -	$ -	N/A	N/A
B	Hot Water Pipe Insulation	CML	1055	1,278	$ 2,718,359	$ 3,290,319	$ 1,000	$ 1,000	0.00	0.00
C	Solar Pool Heaters	CML	1877	3,156	$ 4,345,334	$ 7,635,653	$ 67,109	$ 68,109	0.04	0.02
D	Programmable Thermostats	CML	6902	10,058	$ 18,841,740	$ 26,477,393	$ 488,114	$ 556,223	0.07	0.03
E	Solar Pool Heaters	F. Unconstrained	3349	13,407	$ 8,068,567	$ 34,545,960	$ 213,392	$ 769,615	0.06	0.03
	Swimming Pool Covers	CML	49	13,457	$ 46,707	$ 34,592,667	$ 2,327	$ 771,942	0.05	0.05
	Swimming Pool Covers	F. Unconstrained	46	13,503	$ 47,735	$ 34,640,402	$ 4,728	$ 776,670	0.10	0.10
F	Programmable Thermostats	F. Unconstrained	1330	14,832	$ 3,650,170	$ 38,290,572	$ 417,087	$ 1,193,757	0.31	0.11
G	Efficient Top-Loading Clothes Washers	CML	1479	16,311	$ 3,272,110	$ 41,562,682	$ 532,910	$ 1,726,667	0.36	0.16
	High-Efficiency Fireplaces	CML	295	16,606	$ 353,129	$ 41,915,811	$ 74,426	$ 1,801,093	0.25	0.21
H	Efficient Dishwashers	CML	516	17,122	$ 1,088,993	$ 43,004,804	$ 377,905	$ 2,178,998	0.73	0.35
	Efficient Front-Loading Clothes Washers	CML	20	17,141	$ 14,943	$ 43,019,748	$ 6,234	$ 2,185,231	0.32	0.42
	High-Efficiency Fireplaces	F. Unconstrained	99	17,240	$ 111,782	$ 43,131,530	$ 63,842	$ 2,249,073	0.65	0.57
I	High-Performance Windows	CML	1636	18,876	$ 2,710,391	$ 45,841,921	$ 3,857,171	$ 6,106,244	2.36	1.42
	Solar Pre-Heated Make-Up Air	CML	678	19,553	$ 213,677	$ 46,055,598	$ 570,731	$ 6,676,975	0.84	2.67
	DHW Temperature Reduction	CML	36	19,589	$ 13,228	$ 46,068,826	$ 50,000	$ 6,726,975	1.39	3.78
	Ceiling Insulation	CML	19	19,608	$ 2,396	$ 46,071,222	$ 18,349	$ 6,745,324	0.98	7.66
	Solar Pre-Heated Make-Up Air	F. Unconstrained	627	20,235	$ 266,655	$ 46,337,878	$ 2,367,268	$ 9,112,592	3.78	8.88
	Air Sealing and Insulation (Old Homes)	CML	1891	22,126	$ 173,806	$ 46,511,683	$ 1,875,989	$ 10,988,581	0.99	10.79
	Ceiling Insulation	F. Unconstrained	112	22,238	$ 18,751	$ 46,530,434	$ 204,098	$ 11,192,679	1.82	10.88
J	Air Sealing and Insulation (Old Homes)	F. Unconstrained	11328	33,566	$ 1,485,712	$ 48,016,146	$ 20,863,983	$ 32,056,662	1.84	14.04
	Solar Orphans Program	F. Unconstrained	81	33,646	$ 1,135	$ 48,017,281	$ 42,377	$ 32,099,039	0.53	37.33
	Solar Orphans Program	CML	50	33,697	$ 530	$ 48,017,812	$ 25,457	$ 32,124,496	0.51	47.99
	Super High-Performance Windows	CML	425	34,121	$ -	$ 48,017,812	$ 1,298,272	$ 33,422,768	3.06	N/A
	Super High-Performance Windows	F. Unconstrained	902	35,024	$ -	$ 48,017,812	$ 2,763,279	$ 36,186,046	3.06	N/A
					Weighted Average (@ $10M Spending)				0.47	0.22
					Weighted Average (@ $20M Spending)				0.74	0.42
					Weighted Average (Total)				1.03	0.75

** Savings shown are incremental to those for preceding measures.

Exhibit 3.16: Achievable Potential Supply Curve, 2017: Program Cost vs. TRC Net Benefits, for the Total Enbridge Service Area

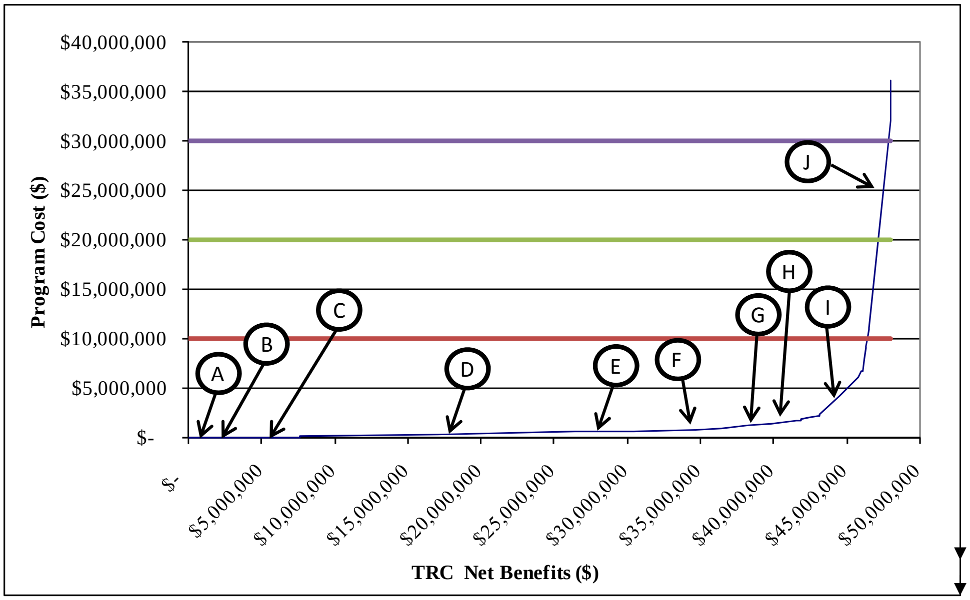
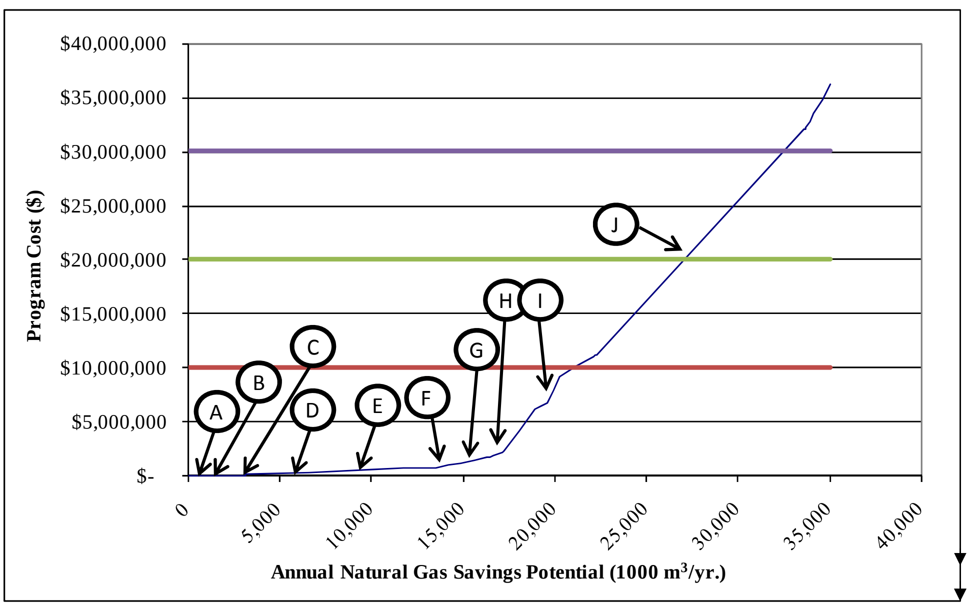


Exhibit 3.17: Achievable Potential Supply Curve, 2017: Program Cost vs. Annual Gross Natural Gas Savings Potential, for the Total Enbridge Service Area



3.7.5 Conclusions

Selected highlights are provided below.

- Program costs per dollar of TRC net benefits increase over the study period to 2017. This is because the measures with low installed cost are assumed to follow a more rapid adoption curve (Curve C, as described in the workshop), leaving more expensive measures to dominate the mixture in later years of the program.

- The supply curves show a sharp increase in program costs associated with capturing additional savings past an annual program spending of level of approximately $10 million on residential DSM.

- With residential program spending of approximately $10M in 2017, program costs are approximately $0.47 per gross m^3 of natural gas savings and $0.22 per dollar of gross TRC benefits. If residential program spending increases to $20M in the same year, program costs increase substantially to approximately $0.74 per gross m^3 of natural gas savings and $0.42 per dollar of gross TRC benefits. This compares with recent Enbridge monitoring and evaluation results[16] of $0.32 m^3 of gross natural gas savings ($0.51 per m^3 of net savings).

- The measures that provide the most significant contribution to annual savings differ somewhat by milestone year. Measures that offer particularly significant natural gas savings potential in both milestone years include air sealing in older homes, programmable thermostats, and high-performance windows. Measures such as ultra low-flow showerheads provide large savings in 2012 but not in 2017 as they are assumed to have fully penetrated the market by 2017.

- Although the weighted average program costs associated with each of the financially constrained scenarios will vary depending on the specific composition of future program portfolios[17], there is an evident trend towards higher future program costs to achieve natural gas savings and TRC benefits. This trend recognizes that savings from DSM programs tend to become more expensive with time as the most attractive measures gain greater market penetration and new performance standards are introduced, which leaves the more challenging measures.

[16] Enbridge, 2007 LRAM Post Audit Results.

[17] Design of a DSM program portfolio is beyond the scope of this current study.

3.8 ADDITIONAL OBSERVATIONS

Two additional observations warrant note as they may affect future residential program strategies. They include:

- ***Niche Markets Warrant Greater Program Focus:*** As the DSM market matures within Enbridge's service area, niche or target markets are becoming increasingly important. For example, measures that may not pass the TRC test in a "typical" or "average" application often will pass in niche applications. Air sealing and insulation in older homes (built before 1980) is one example that was included in this study, as data were available. Similarly, additional domestic hot water measures may be feasible in homes with a larger number of occupants. For example, drain water heat recovery systems and DHW recirculation systems become more economically attractive with larger household sizes. These latter measures have not been included in the current results as suitable data were not available.

- ***Market Transformation Approaches Warrant Additional Consideration***: The technology cost sensitivity analysis showed that there remains an additional untapped potential savings by 2017 of about 1,100 million m^3 from technically mature measures that do not currently pass the TRC screen. The largest share of these additional potential savings is from air sealing and envelope insulation in existing homes. These measures do not pass the TRC screen as currently defined. However, they provide non-energy benefits such as increased comfort and reduced noise that are not currently captured in the TRC calculation. Similarly, industry specialists emphasized that as insulation levels increase, proper air and moisture sealing is becoming increasingly essential to the long-term structural integrity of Ontario's housing stock. This situation presents both an opportunity and a possible technical issue that may be better addressed through a market transformation approach.

4. COMMERCIAL SECTOR

The Commercial sector includes office and retail buildings, hotels and motels, restaurants, warehouses and a wide variety of small buildings. In this study, it also includes buildings that are often classified as "institutional," such as hospitals and nursing homes, schools and universities.

Throughout this report, use of the word "commercial" includes both commercial and institutional buildings unless otherwise noted.

4.1 APPROACH

The detailed end-use analysis of energy efficiency opportunities in the Commercial sector employed two linked modelling platforms: **CEEAM** (Commercial Energy and Emissions Analysis Model), a Marbek in-house simulation model developed in conjunction with Natural Resources Canada (NRCan) for modelling natural gas use in commercial/institutional building stock, and **CSEEM** (Commercial Sector Energy End-use Model), an in-house spreadsheet-based macro model.

The major steps in the general approach to the study were outlined earlier in Section 1.4 (Approach). Specific procedures for the Commercial sector were as follows:

- **Modelling of Base Year –** Marbek compiled data that defines "where" and "how" natural gas is currently used in existing commercial buildings. The consultants then created building energy use simulations for each type of commercial building and calibrated the models to reflect actual Enbridge customer sales data. Estimated savings for the Other Commercial Buildings category were derived from the results of the modelled segments. They did not directly model that category because it is extremely diverse and the natural gas use of individual facility types is relatively small. The consultant's model produced a close match with actual Enbridge sales data.

- **Reference Case Calculations –** For the Commercial sector, Marbek developed detailed profiles of new buildings in each of the building segments, estimated the growth in building stock and estimated "natural" changes affecting Natural gas consumption over the study period. As with the Base Year calibration, the consultant's projection closely matches the Enbridge 2007 forecast of future natural gas requirements.

- **Assessment of DSM Measures** - To estimate the economic and achievable natural gas savings potentials, the consultants assessed a wide range of commercially available DSM measures and technologies such as:

  - Measures to improve building envelope efficiency
  - Measures to reduce domestic hot water use, including solar hot water systems
  - Upgraded heating and ventilating systems
  - Improved construction in new buildings
  - Efficient cooking appliances.

4.2 COMMERCIAL NATURAL GAS SAVINGS POTENTIAL

A summary of the levels of annual natural gas consumption and potential natural gas savings contained in each of the Commercial sector forecasts addressed by the study are presented in Exhibits 4.1 to 4.3 and discussed briefly in the sub sections that follow.

Exhibit 4.1: Graphic of Forecast Results for the Enbridge Service Area – Annual Natural Gas Consumption, Commercial Sector (million m^3/yr)

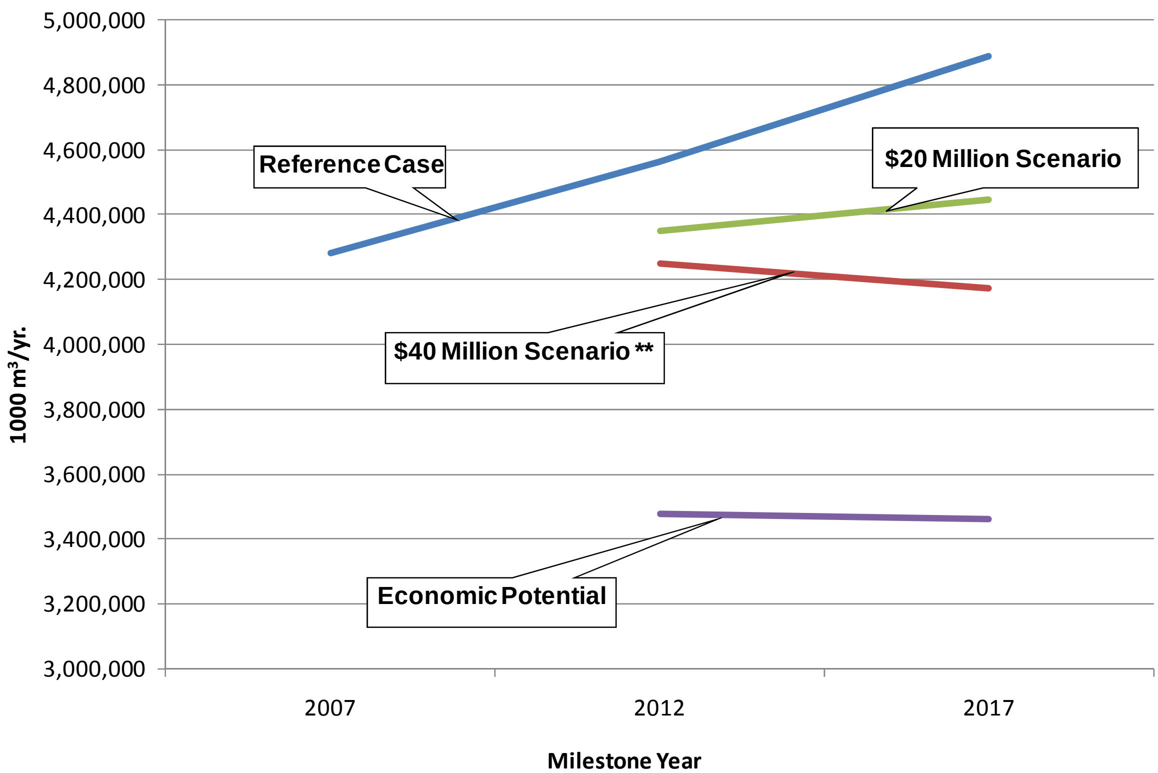


Exhibit 4.2: Summary of Forecast Results for the Total Enbridge Service Area - Annual Natural Gas Consumption, Commercial Sector (million m^3/yr)

Milestone Year	Annual Consumption in Commercial Sector (million m^3/yr.)					
	Reference Case	Economic Potential	Achievable Potential			
			$20M Scenario	$40M Scenario*	$60M Scenario	Financially Unconstrained
2007	4,281					
2012	4,561	3,479	4,350	4,251	**	4,251
2017	4,888	3,461	4,447	4,172	**	4,172

Note: Estimated annual program costs for implementing all cost-effective Commercial sector measures is $10.9 million, moderately less than the $12 million allocated to the commercial sector in the $40 million DSM scenario. Based on the Achievable workshop results, no additional savings were identified in the $60 million or Financially Unconstrained scenarios, while maintaining a positive TRC.

Exhibit 4.3: Summary of Forecast Results for the Total Enbridge Service Area – Achievable Natural Gas Savings in Milestone Years, Commercial Sector (million m³/yr. and % Relative to Economic Potential Scenario)

Milestone Year	Natural Gas Savings (million m³/yr., % Relative to Economic Potential)				
	Economic Potential	Achievable Potential			
		$20M Scenario	$40M Scenario*	$60M Scenario	Financially Unconstrained
2012	1,082	212	310	**	310
2017	1,427	440	715	**	715
2012		20%	29%	**	29%
2017		31%	50%	**	50%

Note**:** Natural gas savings in the milestone years represent the potential reduction in gas use in that year as a result of DSM measures implemented in the period. Based on the Achievable workshop results, no additional savings were identified in the $60 million or Financially Unconstrained scenarios, while maintaining a positive TRC.

4.3 BASE YEAR NATURAL GAS USE

In the Base Year of 2007, the Commercial sector in Enbridge's total service area consumed about 4,200,439,000 m³. The Central service region accounts for approximately 78% of the total commercial sector sales shown in Exhibit 4.4; the Eastern service region accounts for the remaining 22%.

Among the modelled sub sectors shown in Exhibit 4.4, high-rise apartments, mid-rise apartments and large offices are the three largest natural gas users.

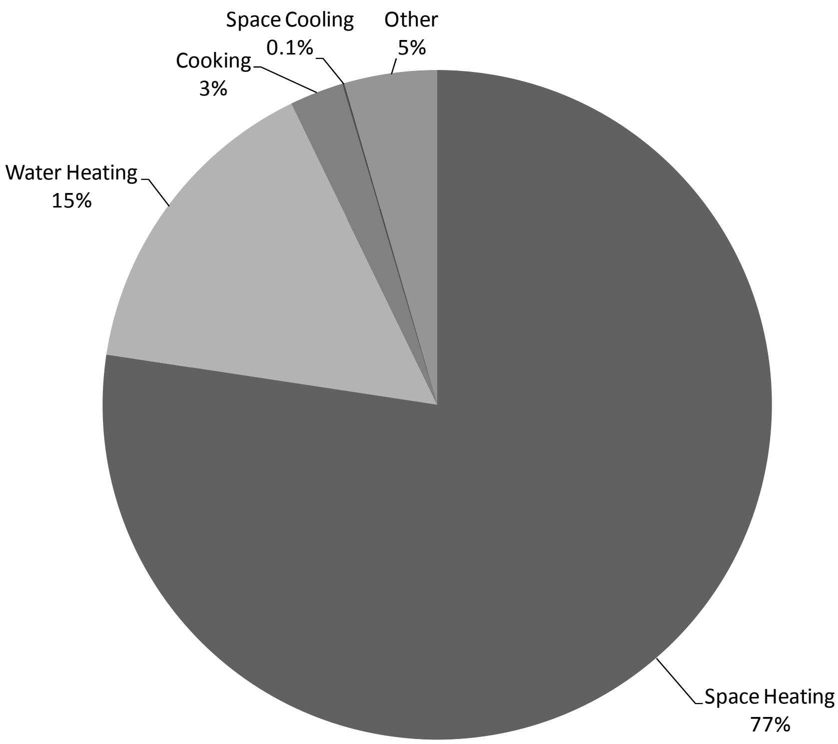
The Other Commercial Buildings sub sector, which is also a large natural gas user, includes buildings that do not fit into any of the remaining sub sectors listed in Exhibit 4.4. These include buildings used for recreational purposes, religious buildings, laundromats, gas stations/car washes, institutional buildings such as correctional facilities, and numerous other building types. Finally, the "Other" sub sector shown in Exhibit 4.4 includes Enbridge customer accounts with missing or unsubstantiated Standard Industrial Classification (SIC) code data. These accounts are classified as "not found" or are unlabelled in the Enbridge sales database.

Exhibit 4.4: Base Year Commercial Sector Natural Gas Use for the Total Enbridge Service Area (1000 m^3/yr)

Sub Sector	Space Heating	Water Heating	Cooking	Space Cooling	Other	Total
Large Office	326,437	34,368	1,431	1,695	53,675	417,606
Small Office	203,775	16,956	691	0	10,360	231,782
Strip Mall	122,794	11,696	5,322	0	6,652	146,464
Retail Services	133,496	8,610	4,366	0	5,458	151,930
Food Retail	62,786	6,173	4,151	0	865	73,975
Large Hotel	20,296	11,489	2,246	232	2,215	36,478
Hotel/Motel	4,239	3,638	97	0	730	8,705
Hospital	78,360	14,835	1,844	503	7,674	103,217
Nursing Home	26,511	8,913	1,993	0	2,835	40,252
School	115,427	7,666	1,789	0	844	125,725
University/College	111,654	15,488	3,742	973	7,128	138,985
Restaurant/Tavern	69,334	27,949	46,130	0	582	143,996
Warehouse/Wholesale	248,854	12,254	510	0	10,195	271,813
Highrise Apartment	578,820	195,990	2,575	0	20,597	797,981
Midrise Apartment	214,163	85,405	844	0	4,222	304,634
Other Commercial Buildings						250,838
Other						956,055
Total	2,316,948	461,429	77,731	3,403	134,034	4,200,439

Exhibit 4.5 shows that space heating accounts for about 77% of total commercial sector natural gas use. Domestic hot water (DHW) accounts for about 15% of the total natural gas use, followed by cooking (3%). A variety of other miscellaneous end uses accounts for the remaining natural gas consumption.

Exhibit 4.5: Base Year Commercial Sector Natural Gas Use for the Total Enbridge Service Area, by End Use[18]



4.4 REFERENCE CASE

In the absence of new DSM initiatives, the study estimates that natural gas consumption in the Commercial sector will grow from 4,200,439,000 $m^{3/}$yr in 2007 to about 4,795,278,000 $m^{3/}$yr in 2017. This represents an overall growth of about 14.2 % in the period and compares very closely with Enbridge's own forecast, which also includes consideration of the impacts of "natural conservation."

Exhibit 4.6 (overleaf) shows the forecast levels of Commercial sector natural gas consumption for the entire Enbridge service area. The results are presented for each milestone year and end use.

[18] The pie chart in Exhibit 4.5 presents percentage of gas consumption by end use for modelled buildings only; the sub sectors "Other Commercial Buildings" and "Other" are included in the total load of the preceding Exhibits, but not included in the pie chart.

Exhibit 4.6: Commercial Sector Reference Case Natural Gas Use for the Total Enbridge Service Area, by Building Type, End use and Milestone Year (1000m^3/yr)

Building Type	Milestone Year	Total	Space Heating	Water Heating	Cooking	Space Cooling	Other
Large Office	2007	417,606	326,437	34,368	1,431	1,695	53,675
	2012	448,243	351,297	37,481	1,617	1,695	56,153
	2017	485,213	381,295	41,238	1,841	1,695	59,143
Small Office	2007	231,782	203,775	16,956	691	0	10,360
	2012	248,787	218,283	18,450	782	0	11,273
	2017	269,334	235,813	20,254	892	0	12,375
Strip Mall	2007	146,464	122,794	11,696	5,322	0	6,652
	2012	157,209	131,547	12,702	5,760	0	7,200
	2017	170,125	142,068	13,911	6,287	0	7,859
Retail Services	2007	151,930	133,496	8,610	4,366	0	5,458
	2012	163,076	142,890	9,493	4,753	0	5,941
	2017	176,550	154,245	10,561	5,220	0	6,525
Food Retail	2007	73,975	62,786	6,173	4,151	0	865
	2012	79,403	67,234	6,713	4,515	0	941
	2017	85,958	72,606	7,365	4,955	0	1,032
Large Hotel	2007	36,478	20,296	11,489	2,246	232	2,215
	2012	39,154	21,465	12,625	2,399	232	2,433
	2017	42,419	22,891	14,011	2,585	232	2,700
Hotel/Motel	2007	8,705	4,239	3,638	97	0	730
	2012	9,343	4,562	3,908	105	0	768
	2017	10,108	4,949	4,231	114	0	814
Hospital	2007	103,217	78,360	14,835	1,844	503	7,674
	2012	110,789	83,801	16,268	2,005	544	8,171
	2017	119,980	90,405	18,007	2,201	593	8,774
Nursing Home	2007	40,252	26,511	8,913	1,993	0	2,835
	2012	43,206	28,499	9,571	2,140	0	2,996
	2017	46,727	30,869	10,355	2,315	0	3,188
School	2007	125,725	115,427	7,666	1,789	0	844
	2012	134,949	123,493	8,565	1,964	0	926
	2017	146,195	133,329	9,661	2,178	0	1,027
University/College	2007	138,985	111,654	15,488	3,742	973	7,128
	2012	149,181	119,911	16,697	4,043	973	7,558
	2017	161,417	129,818	18,148	4,404	973	8,074
Restaurant/Tavern	2007	143,996	69,334	27,949	46,130	0	582
	2012	154,560	74,095	30,167	49,671	0	627
	2017	167,192	79,788	32,819	53,904	0	681
Warehouse/Wholesale	2007	271,813	248,854	12,254	510	0	10,195
	2012	291,754	266,608	13,413	559	0	11,175
	2017	316,025	288,215	14,825	618	0	12,367
Highrise Apartment	2007	797,981	578,820	195,990	2,575	0	20,597
	2012	839,325	604,815	209,824	2,743	0	21,943
	2017	883,072	632,322	224,463	2,921	0	23,367
Midrise Apartment	2007	304,634	214,163	85,405	844	0	4,222
	2012	320,418	224,504	90,495	945	0	4,474
	2017	337,028	235,387	95,852	1,051	0	4,738
Other Commercial Buildings	2007	250,838					
	2012	267,272					
	2017	286,406					
Other	2007	956,055					
	2012	1,018,655					
	2017	1,091,528					
Total	2007	4,200,439	2,316,948	461,429	77,731	3,403	134,034
	2012	4,475,324	2,463,003	496,371	84,000	3,444	142,579
	2017	4,795,278	2,633,999	535,700	91,488	3,493	152,664

4.5 ASSESSMENT OF ENERGY EFFICIENCY MEASURES

The study assessed over 40 potential energy efficiency measures. A summary of the screening results for the energy-efficiency measures is presented in Exhibit 4.7. Due to the number of measures assessed, Exhibit 4.7 shows only the results for options in the Central service region.

Exhibit 4.7: Summary of Measure TRC Screening Results Commercial Sector Energy-efficiency Options – Central Region

Measure Name	Target Market			Simple Payback (Yrs)	B/C Ratio
	Sub Sector(s)	Vintage	Full/ Incr		
High-Performance Glazings	All	E	I	5.3	1.56
Super High-Performance Glazings	All	E	I	15.9	0.52
Wall Insulation	All	E	I	28.7	0.25
Roof Insulation	All	E	I	7.1	1.00
Air Sealing	All	E	F	3.5	0.92
Air Curtains	All	E	F	1.1	5.52
Condensing Boiler - Baseline: Standard Boiler - 1,500 FLE hours	All	E	I	5.0	1.58
Condensing Boiler - Baseline: Near-condensing - 1,500 FLE hours	All	E	I	7.6	1.04
Near Condensing Boiler - Baseline: Standard Boiler - 1,500 FLE hours	All	E	I	1.8	4.33
Condensing Unit heater - Baseline: Standard efficiency - 1,500 FLE hours	All	E	I	2.3	2.96
High-Efficiency Rooftop Unit - Baseline: Standard efficiency - 1,500 FLE hours	All	E	I	2.1	2.96
Condensing Rooftop Unit - Baseline: Standard efficiency - 1,500 FLE hours	All	E	I	4.8	1.28
Gas Absorption Heat Pump - Baseline: standard efficiency boiler - 1,500 FLE hours	All	E	I	2.7	2.29
Steam Plant Efficiency Measures	All	E	F	1.2	4.00
HVLS Destratification Fans	All	E	F	3.4	1.77
Heat Reflector Panels	All	E	F	3.2	2.10
Programmable Heating Controls	All	E	F	2.3	2.72
Heat Recovery	All	E	F	3.2	1.91
Demand Controlled Ventilation	All	E	F	1.5	2.87
Demand Control Kitchen Ventilation	All	E	F	1.8	3.69
Condensing Furnace	All	E	I	2.4	2.81
Ground Source Heat Pumps	All	E	I	24.6	0.61
Solar Preheated Make-up Air	All	E	F	11.5	0.62
Condensing Water Heater - Baseline: standard efficiency - 1,000 FLE hours	All	E	I	3.9	1.83
Condensing Storage Water Heater - Baseline: standard efficiency - 1,000 FLE hours	All	E	I	3.1	1.79
Tankless Water Heater - Baseline: standard efficiency - 1,000 FLE hours	All	E	I	5.5	1.19
Solar Weater Heating System - Baseline: standard efficiency - 1,000 FLE hours	All	E	F	19.1	0.33
Drainwater Heat Recovery - 10 minute shower, 3 times per day	All	E	I	9.2	0.70
Low-Flow Faucet Aerators - 3 min/day	All	E	F	0.4	9.53
Low-Flow Showerheads - 10 min/day	All	E	F	0.3	12.45
Pre-Rinse Spray Valve - 40 min/day	All	E	F	0.3	8.42
High-Efficiency Gas Griddle	All	E	I	5.1	0.87
High-Efficiency Gas Broiler	All	E	I	0.5	8.73
High-Efficiency Gas Oven	All	E	I	7.8	0.56
ENERGY STAR ® Fryer	All	E	I	3.7	1.18
High-Efficiency Gas Range Top	All	E	I	2.4	1.86
Building Recommissioning	All	E	F	0.7	3.31
Advanced Building Automation Systems	All	E	F	2.9	1.47
New Construction - 25% more efficient	All	N	I	3.9	1.78
New Construction - 40% more efficient	All	N	I	4.0	1.74

4.6 ECONOMIC POTENTIAL FORECAST

Under the conditions of the Economic Potential Forecast,[19] the study estimated that natural gas consumption in the Commercial sector would decline to about 3,461,000,000 $m^{3/}$yr by 2017 for the total Enbridge service area. Annual savings relative to the Reference Case are about 1,427,000,000 $m^{3/}$yr by 2017, or about 29%. Further details are provided in Exhibit 4.8, which show the results for both milestone years by sub sector and end use.

4.6.1 Sensitivity Analysis

The Economic Potential results were subjected to a sensitivity analysis around two of the assumptions employed: Technology Cost and inclusion of a value for GHG emissions (as described in Step 5, in Section 1.4). The two sensitivity analyses offer the following insights:

- In the commercial sector, there are relatively few measures that do not pass the economic screen (10 of a total of 40 evaluated measures). Moreover, the additional 10 measures included in the Technology Cost sensitivity analysis provide only modest additional savings relative to the technologies already included in the Economic Potential Forecast.

- The Technology Cost sensitivity analysis identified potential savings of about 1,680 million m^3 in 2017; this compares with identified savings potential of about 1,399 million m^3 in 2017 under the Economic Potential forecast. Hence, the identified Technical savings potential is about 20% greater than that identified in the Economic Potential forecast.

- The GHG adder makes a relatively small difference to the overall avoided cost of energy, and therefore, only one additional measure passes the economic screen. Potential savings are increased by about 2%.

[19] The level of natural gas consumption that would occur if all equipment and building envelopes were upgraded to the level that is cost-effective. In this study, “cost-effective” means that the technology upgrade passes the measure Total Resource Cost (TRC) test

Exhibit 4.8: Natural Gas Savings by Sub Sector, End Use and Milestone Year, Total Enbridge Service Region (1000 m^3/yr.)

Sub sector	Milestone Year	Total	Space Heating	Water Heating	Cooking	Space Cooling	Other
Large Office	2012	114,101	90,126	13,497	113	242	10,124
	2017	144,031	113,723	17,006	257	242	12,804
Small Office	2012	65,476	58,022	5,268	55	0	2,131
	2017	87,524	77,237	7,301	124	0	2,862
Strip Mall	2012	41,587	35,125	4,702	402	0	1,359
	2017	58,335	49,648	5,996	877	0	1,813
Retail Services	2012	40,488	35,764	3,280	331	0	1,113
	2017	55,442	49,157	4,069	728	0	1,488
Food Retail	2012	18,809	16,413	1,902	315	0	179
	2017	25,898	22,340	2,626	691	0	241
Large Hotel	2012	9,626	4,911	4,048	167	33	467
	2017	12,719	6,938	4,750	360	33	638
Hotel/Motel	2012	2,453	1,024	1,281	7	0	141
	2017	3,143	1,456	1,491	16	0	180
Hospital	2012	28,336	21,360	5,414	140	88	1,335
	2017	36,719	28,187	6,499	307	108	1,618
Nursing Home	2012	12,799	8,846	3,260	149	0	543
	2017	15,567	10,640	3,910	323	0	694
School	2012	29,841	26,668	2,865	137	0	171
	2017	41,314	37,273	3,509	304	0	229
University/College	2012	38,890	31,826	5,369	282	139	1,275
	2017	51,299	42,790	6,189	614	139	1,568
Restaurant/Tavern	2012	36,898	22,790	10,527	3,462	0	118
	2017	48,391	27,877	12,843	7,515	0	156
Warehouse/Wholesale	2012	81,106	75,090	3,815	39	0	2,162
	2017	106,741	98,392	5,306	86	0	2,957
High-rise Apartment	2012	213,867	139,707	69,916	191	0	4,052
	2017	281,577	194,612	81,357	407	0	5,201
Mid-rise Apartment	2012	83,772	51,533	31,358	66	0	815
	2017	110,115	71,733	37,202	146	0	1,033
Other Commercial Buildings	2012	51,397					
	2017	67,753					
Other	2012	212,473					
	2017	280,138					
Total	2012	1,081,920	619,206	166,503	5,855	501	25,983
	2017	1,426,706	832,003	200,055	12,755	521	33,482

4.7 ACHIEVABLE POTENTIAL

As noted previously, Achievable Potential was assessed from two perspectives: [20]

- Potential Savings in Future Natural Gas Consumption: Savings in one year due to the Aggregate impact of measures implemented over the time period of Base Year (2007) to Milestone Year (2012 and 2017). This method calculates the net change in future natural gas supply requirements.

- Potential DSM Program TRC Benefits. [21] Savings due to (only) those measures implemented in one year. This method is used in calculation of the net TRC benefits.

Within each of the above perspectives, the analysis of Achievable Potential was assessed under four different Marketing scenarios:

- One Financially Unconstrained scenario
- Three Financially Constrained scenarios, each limited by a different level of program budget availability.

Further detail related to each of the Marketing scenarios is provided below followed by a summary of results.

4.7.1 Financially Unconstrained DSM Marketing Scenario

The Financially Unconstrained scenario provides an overview of the level of potential natural gas savings that could be achieved if a comprehensive portfolio of DSM programs was launched without any constraint on the availability of program funding, except for the requirement to maintain a positive TRC.

Although the results of this scenario are not constrained by program funding, the results do incorporate consideration of the market constraints identified during the Achievable Potential workshop, such as product and service availability and customer transaction costs.

This scenario, therefore, provides a high-level estimate of the upper level of natural gas savings that could be achieved by Enbridge's commercial customers over the nine-year period beginning in 2009 and ending in 2017. It also provides Enbridge's DSM program personnel with a view of the relative potential contribution of individual sub sectors, end uses, technologies and service regions.

[20] See definition of savings as provided in Step 6, page 7.

[21] The annual savings presented do not explicitly address the potential impact of free riders at the level of individual program measure. However, the Reference Case 3 does include an estimate of the impact of natural conservation over the study period, by end use (i.e., an estimate of natural gas savings that would occur in the absence of additional Enbridge DSM programs). Hence, the inclusion of natural conservation in the study's Reference Case does address some, but not necessarily all, free rider and spillover impacts. A more detailed assessment of free rider and spillover impacts is practical only as part of a detailed program design, which is beyond the scope of this study.

Major Assumptions: Financially Unconstrained Scenario

- All measures that pass the measure TRC screen are included
- No program financial limit is set, except that all measures must continue to pass the measure TRC screen
- Participation rates for each measure are based on the workshop results, which consider both market barriers and potential promotional strategies.

Exhibit 4.9 provides details on the program costs assumed for each measure.

Exhibit 4.9: Summary of Program Cost Assumptions, Financially Unconstrained Scenario[22]

Measure Name	Fixed Program Costs per bundle ($/yr.)	Incentive Amount ($/$m^3$ saved)	Simple Payback After Incentive (yrs.)
High-Performance Glazings	$ 75,000	$ 0.332	4.6
Roof insulation		$ 0.332	6.4
Air Curtains	$ 14,000	$ 0.277	0.9
Condensing Boiler - Baseline: Standard Boiler	$ 60,000	$ 0.221	4.5
Condensing Boiler - Baseline: Near Condensing		$ 0.221	7.1
Near-Condensing Boiler		$ 0.221	1.3
Condensing Unit Heater	$ 60,000	$ 0.332	1.6
High-Efficiency Rooftop Unit		$ 0.277	1.5
Condensing Furnace		$ 0.221	1.9
Demand Controlled Ventilation	$ 70,000	$ 0.332	0.8
Demand Control Kitchen Ventilation		$ 0.508	1.1
Heat Recovery		$ 0.332	2.5
Condensing Water Heater	$ 40,000	$ 0.332	3.3
Condensing Storage Water Heater		$ 0.332	2.4
Low-Flow Faucet Aerators	$ 2,500	$ 0.042	0.4
Low-Flow Showerheads		$ 0.042	0.3
Pre-Rinse Spray Valve	$ 40,000	$ 0.300	0.1
High-Efficiency Broiler	$ 40,000	$ 0.332	-0.2
ENERGY STAR® Fryer		$ 0.332	3.0
High-Efficiency Range		$ 0.332	1.7
Building Recommissioning	$ 600,000	$ 0.249	0.6
Advanced Building Automation Systems		$ 0.249	2.7
Steam Plant Efficiency Measures		$ 0.249	0.7
HVLS Destratification Fans	$ 20,000	$ 0.332	2.7
New Construction - 25% More Efficient	$ 735,000	$ 0.159	3.8
New Construction - 40% More Efficient		$ 0.159	3.9

[22] Salary and related overhead costs are not included in program cost estimates. Also, the incentive levels are capped at 100% of the indicated measure cost.

4.7.2 Financially Constrained DSM Marketing Scenarios

These DSM scenarios provide estimates of the potential impacts of increasingly larger annual DSM budgets, which as noted previously were set at $20, $40 and $60 million, annually. Within each of these budgets, 30% of the funding is allocated to the Commercial sector for the purposes of this analysis.

The financially constrained scenarios include the following DSM costs:

- **Fixed Program Costs**: This includes costs for items such as newspaper advertisements, preparation of information and marketing materials, training workshops, contractor certifications, etc. These program cost elements are not expected to vary significantly if the number of installations of the measure changed. Estimates for these cost items were provided by Enbridge personnel, based on current and previous experience with similar DSM measures. In each case, these costs are expressed as dollars of program spending per year. For each of the measures, fixed program costs were estimated for both the CML and Financially Unconstrained Marketing scenarios. Salary and related overhead costs are not included.

- **Incentive Costs**: These costs would include any costs that vary directly according to the number of installations of the measure. Incentive amounts vary by measure and are expressed as dollars per m^3 gas saved.

Exhibit 4.10 provides details on the program costs assumed for each measure.

Exhibit 4.10: Summary of Program Cost Assumptions, CML Scenario[23]

Measure Name	Fixed Program Costs per bundle ($/yr.)	Incentive Amount ($/m^3 saved)	Simple Payback After Incentive (yrs.)
High-Performance Glazings	$ 50,000	$ 0.100	5.1
Roof Insulation		$ 0.100	6.9
Air Curtains	$ 7,000	$ 0.100	1.0
Condensing Boiler - Baseline: Standard Boiler	$ 40,000	$ 0.100	4.7
Condensing Boiler - Baseline: Near Condensing		$ 0.100	7.3
Near-Condensing Boiler		$ 0.100	1.6
Condensing Unit Heater	$ 40,000	$ 0.100	2.1
High-Efficiency Rooftop Unit		$ 0.100	1.9
Condensing Furnace		$ 0.100	2.2
Demand Controlled Ventilation	$ 35,000	$ 0.100	1.3
Demand Control Kitchen Ventilation		$ 0.152	1.6
Heat Recovery		$ 0.100	3.0
Condensing Water Heater	$ 20,000	$ 0.100	3.7
Condensing Storage Water Heater		$ 0.100	2.9
Low-Flow Faucet Aerators	$ 1,000	$ 0.025	0.4
Low-Flow Showerheads		$ 0.025	0.3
Pre-Rinse Spray Valve	$ 20,000	$ 0.120	0.2
High-Efficiency Broiler	$ 20,000	$ 0.100	0.3
ENERGY STAR® Fryer		$ 0.100	3.5
High-Efficiency Range		$ 0.100	2.1
Building Recommissioning	$ 400,000	$ 0.100	0.7
Advanced Building Automation Systems		$ 0.100	2.8
Steam Plant Efficiency Measures		$ 0.100	1.0
HVLS Destratification Fans	$ 10,000	$ 0.100	3.2
New Construction - 25% More Efficient	$ 490,000	$ 0.064	3.8
New Construction - 40% More Efficient		$ 0.064	3.9

23 Salary and related overhead costs are not included in program cost estimates. Also, the incentive levels are capped at 100% of the indicated measure cost.

4.7.3 Achievable Potential Savings – Future Natural Gas Consumption

Exhibits 4.11 and 4.12 present a summary of the Achievable Potential savings in future natural gas consumption relative to the Reference Case levels. For illustration, the results of the Financially Unconstrained scenario are shown. Selected highlights are provided below.

- Exhibit 4.11 shows that total Commercial sector natural gas savings in 2017 are estimated to be approximately 715 million m^3/yr. This represents a savings of approximately 15%, relative to the Reference Case and is equal to approximately 50% of the savings identified in the Economic Potential Forecast. The Central service region accounts for about 81% of the identified potential.

- Exhibit 4.12 shows the results by sub sector and end use for the Enbridge Service Area. As illustrated, the majority of savings are associated with the space heating end use (74%), while three sub sectors (High-rise Apartment, Other Buildings and Large Office) account for nearly 50% of total savings under this scenario.

Exhibit 4.11: Natural Gas Savings by Service Region and Milestone Year, Financially Unconstrained Scenario (1000 m^3/yr.)

Milestone Year	Central service region	Eastern service region	Total	% Savings Relative to Ref Case
	(1000 m^3/yr.)			
2012	251,047	59,149	310,196	7%
2017	580,405	135,008	715,414	15%
% Savings 2017 Re: Reference Case	14%	15%	15%	
% Savings 2017 Re: Total	81%	19%	100%	

Exhibit 4.12: Natural Gas Savings by End Use and Milestone Year for the Total Enbridge Service Area, Financially Unconstrained Scenario (1000 m^3/yr.)

Sub sector	Milestone Year	Total	Space Heating	Water Heating	Cooking	Space Cooling	Other
Large Office	2012	34,632	27,494	4,150	38	80	2,869
	2017	77,260	61,159	9,291	139	163	6,508
Small Office	2012	16,742	14,716	1,480	18	0	528
	2017	38,979	34,105	3,552	66	0	1,256
Strip Mall	2012	9,639	7,945	1,252	133	0	310
	2017	23,734	19,625	2,896	462	0	751
Retail Services	2012	11,390	9,977	994	112	0	306
	2017	26,898	23,579	2,203	392	0	725
Food Retail	2012	5,404	4,659	582	115	0	49
	2017	12,779	10,884	1,378	402	0	116
Large Hotel	2012	2,815	1,387	1,238	53	11	126
	2017	6,510	3,332	2,672	181	22	302
Hotel/Motel	2012	668	265	364	2	0	36
	2017	1,524	641	793	9	0	82
Hospital	2012	8,811	6,449	1,831	53	29	449
	2017	20,450	15,204	3,975	185	66	1,020
Nursing Home	2012	3,833	2,637	999	48	0	148
	2017	8,430	5,722	2,199	167	0	342
School	2012	9,564	8,507	956	50	0	52
	2017	22,720	20,328	2,092	177	0	123
University/College	2012	12,006	9,597	1,852	95	51	412
	2017	27,617	22,293	3,966	328	103	926
Restaurant/Tavern	2012	10,386	6,056	3,140	1,161	0	30
	2017	24,479	13,326	7,068	4,015	0	71
Warehouse/Wholesale	2012	20,479	19,002	983	13	0	480
	2017	47,430	43,809	2,400	45	0	1,175
High-rise Apartment	2012	62,916	39,869	21,853	64	0	1,131
	2017	144,451	94,195	47,459	217	0	2,580
Mid-rise Apartment	2012	24,969	14,521	10,197	22	0	228
	2017	57,094	34,105	22,393	79	0	517
Other Commercial Buildings	2012	14,832					
	2017	34,177					
Other	2012	61,111					
	2017	140,882					
Total	2012	310,196	173,080	51,870	1,979	171	7,153
	2017	715,414	402,307	114,336	6,865	355	16,492

4.7.4 Potential DSM Program TRC Benefits

Exhibits 4.13, 4.14 and 4.15 present the results for the milestone year 2017. As illustrated, annual Commercial sector program spending of approximately $10.4 million in 2017 is estimated to result in the installation of measures providing approximately 67 million m^3/year in natural gas savings[24] and approximately $203 million in TRC net benefits. The exhibits also show that annual commercial program spending achieves maximum results at expenditures of $10.4 million in 2012 and $10.9 million in 2017, which is below the allowable Commercial sector program budget of $12 million. This is because additional cost-effective measures were not available while also maintaining a positive TRC. Additional details are provided in the following exhibits.

- Exhibit 4.13 presents the 2017 results by upgrade technology bundle, including both the current marketing level of participation and the increment from CML to financially unconstrained. For each measure bundle, annual natural gas savings potential, net TRC benefits and annual program costs are presented both individually and cumulatively. The measures are sorted in order of increasing program cost per dollar of TRC benefits. The six measure bundles contributing the most TRC benefits are assigned letters, matching the labels on Exhibits 4.13 and 4.14.

- Exhibit 4.14 presents the 2017 results graphically, with program costs on the vertical axis and net TRC benefits on the horizontal axis. The $6 million annual budget level for commercial program spending is shown as a horizontal line for reference.

- Exhibit 4.15 presents the 2017 results graphically, with program costs on the vertical axis and annual natural gas savings potential on the horizontal axis. The $6 million annual budget level for commercial program spending is shown as a horizontal line for reference.

[24] Note: the savings shown are only for the measures installed in 2017; they do not include the savings in 2017 that occur as a result of measures installed in prior periods.

Exhibit 4.13: Summary Achievable Results** by Measure, for the Enbridge Service Area, 2017 Installations

Reference (Marked on Graphs)	Upgrade Technology/Measures	Scenario	Annual Natural Gas Savings Potential (1000 m^3/yr.)		TRC ($)		Annual Program Costs ($)		Program Costs per Unit	
				Cumulative		Cumulative		Cumulative	per Natural Gas Savings ($/$m^3$)	per TRC Benefits ($/$)
A	DHW - Conservation Measures	CML	8,012	8,012	$ 25,087,338	$ 25,087,338	$ 270,758	$ 270,758	$ 0.034	$ 0.011
B	DHW - Conservation Measures	Aggressive	3,923	11,935	$ 12,269,293	$ 37,356,631	$ 250,043	$ 520,801	$ 0.064	$ 0.020
C	New construction - 40% Better	CML	3,316	15,251	$ 23,953,898	$ 61,310,529	$ 692,096	$ 1,212,896	$ 0.209	$ 0.029
D	New construction - 40% Better	Aggressive	3,131	18,382	$ 22,801,127	$ 84,111,655	$ 760,595	$ 1,973,491	$ 0.243	$ 0.033
E	Space Heating / Other - Recommissioning	CML	21,322	39,704	$ 64,963,918	$ 149,075,574	$ 2,523,683	$ 4,497,174	$ 0.118	$ 0.039
	Space Heating - Ventilation Measures - Heat Recovery	CML	3,149	42,853	$ 5,563,440	$ 154,639,013	$ 363,926	$ 4,861,100	$ 0.116	$ 0.065
	Space Heating - Equipment	CML	3,311	46,164	$ 5,160,942	$ 159,799,955	$ 409,752	$ 5,270,852	$ 0.124	$ 0.079
F	Space Heating / Other - Recommissioning	Aggressive	10,260	56,424	$ 31,251,590	$ 191,051,545	$ 2,754,864	$ 8,025,716	$ 0.268	$ 0.088
	DHW - Equipment Measures	CML	1,391	57,815	$ 1,788,785	$ 192,840,330	$ 158,547	$ 8,184,264	$ 0.114	$ 0.089
	Space Heating - Envelope measures (Conductive)	CML	854	58,670	$ 769,917	$ 193,610,246	$ 135,106	$ 8,319,370	$ 0.158	$ 0.175
	Space Heating - Ventilation Measures - Heat Recovery	Aggressive	2,863	61,533	$ 5,053,834	$ 198,664,080	$ 1,031,819	$ 9,351,189	$ 0.360	$ 0.204
	Space Heating - Envelope measures (Mass transfer)	CML	1,056	62,588	$ 479,097	$ 199,143,177	$ 112,141	$ 9,463,330	$ 0.106	$ 0.234
	Space Heating - Envelope measures (Conductive)	Aggressive	2,975	65,564	$ 2,878,361	$ 202,021,539	$ 1,012,833	$ 10,476,162	$ 0.340	$ 0.352
	Space Heating - Envelope measures (Mass transfer)	Aggressive	1,116	66,679	$ 506,902	$ 202,528,440	$ 316,304	$ 10,792,467	$ 0.283	$ 0.624
	Efficient Food Service Equipment	CML	33	66,713	$ 13,068	$ 202,541,509	$ 13,309	$ 10,805,775	$ 0.401	$ 1.018
	Efficient Food Service Equipment	Aggressive	57	66,770	$ 5,767	$ 202,547,275	$ 49,068	$ 10,854,843	$ 0.854	$ 8.509
								Weighted Average (@ $6M spending):	$ 0.114	$ 0.032
								Weighted Average (all measures):	$ 0.163	$ 0.054

** Savings shown are incremental to those for preceding measures.

Exhibit 4.14: Achievable Potential Supply Curve, 2017 Installations: Program Cost vs. TRC Net Benefits, for the Enbridge Service Area

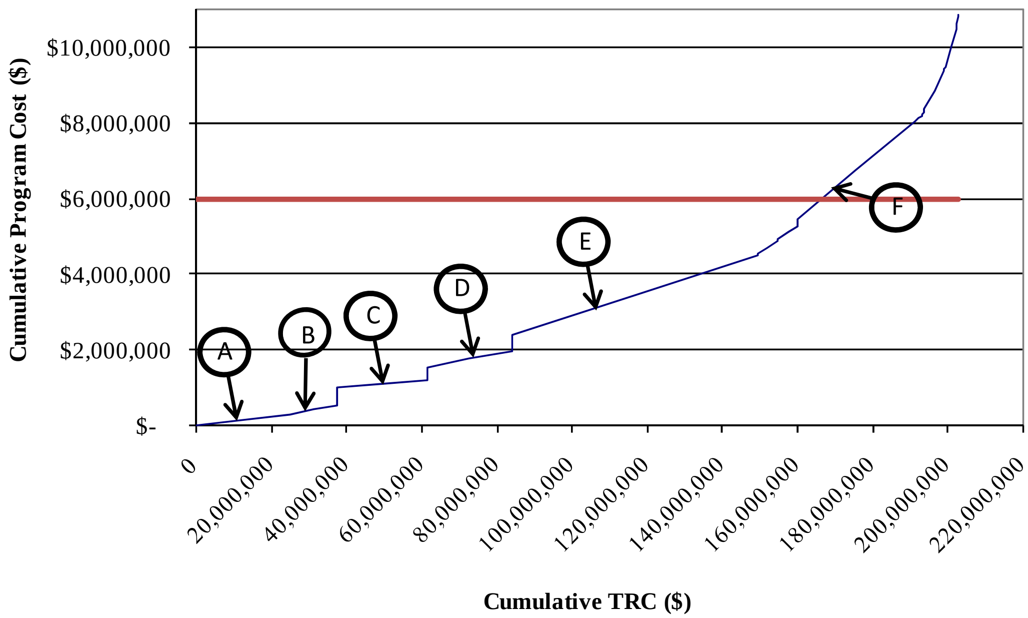
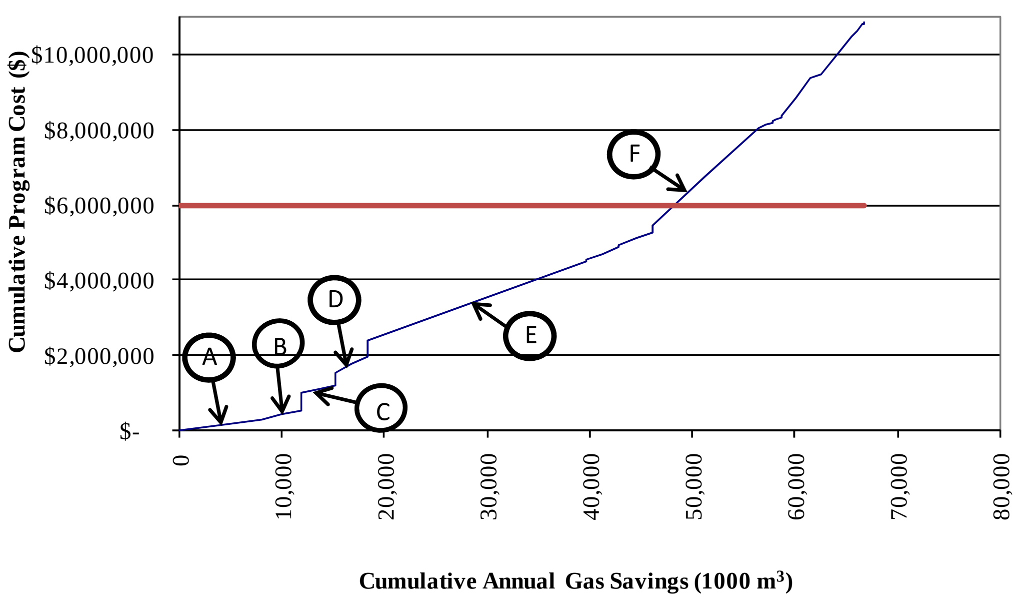


Exhibit 4.15: Achievable Potential Supply Curve, 2017 Installations: Program Cost vs. Annual Natural Gas Savings Potential, for the Enbridge Service Area



4.7.5 Conclusions

Selected highlights are provided below.

- Annual commercial program spending achieves maximum results at expenditures of $10.4 million in 2012 and $10.9 million in 2017, which is below the allowable commercial budget of $12 million. This is because additional cost-effective measures were not available under the conditions defined by this scenario.

- Program costs per dollar of TRC net benefits increase over the study period. This is primarily due to the fact that recommissioning, the largest commercial opportunity, is slightly more expensive on a cost per TRC dollar basis in 2017 than 2012. This reflects a situation in which fixed costs remain constant through time, while yearly savings levels decrease as the most attractive opportunities are realized by the earlier milestone year.

- With commercial program spending of approximately $10.4 million in 2017, program costs are approximately $0.16 per m^3 of natural gas savings and $0.05 per dollar of TRC benefits. This compares with recent Enbridge monitoring and evaluation results[25] of $0.11 per m^3 of gross natural gas savings ($0.14 m^3 net of free riders) in 2007.

- For two measure groups (space heating equipment and water heating equipment), savings for the year 2017 are greater under the Financially Constrained scenarios than under the Financially Unconstrained scenario. This reflects a situation in which the majority of the opportunity is realized in early years under the Financially Unconstrained scenario, while savings “ramp up” slowly under the Financially Constrained scenarios.

- Recommissioning represents the largest contribution to annual savings in both milestone years. Other measures that offer particularly significant natural gas savings potential in both milestone years include hot water conservation measures and efficient new construction.

[25] Enbridge Gas, 2007 LRAM Post Audit Results.

4.8 ADDITIONAL OBSERVATIONS

In addition to the preceding conclusions, three additional observations warrant note as they may affect future Commercial sector program strategies. They include:

- ***Rate of measure implementation has a large effect on overall savings:*** For measures that pass the TRC screen on an incremental cost basis, low participation rates in early milestone years create a significant "lost opportunity." This is particularly relevant to the replacement of equipment with a very long life (i.e. space heating equipment), building renovations such as envelope improvements, and new building construction. The gap between Economic Potential and Achievable Potential savings presented in this study is due in large part to this significant lost opportunity that occurs in early milestone years.

- ***Savings arising from full cost measures may be delayed without eroding overall potential:*** This is a corollary of the above point, and most pertinent to the discussion of the largest opportunity identified in this study, recommissioning. As recommissioning passes the TRC screen at full cost, eligible buildings which are not recommissioned remains as future opportunities, while incremental cost opportunities which are not exploited represent lost opportunities. This may be especially relevant to programming strategy during periods of economic downturn, when building owners and managers may be less likely to implement measures despite an attractive payback.

- ***Market transformation approaches warrant additional consideration:*** The technology cost sensitivity analysis showed that there remains an additional untapped potential savings by 2017 of about 269 million m^3 from technically mature measures that do not currently pass the TRC screen. The largest share of these additional potential savings are from air sealing and envelope upgrades, including wall insulation and more energy efficient glazing measures in existing buildings. These measures do not pass the TRC screen as currently defined. However, they provide non-energy benefits such as increased comfort and reduced noise that are not currently captured in the TRC calculation. In addition, industry specialists emphasized that some emerging technologies, such as solar preheated make-up air may be better addressed in a market transformation context, as they provide "soft" benefits, such as visible contribution to corporate greening goals, that are not included in the TRC calculation.

5. INDUSTRIAL SECTOR

The Industrial sector consists of the seven largest natural gas consuming industries within the Enbridge service area plus an additional miscellaneous category that combines eight smaller industry groups. The seven large industries, which are the primary focus of this study, are: Non-metallic Mineral Products, Food Products, Paper Manufacturing, Refined Petroleum and Coal, Chemical Manufacturing, Primary Metals and Fabricated Metals.

5.1 APPROACH

The detailed end-use analysis of energy efficiency opportunities in the Industrial sector employed Marbek's customized macro model. The model is organized by major industrial sub sector and major end use.

Natural gas end-use profiles were developed for the seven sub sectors described above. The profiles map proportionally how much natural gas is used by each of the end uses for each sub sector. These profiles represent the sub sector archetypes and are used in the model to calculate the natural gas used by each end use for each sub sector.

The major steps in the general approach to the study are outlined in Section 1.4 above (Approach). Specific procedures for the Industrial sector were as follows:

- **Modelling of Base Year –** The consultants compiled Base Year data on the industrial sector from a variety of sources, including Enbridge's customer information, the study team's own energy assessment experience within many of the sub sectors and secondary data sources. The macro model results produced a close match with actual Enbridge sales data.

- **Reference Case Calculations -** The consultants prepared a Reference Case forecast based on projected growth forecasts provided by Enbridge, which includes anticipated closing of existing facilities and opening of new facilities.

- **Assessment of DSM Measures –**To estimate the economic and achievable natural gas savings potentials, the consultants assessed a wide range of commercially available energy efficiency measures and technologies such as:

  - Integrated control systems
  - More efficient boiler, steam and hot water systems
  - Efficient process heating technologies
  - Efficient space heating and ventilation, including solar thermal technologies.

5.2 INDUSTRIAL NATURAL GAS SAVINGS POTENTIAL

A summary of the levels of annual natural gas consumption and potential natural gas savings contained in each of the Industrial sector forecasts addressed by the study are presented in Exhibits 5.1 to 5.3 and discussed briefly in the sub sections that follow.

Exhibit 5.1: Graphic of Forecast Results for the Enbridge Service Area – Annual Natural Gas Consumption, Industrial Sector (million m^3/yr)

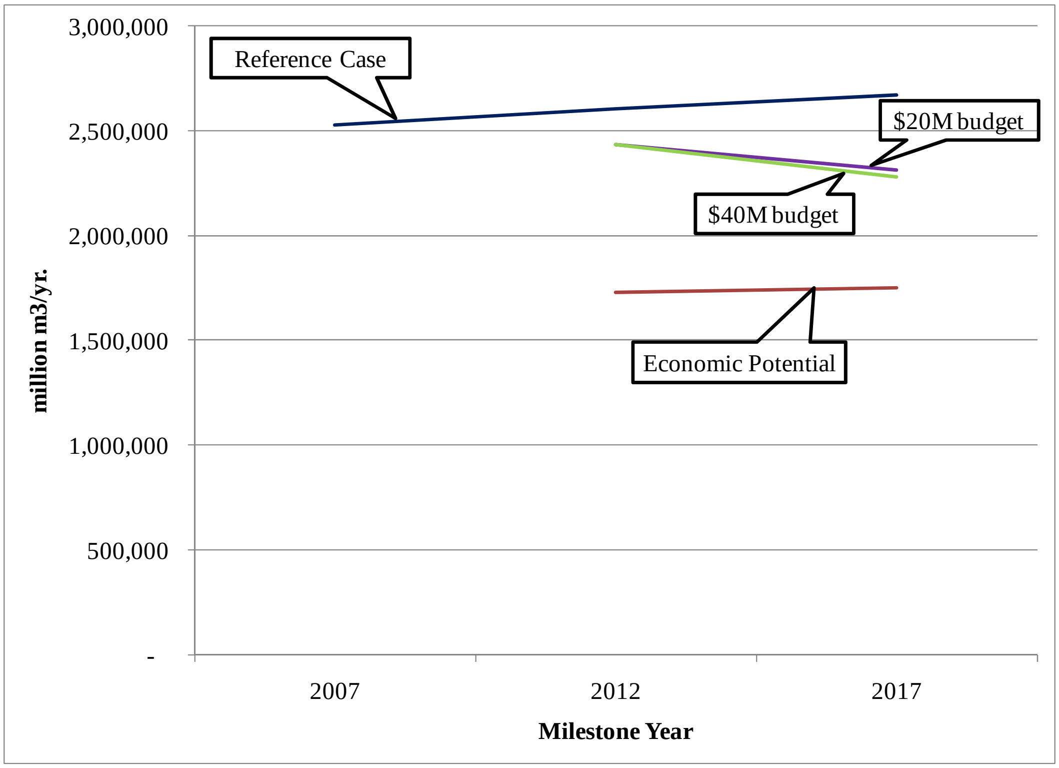


Exhibit 5.2: Summary of Forecast Results for the Total Enbridge Service Area - Annual Natural Gas Consumption, Industrial Sector (million m^3/yr)

Milestone Year	Annual Consumption in Industrial Sector (million m^3/yr)					
	Reference Case	Economic Potential	Achievable Potential			
			$20M Scenario*	$40M Scenario**	$60M Scenario	Financially Unconstrained
2007	2,530					
2012	2,604	1,726	2,433	***	***	2,433
2017	2,671	1,751	2,316	2,278	****	2,278

Exhibit 5.3: Summary of Forecast Results for the Total Enbridge Service Area – Achievable Natural Gas Savings in Milestone Years, Industrial Sector (million m^3/yr. and % Relative to Economic Potential Scenario)

Milestone Year	Natural Gas Savings (million m^3/yr., Relative to Economic Potential %)				
	Economic Potential	Achievable Potential			
		$20M Scenario*	$40M Scenario**	$60M Scenario	Financially Unconstrained
2012	877	171	***	***	171
2017	919	355	392	****	392
2012		19%	***	***	19%
2017		39%	43%	****	43%

Note**:** Natural gas savings in the milestone years represent the potential reduction in gas use in that year as a result of DSM measures implemented in the period.

* Estimated annual program costs for implementing all cost-effective measures is $3.1 million in 2012, moderately less than the $4 million allocated to the industrial sector in the $20 million DSM scenario. Results reported are for $3.1 million, and represent the maximum savings for the achievable scenario in 2012.

** Estimated annual program costs for implementing all cost-effective measures is $4.4 million in 2017, significantly less than the $8 million allocated to the industrial sector in the $40 million DSM scenario. Results reported are for $4.4 million, and represent the maximum savings for the achievable scenario in 2017.

*** Maximum measure implementation rates are achieved in the $20 million scenario in 2012. Based on the Achievable workshop results, no additional savings were identified in the $40 million, $60 million or Financially Unconstrained scenarios, while maintaining a positive TRC.

**** Maximum measure implementation rates are achieved in the $40 million scenario in 2017. Based on the Achievable workshop results, no additional savings were identified in the $60 million or Financially Unconstrained scenarios, while maintaining a positive TRC.

5.3 BASE YEAR NATURAL GAS USE

In the Base Year of 2007, the Industrial sector in Enbridge's total service area consumed about 2,529,979,000 m^3. This volume excludes natural gas used for power generation, co-generation and industrial feedstock, as these uses of natural gas are beyond the scope of this study.

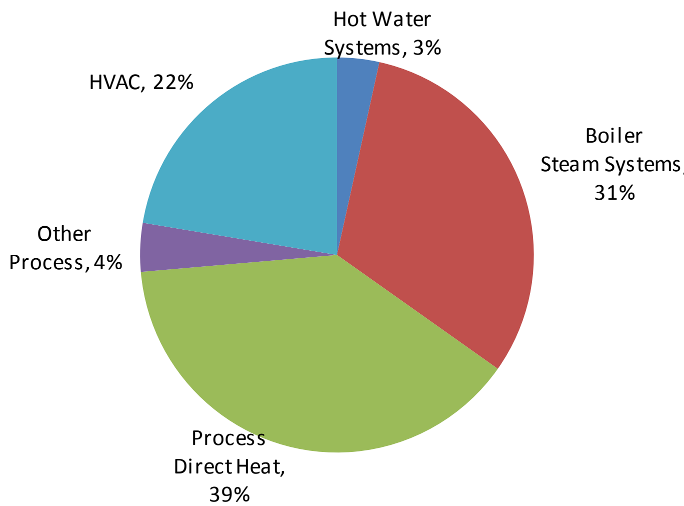
The 7 core industry sub sectors shown in Exhibit 5.4 account for 67% of the total industry natural gas consumption; 88% of the total industry natural gas consumption occurs in the central service region.

Exhibit 5.4: Base Year Industrial Sector Natural Gas Consumption for the Total Enbridge Service Area (1,000 m^3/yr.)

Sub Sector	End Use						
	Hot Water Systems	Boiler Steam Systems	Process Direct Heat	Other Process	HVAC	Total	Percentage of Total (%)
Non-metallic Mineral Product Mfg.	6,655	39,798	235,793	12,578	37,935	332,759	13%
Food Product Mfg.	26,125	156,162	89,772	20,214	34,289	326,563	13%
Paper Manufacturing	5,820	181,547	55,113	5,325	43,182	290,987	11%
Refined Petroleum & Coal	8,556	74,155	165,423	4,563	32,514	285,213	11%
Primary Metal	3,663	21,518	127,953	4,175	25,821	183,131	7%
Fabricated Metal	7,313	34,736	85,927	9,141	45,706	182,822	7%
Chemical	3,514	71,337	57,983	12,966	29,907	175,706	7%
Miscellaneous Mfg.	27,526	222,764	222,175	34,790	326,329	833,584	33%
Total	87,557	792,355	982,895	100,699	566,473	2,529,979	100%
Percentage	3%	31%	39%	4%	22%		

As illustrated in Exhibit 5.5 process direct heat accounts for about 39% of total industrial sector natural gas use. Boiler steam systems account for about 31% of the total natural gas use, followed by heating, ventilation and air conditioning (HVAC), which accounts for about 22%. Other processes and hot water systems account for the remaining natural gas consumption.

Exhibit 5.5: Base Year Industrial Sector Natural Gas Use for the Total Enbridge Service Area, by End Use



5.4 REFERENCE CASE

In the absence of new DSM initiatives, the study estimates that natural gas consumption in the Industrial sector will grow from 2,529,979,000 $m^{3/}$yr in 2007 to about 2,670,651,000 $m^{3/}$yr in 2017. This represents an overall growth of about 5.6% in the period and compares very closely with Enbridge's own forecast, which also includes consideration of the impacts of "natural conservation." Exhibit 5.6 shows the forecast levels of Industrial sector natural gas consumption for the entire Enbridge service area. The results are presented for each milestone year and sub sector.

Exhibit 5.6: Industrial Sector Reference Case Natural Gas Use for the Total Enbridge Service Area, by Sub Sector and Milestone Year (1000 m^3/yr)

	Eastern Region			Central Region			All Regions		
Sub Sector	**2007**	**2012**	**2017**	**2007**	**2012**	**2017**	**2007**	**2012**	**2017**
Non-metallic Mineral Product Mfg.	40,316	41,493	42,557	211,657	217,838	223,426	251,973	259,331	265,983
Food Product Mfg.	26,138	26,901	27,591	300,425	309,198	317,129	326,563	336,098	344,721
Paper Manufacturing	13,393	13,784	14,138	277,594	285,700	293,029	290,987	299,484	307,167
Refined Petroleum & Coal	16,091	16,561	16,986	269,122	276,980	284,085	285,213	293,541	301,071
Primary Metal	44,663	45,968	47,147	138,467	142,510	146,166	183,131	188,478	193,313
Fabricated Metal	18,290	18,824	19,307	164,533	169,337	173,681	182,822	188,161	192,988
Chemical	26,435	27,207	27,905	149,271	153,630	157,571	175,706	180,837	185,476
Miscellaneous Mfg.	121,869	125,428	128,646	711,714	732,496	751,287	833,584	857,924	879,933
Total	307,195	316,165	324,276	2,222,784	2,287,689	2,346,376	2,529,979	2,603,854	2,670,651

5.5 ASSESSMENT OF ENERGY EFFICIENCY MEASURES

The study assessed over 30 potential energy efficiency measures. A summary of the screening results for the energy-efficiency measures is presented in Exhibit 5.7. Due to the number of measures assessed for each sub sector the results shown are for the measures applied to a large technology group in the Chemical sub sector.

Exhibit 5.7: Summary of Measure TRC Screening Results — Example for Chemical Sub Sector, Large Technology Energy-efficiency Options

End Use	Measure	Full/ Incremental	Net Measure TRC	Simple Payback Period (Years)	Benefit/ Cost Ratio
System	Integrated control system	F	$ 772,955	0.8	5.3
	Sub metering, monitoring and targeting	F	$ 373,150	2.8	2.0
Boiler, Steam & Hot Water Systems	Economizers	F	$ 547,220	2.7	2.3
	Blowdown heat recovery	F	$ 207,457	3.3	1.8
	Boiler combustion air preheat	F	$ 570,854	3.2	1.9
	Heat recovery to preheat make-up water	F	$ 1,073,127	2.1	3.2
	Condensing boiler	I	$ 1,597,860	2.0	3.0
	Boiler right sizing and load management	I	$ 2,816,602	N/A	N/A
	High-efficiency burners	F	$ 734,121	2.5	2.6
	Insulation	F	$ 839,968	1.0	5.4
	Advanced boiler controls	F	$ 767,976	1.3	3.9
	Blowdown control	F	-$ 30,664	8.2	0.8
	Boiler water treatment	F	$ 83,769	1.8	2.1
	Boiler maintenance	F	$ 273,377	N/A	2.4
	Minimize deaerator vent losses	F	$ 339,472	2.3	2.8
	Condensate return	F	$ 258,722	4.4	1.5
	Steam trap survey and repair	F	$ 16,243	1.6	1.1
Process Heating (Furnaces/ Kilns/ Ovens/ Dryers)	Exhaust gas heat recovery	F	$ 5,159,494	1.0	5.4
	High-efficiency burners	F	$ 6,518,245	0.7	9.2
	Insulation	F	$ 1,283,871	1.0	5.3
	Advanced heating and process controls	F	$ 2,530,763	1.0	5.0
Other Process	Process heat recovery	F	$ 2,856,281	1.6	3.1
HVAC	Radiant heaters	F	$ 78,369	4.7	1.3
	Automated temperature control	F	$ 2,614	6.7	1.0
	Solar walls	F	-$ 69,729	10.2	0.7
	Ventilation optimization	F	$ 107,538	2.5	2.2
	Warehouse loading dock seals	F	-$ 15,800	6.3	0.7
	Air curtains	F	-$ 5,510	6.1	0.9
	Air compressor heat recovery	F	$ 136,353	3.1	2.1
	Destratification fans	F	$ 16,262	5.5	1.2
	Ventilation heat recovery	F	$ 113,925	2.8	2.0

5.6 ECONOMIC POTENTIAL FORECAST

Under the conditions of the Economic Potential Forecast,[26] the study estimated that natural gas consumption in the Industrial sector would decline to about 1,751,313,000 $m^{3/}$yr by 2017 for the total Enbridge service area. Annual savings relative to the Reference Case are about 919,340,000 $m^{3/}$yr by 2017, or about 34%. %. Further details are provided in Exhibits 5.8 and 5.9, which show the results by sub sector and end use for the milestone years 2012 and 2017, respectively.

Exhibit 5.8: Natural Gas Savings for the Total Enbridge Service Area by Sub Sector and End Use for the Milestone Year 2012, Reference Case vs. Economic Potential (1000 m^3/yr.)

	End Use							
Sub Sector	**System**	**Hot Water Systems**	**Boiler Steam Systems**	**Process Direct Heat**	**Other Process**	**HVAC**	**Total**	
Non-metallic Mineral Product Mfg.	9,505	886	8,797	29,511	784	17,187	66,669	8%
Food Product Mfg.	21,999	4,753	50,613	14,702	1,660	20,280	114,006	13%
Paper Manufacturing	14,467	1,016	52,389	8,505	433	25,486	102,296	12%
Refined Petroleum & Coal	10,759	1,461	22,620	26,589	374	20,290	82,094	9%
Primary Metal	6,908	755	7,345	20,401	344	15,828	51,583	6%
Fabricated Metal	12,316	1,526	11,808	14,487	751	25,749	66,637	8%
Chemical	7,496	611	20,765	9,516	1,067	17,889	57,344	7%
Miscellaneous Mfg.	31,445	5,018	68,431	37,341	2,862	191,669	336,766	38%
Total	114,896	16,026	242,768	161,052	8,275	334,379	877,394	100%
%	13%	2%	28%	18%	1%	38%	100%	

Exhibit 5.9: Natural Gas Savings for the Total Enbridge Service Area by Sub Sector and End Use for the Milestone Year 2017, Reference Case vs. Economic Potential (1000 m^3/yr.)

	End Use							
Sub Sector	**System**	**Hot Water Systems**	**Boiler Steam Systems**	**Process Direct Heat**	**Other Process**	**HVAC**	**Total**	
Non-metallic Mineral Product Mfg.	9,469	1,307	10,480	33,845	778	17,047	72,927	8%
Food Product Mfg.	22,201	5,956	54,287	15,367	1,645	20,071	119,526	13%
Paper Manufacturing	14,412	1,490	62,222	8,823	429	25,203	112,579	12%
Refined Petroleum & Coal	10,719	1,858	24,308	28,865	371	20,105	86,226	9%
Primary Metal	6,882	933	7,916	22,280	343	15,756	54,110	6%
Fabricated Metal	12,429	1,874	12,677	15,775	745	25,516	69,016	8%
Chemical	7,494	750	22,534	9,964	1,059	17,739	59,539	6%
Miscellaneous Mfg.	31,327	6,331	73,973	40,922	2,841	190,022	345,416	38%
Total	114,932	20,499	268,397	175,843	8,211	331,458	919,339	100%
%	13%	2%	29%	19%	1%	36%	100%	

5.6.1 Sensitivity Analysis

The Economic Potential results were subjected to a sensitivity analysis around two of the assumptions employed: Technology Cost and inclusion of a value for GHG emissions (as described in Step 5, in Section 1.4). The two sensitivity analyses offer the following insights:

[26] The level of natural gas consumption that would occur if all equipment and building envelopes were upgraded to the level that is cost-effective. In this study, "cost-effective" means that the technology upgrade passes the measure Total Resource Cost (TRC) test, as discussed previously in Section 1.4.

- In the Industrial sector, the additional measures included in the technology cost sensitivity analysis provide only modest additional savings relative to the technologies already included in the Economic Potential Forecast.

- The sensitivity analysis identified potential savings of about 1,015 million m^3 in 2017; this compares with the identified savings potential of about 919 million m^3 in 2017 under the Economic Potential Forecast. Hence, the identified technical savings potential is about 12% greater than that identified in the Economic Potential Forecast.

- The GHG adder makes a relatively small difference to the overall avoided cost of energy.

5.7 ACHIEVABLE POTENTIAL

As noted previously, Achievable Potential was assessed from two perspectives:

- Potential Savings in Future Natural Gas Consumption Savings in one year due to the Aggregate impact of measures implemented over the time period of Base Year (2007) to Milestone Year (2012 and 2017). This method calculates the net change in future natural gas supply requirements.

- Potential DSM Program TRC Benefits. [27] Savings due to (only) those measures implemented in one year. This method is used in calculation of the net TRC benefits.

Within each of the above perspectives, the analysis of Achievable Potential was assessed under four different Marketing scenarios:

- One Financially Unconstrained scenario
- Three Financially Constrained scenarios, each limited by a different level of program budget availability.

Further detail related to each of the Marketing scenarios is provided below followed by a summary of results.

5.7.1 Financially Unconstrained DSM Marketing Scenario

The Financially Unconstrained scenario provides an overview of the level of potential natural gas savings that could be achieved if a comprehensive portfolio of DSM programs was launched without any constraint on the availability of program funding.

[27] The annual savings presented do not explicitly address the potential impact of free riders at the level of individual program measure. However, the Reference Case 3 does include an estimate of the impact of natural conservation over the study period, by end use (i.e., an estimate of natural gas savings that would occur in the absence of additional Enbridge DSM programs). Hence, the inclusion of natural conservation in the study's Reference Case does address some, but not necessarily all, free rider and spillover impacts. A more detailed assessment of free rider and spillover impacts is practical only as part of a detailed program design, which is beyond the scope of this study.

Although the results of this scenario are not constrained by program funding, the results do incorporate consideration of the market constraints identified during the Achievable Potential workshop, such as product and service availability and customer transaction costs.

This scenario, therefore, provides a high-level estimate of the upper level of natural gas savings that could be achieved by Enbridge's industrial customers over the nine-year period beginning in 2009 and ending in 2017. It also provides Enbridge's industrial DSM program personnel with a view of the relative potential contribution of individual sub sectors, end uses, technologies and service regions.

Major Assumptions: Financially Unconstrained Scenario

- All measures that pass the measure TRC screen are included
- No program financial limit is set, except that all measures must continue to pass the measure TRC screen
- Participation rates for each measure are based on the workshop results, which consider both market barriers and potential promotional strategies.

Exhibit 5.10 provides details on the program costs assumed for each measure.

Exhibit 5.10: Summary of Program Cost Assumptions, Financially Unconstrained Scenario[28]

End Use	Bundle	Measure Name	Fixed Program Costs ($/yr)	Incentive ($/m^3)	Payback After Incentive (yrs)[29]
System wide	1	Integrated control system	20,000	0.07	0.9
	2	Sub-metering	25,000	0.07	2.8
Boiler	3	Heat recovery to preheat makeup water	20,000	0.07	6.0
		Boiler combustion air preheat	20,000	0.07	9.8
		Minimize deaerator vent losses	20,000	0.07	5.8
		Blowdown heat recovery	20,000	0.07	6.6
		Boiler water treatment	20,000	0.07	4.3
		High efficiency burners	20,000	0.07	3.3
		Advanced boiler controls	20,000	0.07	2.7
		Economizer	20,000	0.07	3.8
		Weighted Average for Bundle 3	160,000		5.2
	4	Boiler right sizing and load management	20,000	0.07	-0.5
	5	Steam trap survey and repair	12,000	0.07	1.6
	6	Condensate return	25,000	0.07	5.9
	7	Insulation	20,000	0.07	1.8
	8	Boiler maintenance	20,000	0.07	2.3
	9	Condensing boiler	27,000	0.07	2.1
		Direct contact hot water heaters	27,000	0.07	-0.1
		Weighted Average for Bundle 9	54,000		0.5
Process	10	Exhaust gas heat recovery	32,500	0.07	4.1
		High efficiency burners	32,500	0.07	1.8
		Insulation	32,500	0.07	1.6
		Advanced heating and process controls	32,500	0.07	4.7
		Weighted Average for Bundle 10	130,000		2.9
	11	High-efficiency ovens	12,500	0.07	0.9
		High-efficiency dryers	12,500	0.07	0.7
		High-efficiency kilns	12,500	0.07	0.0
		High-efficiency furnaces	12,500	0.07	0.3
		Radiant tube burners	12,500	0.07	4.4
		Weighted Average for Bundle 11	62,500		0.3
Other	12	Process Heat Recovery	80,000	0.07	3.5
HVAC	13	Automated temperature control	30,000	0.07	6.4
		Air compressor heat recovery	30,000	0.07	5.4
		Radiant heaters	30,000	0.07	4.8
		Destratification fans	12,000	0.07	5.7
		Weighted Average for Bundle 13	30,000		4.6
	14	Ventilation Optimization	15,000	0.07	4.4
		Ventilation Heat Recovery	15,000	0.07	4.7
		Weighted Average for Bundle 14	30,000		4.6

[28] Salary and related overhead costs are not included in program cost estimates.

[29] The payback period is a weighted average payback period for the measures based on technology size distribution and gas consumption by sub sector.

5.7.2 Financially Constrained DSM Marketing Scenarios

These DSM Marketing scenarios provide estimates of the potential impacts of increasingly larger annual DSM budgets, which as noted previously were set at $20, $40 and $60 million, annually. Within each of these budgets, 20% of the funding is allocated to the Industrial sector for the purposes of this analysis.

The financially constrained scenarios include the following DSM costs:

- **Fixed Program Costs**: This includes costs for items such as newspaper advertisements, preparation of information and marketing materials, training workshops, contractor certifications, etc. These program cost elements are not expected to vary significantly if the number of installations of the measure changed. Estimates for these cost items were provided by Enbridge personnel, based on current and previous experience with similar DSM measures. In each case, these costs are expressed as dollars of program spending per year. For each of the measures, fixed program costs were estimated for both the CML and Financially Unconstrained Marketing scenarios. Salary and related overhead costs are not included.

- **Incentive Costs** (either end user or channel member): These costs would include any costs that vary directly according to the volume of gas saved by the measure. An incentive of $ 0.05 / m^3 gas saved was used for the CML scenario and $ 0.07 / m^3 gas saved for the Financially Unconstrained scenario. For each of the measures, incentive costs were estimated for both the CML and the Financially Unconstrained scenarios based on the volume of gas saved.

Exhibit 5.11 provides details on the program costs assumed for each measure.

Exhibit 5.11: Summary of Program Cost Assumptions, CML Scenario[30]

End Use	Bundle	Measure Name	Fixed Program Costs ($/yr)	Incentive ($/m^3)	Payback After Incentive (yrs)[31]
System wide	1	Integrated control system	15,000	0.05	0.9
	2	Sub-metering	10,000	0.05	2.9
Boiler	3	Heat recovery to preheat makeup water	15,000	0.05	6.2
		Boiler combustion air preheat	15,000	0.05	10.0
		Minimize deaerator vent losses	15,000	0.05	5.9
		Blowdown heat recovery	15,000	0.05	6.8
		Boiler water treatment	15,000	0.05	4.4
		High efficiency burners	15,000	0.05	3.4
		Advanced boiler controls	15,000	0.05	2.7
		Economizer	15,000	0.05	3.9
		Weighted Average for Bundle 3	120,000		5.3
	4	Boiler right sizing and load management	15,000	0.05	-0.5
	5	Steam trap survey and repair	8,000	0.05	1.6
	6	Condensate return	10,000	0.05	6.0
	7	Insulation	15,000	0.05	1.8
	8	Boiler maintenance	15,000	0.05	2.3
	9	Condensing boiler	8,000	0.05	2.1
		Direct contact hot water heaters	8,000	0.05	-0.1
		Weighted Average for Bundle 9	16,000		0.5
Process	10	Exhaust gas heat recovery	2,500	0.05	4.2
		High efficiency burners	2,500	0.05	1.9
		Insulation	2,500	0.05	1.6
		Advanced heating and process controls	2,500	0.05	4.9
		Weighted Average for Bundle 10	10,000		2.9
	11	High-efficiency ovens	2,500	0.05	0.9
		High-efficiency dryers	2,500	0.05	0.7
		High-efficiency kilns	2,500	0.05	0.0
		High-efficiency furnaces	2,500	0.05	0.3
		Radiant tube burners	2,500	0.05	4.4
		Weighted Average for Bundle 11	12,500		0.7
Other	12	Process Heat Recovery	2,000	0.05	3.6
HVAC	13	Automated temperature control	5,000	0.05	6.5
		Air compressor heat recovery	5,000	0.05	5.5
		Radiant heaters	5,000	0.05	4.9
		Destratification fans	10,000	0.05	5.8
		Weighted Average for Bundle 13	25,000		5.3
	14	Ventilation Optimization	10,000	0.05	4.5
		Ventilation Heat Recovery	10,000	0.05	4.8
		Weighted Average for Bundle 14	20,000		4.7

30 Salary and related overhead costs are not included in program cost estimates.

31 The payback period is a weighted average payback period for the measures based on technology size distribution and gas consumption by sub sector.

5.7.3 Achievable Potential Savings - Future Natural Gas Consumption[32]

Exhibits 5.12 to 5.14, inclusive, present a summary of the Achievable Potential savings in future natural gas consumption relative to the Reference Case levels. For illustration, the results of the Financially Unconstrained scenario are shown.

Selected highlights are provided below.

- Exhibit 5.12 shows that total industrial sector natural gas savings in 2017 are estimated to be approximately 392 million m^3/yr. This represents a savings of approximately 15%, relative to the Reference Case and is equal to approximately 43% of the savings identified in the Economic Potential Forecast. The Central service region accounts for about 87% of the identified potential.

- Exhibit 5.13 shows the results by sub sector for the entire Enbridge service area. As illustrated, the majority of savings in the unconstrained scenario are associated with the Miscellaneous Manufacturing sub-sector (39%), while the Food Product Manufacturing and Paper Manufacturing sub sectors each contribute approximately 12% each.

- Exhibit 5.14 shows the results by end use. As illustrated, measures applied to three end-uses, boiler steam systems, HVAC, and process heat, account for approximately 93% of the identified potential. Additional details describing the specific measures that contribute to these end-use savings are provided in the following sections.

Exhibit 5.12: Natural Gas Savings by Service Region and Milestone Year, Financially Unconstrained Scenario (1000 m^3/yr.)

Milestone Year	Eastern Region	Central Region	Total	% Savings Relative to Ref Case
	thousand m^3/year			
2012	21,055	149,446	170,501	7%
2017	49,817	342,337	392,155	15%
% Savings 2017 Re: Reference Case	15%	15%	15%	
% Savings 2017 Re: Total	13%	87%	100%	

[32] See definition of savings as provided in Step 6, page 7.

Exhibit 5.13: Natural Gas Savings by Sub-Sector and Milestone Year for the Total Enbridge Service Area, Financially Unconstrained Scenario (1000 m^3/yr.)

Sub-Sector	Milestone Year		% Savings 2017	
	2012	2017	Re: Ref Case	Re: Total
	thousand m^3/year			
Non-metallic Mineral Product Mfg.	13,519	30,297	11%	8%
Food Product Mfg.	22,347	48,545	14%	12%
Paper Manufacturing	20,618	46,080	15%	12%
Refined Petroleum & Coal	16,873	37,382	12%	10%
Primary Metal	9,966	22,686	11%	6%
Fabricated Metal	11,473	27,278	14%	7%
Chemical	11,654	26,289	14%	7%
Miscellaneous Mfg.	64,051	153,598	17%	39%
Total	170,501	392,155	15%	100%

Exhibit 5.14: Natural Gas Savings by End Use and Milestone Year for the Total Enbridge Service Area, Financially Unconstrained Scenario (1000 m^3/yr.)

Sub-Sector	Milestone Year		% Savings 2017	
	2012	2017	Re: Ref Case	Re: Total
	thousand m^3/year			
Systems	2,062	13,331	0.5%	3%
Hot Water Systems	4,851	9,829	11%	3%
Boiler Steam Systems	60,858	121,470	15%	31%
Process Heat	40,989	81,921	8%	20%
Other Process	2,354	4,765	4%	1%
HVAC	59,388	160,839	27%	41%
Total	170,501	392,155	15%	100%

6.7.4 Potential DSM Program TRC Benefits

Exhibits 5.15, 5.16 and 5.17, present the results for the milestone year 2017. As illustrated, annual industrial program spending of approximately $4.4 million in 2017 would result in approximately 48 million m^3/year in natural gas savings[33] and approximately $44 million in TRC net benefits. The exhibits also illustrate that annual Industrial sector program spending achieves maximum results at an annual expenditure of $3.1 million in 2012, which is below the $4 million industrial budget, and $4.4 million in 2017, which is below the $8 million industrial budget. This is because additional cost-effective measures were not available under the conditions defined by these scenarios. Additional details are provided in the following exhibits.

33 Note: the savings shown are only for the measures installed in 2017; they do not include the savings in 2017 that occur as a result of measures installed in prior periods.

- Exhibit 5.15 presents the 2017 results by upgrade technology bundle, including both the current marketing level of participation and the increment from current marketing level to Financially Unconstrained. For each measure bundle, annual natural gas savings potential, net TRC benefits, and annual program costs are presented both individually and cumulatively. The measures are sorted in order of increasing program cost per dollar of TRC benefits.

- Exhibit 5.16 presents the 2017 results graphically, with program costs on the vertical axis and net TRC benefits on the horizontal axis.

- Exhibit 5.17 presents the 2017 results graphically, with program costs on the vertical axis and annual natural gas savings potential on the horizontal axis.

Exhibit 5.15: Summary Achievable Results** by Measure, for the Total Enbridge Service Area, 2017 Installations

Measure Bundle	Scenario	Annual Natural Gas Savings Potential (1000 m^3/yr)		TRC ($)		Annual Program Costs ($)		Program Costs per Unit	
			Cumulative		Cumulative		Cumulative	per Natural Gas Savings ($/$m^3$)	per TRC Benefits ($/$)
10	CML	2,668	2,668	4,618,451	4,618,451	143,384	143,384	0.05	0.03
1	CML	2,446	5,114	4,125,519	8,743,969	137,325	280,709	0.06	0.03
9	CML	83	5,197	490,517	9,234,486	20,135	300,843	0.24	0.04
12	CML	128	5,325	187,460	9,421,947	8,406	309,249	0.07	0.04
2	CML	719	6,044	1,020,872	10,442,819	45,945	355,194	0.06	0.05
4	CML	1,957	8,001	2,114,150	12,556,969	112,857	468,051	0.06	0.05
9	Unconstrained	221	8,222	1,297,911	13,854,880	71,104	539,155	0.32	0.05
2	Unconstrained	3,145	11,367	4,485,051	18,339,931	259,539	798,694	0.08	0.06
10	Unconstrained	5,704	17,071	9,766,933	28,106,864	582,651	1,381,344	0.10	0.06
4	Unconstrained	2,540	19,611	2,743,063	30,849,926	236,932	1,618,277	0.09	0.09
1	Unconstrained	864	20,475	1,441,935	32,291,862	129,397	1,747,673	0.15	0.09
14	CML	3,620	24,094	1,804,404	34,096,266	200,983	1,948,657	0.06	0.11
7	CML	836	24,931	398,624	34,494,890	56,804	2,005,461	0.07	0.14
6	CML	199	25,130	130,800	34,625,690	19,958	2,025,419	0.10	0.15
3	CML	4,040	29,170	2,049,997	36,675,687	322,009	2,347,427	0.08	0.16
14	Unconstrained	7,252	36,422	3,625,066	40,300,753	610,016	2,957,443	0.08	0.17
12	Unconstrained	435	36,856	562,594	40,863,347	112,978	3,070,421	0.26	0.20
7	Unconstrained	952	37,808	450,738	41,314,085	103,328	3,173,750	0.11	0.23
13	Unconstrained	1,509	39,316	551,741	41,865,826	143,295	3,317,044	0.09	0.26
6	Unconstrained	302	39,619	188,824	42,054,650	50,154	3,367,198	0.17	0.27
3	Unconstrained	3,635	43,254	1,792,452	43,847,103	495,264	3,862,462	0.14	0.28
11	CML	360	43,614	50,063	43,897,166	30,486	3,892,948	0.08	0.61
8	CML	295	43,909	43,751	43,940,916	29,775	3,922,723	0.10	0.68
13	CML	634	44,544	140,538	44,081,454	133,722	4,056,445	0.21	0.95
8	Unconstrained	307	44,851	41,068	44,122,522	47,411	4,103,856	0.15	1.15
11	Unconstrained	938	45,788	100,593	44,223,116	135,337	4,239,193	0.14	1.35
5	CML	941	46,730	13,048	44,236,164	55,073	4,294,266	0.06	4.22
5	Unconstrained	1,308	48,038	17,243	44,253,407	122,390	4,416,656	0.09	7.10
				Weighted Average (@ $4M Industrial spending):				0.09	0.09
				Weighted Average (total):				0.09	0.10

** Savings shown are incremental to those for preceding measures.

Exhibit 5.16: Achievable Potential Supply Curve, 2017: Program Cost vs. TRC Net Benefits, for the Total Enbridge Service Area

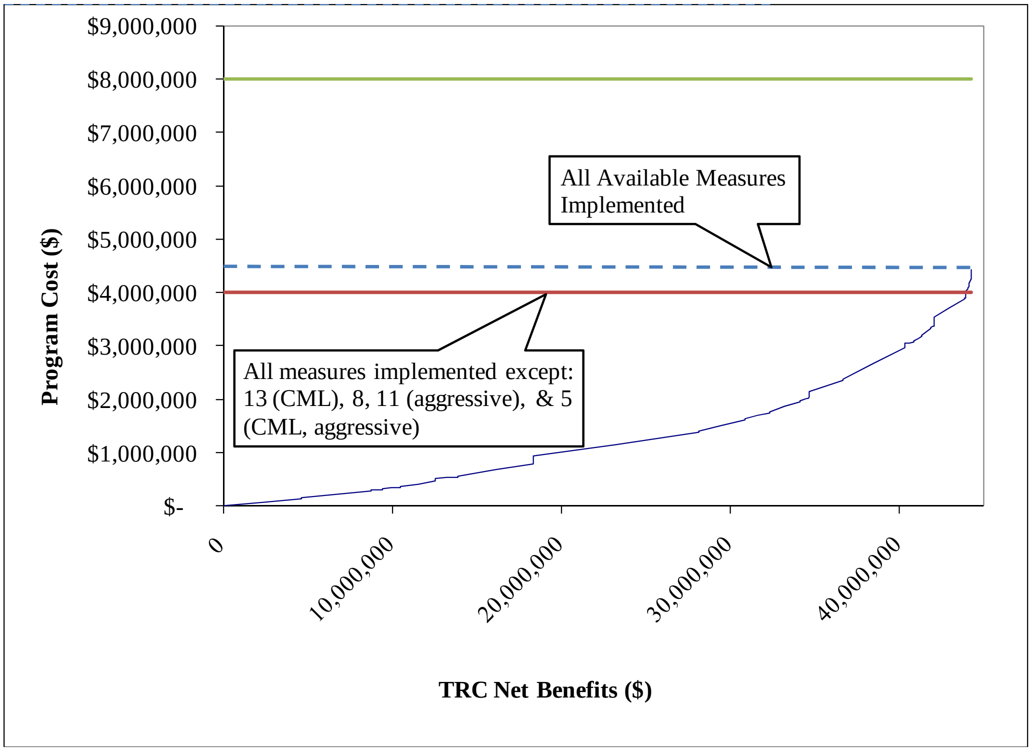
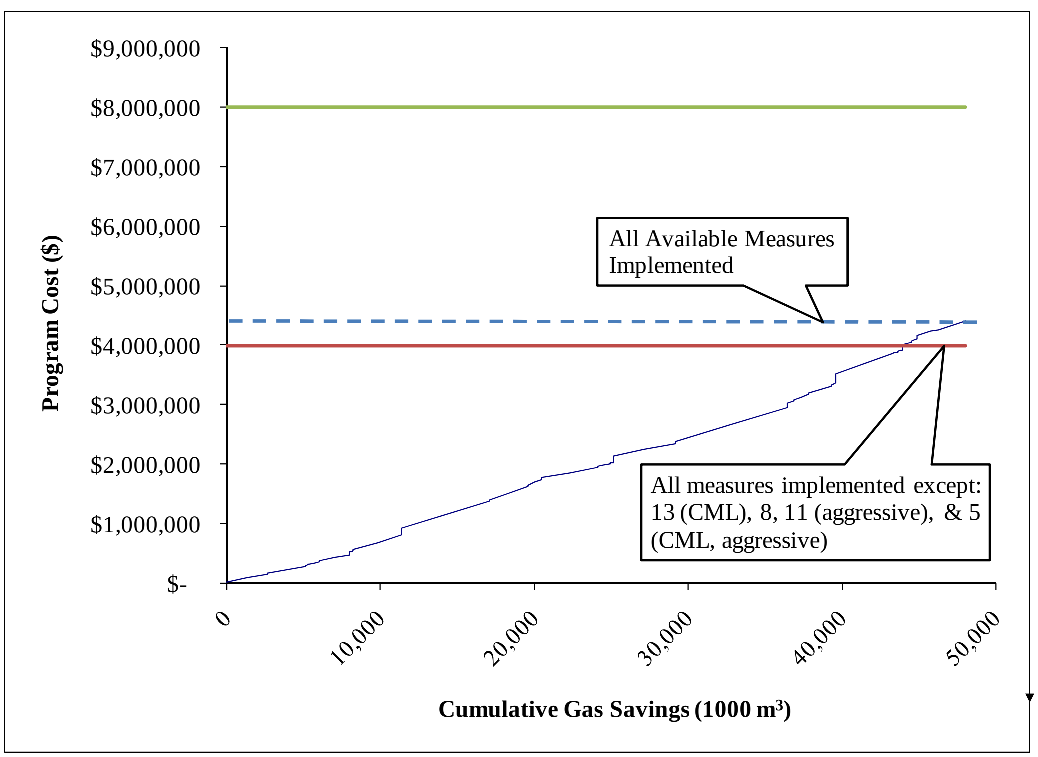


Exhibit 5.17: Achievable Potential Supply Curve, 2017: Program Cost vs. Annual Natural Gas Savings Potential, for the Total Enbridge Service Area



5.7.5 Conclusions

Selected highlights are provided below.

- Annual Industrial sector program spending achieves maximum results at an annual expenditure of $3.1 million in 2012, which is below the $4 million industrial budget, and $4.4 million in 2017, which is below the $8 million industrial budget. This is because additional cost-effective measures were not available under the conditions defined by these scenarios.

- With industrial program spending of approximately $4.4 million in 2017, program costs are approximately $0.09 per gross m^3 of natural gas savings and $0.09 per dollar of gross TRC benefits. This compares with recent Enbridge monitoring and evaluation results[34] of $0.06/m^3 of gross natural gas savings ($0.07/m^3 net of free riders).

- Program costs per dollar of TRC net benefits are particularly attractive for the following measure bundles:
  - Bundle 10 – Retrofitting ovens, dryers, kilns and furnaces to improve efficiency, such as exhaust gas heat recovery, high efficiency burners, insulation and advanced heating and process controls
  - Bundle 1 – System wide integrated control systems
  - Bundle 9 – Upgrading to more efficient boilers and heaters, such as condensing boilers and direct contact hot water heaters
  - Bundle 12 – Process heat recovery
  - Bundle 2 – System wide sub-metering
  - Bundle 4 – Boiler right sizing and load management

5.8 ADDITIONAL OBSERVATIONS

In addition to the preceding conclusions, two additional observations warrant note as they may affect future Industrial sector program strategies. They include:

- ***Rate of measure implementation has a large effect on overall savings:*** For measures that pass the TRC screen on an incremental cost basis, low participation rates in early milestone years create a significant “lost opportunity.” This is particularly relevant to the replacement of equipment with a very long life, which is applicable to most industrial technologies and measures. The gap between Economic Potential and Achievable Potential savings presented in this study is due in large part to the significant lost opportunity that occurs in early milestone years.

- ***Bundling of measures to develop program concepts has an impact on the achievable potential and program development:*** To model the achievable potential scenario measures were grouped into bundles that are manageable within the scope and budget of the project. The Achievable results provide an indicative savings potential based on the

[34] Enbridge Gas, 2007 LRAM Post Audit Results.

specific set of bundles. Savings from individual measures, or different bundle mixes of measures, will vary.

GLOSSARY

achievable potential
The Achievable Potential is the proportion of the natural gas savings identified in the Economic Potential Forecast that could realistically be achieved within the study period. Achievable Potential recognizes that it is difficult to induce customers to purchase and install all of the efficiency technologies that meet the criteria defined by the Economic Potential Forecast.

avoided cost
The unit cost of acquiring the next resource to meet demand, which is used as a measure for evaluating individual demand-side and supply-side options. In the context of this study "avoided cost" is the capital expenditure offset by Enbridge's DSM activities (i.e., the cost of having to buy natural gas on the open market, contract for long-term supply, and the cost of associated transmission and storage.

base year
The Base Year is the year to which all potentials will be compared. It provides a detailed description of "where" and "how" natural gas is currently used in each sector. For this study, it is the calendar year 2007. The modelled base year energy use is calibrated against Enbridge's actual sales for 2007.

benefit/cost ratio
The measure benefit/cost ratio indicates the relative attractiveness of the measures. A measure that has a benefit/cost ratio in excess of 1.0 has benefits which outweigh its costs. Similarly, a measure with a benefit/cost ratio that is well in excess of one (e.g., 3.0) means that it is very attractive. A measure with a benefit/cost ratio of less than 1.0 has costs which outweigh its benefits.

building envelope
The material separation between the interior and the exterior environments of a building. The building envelope serves as the outer shell to protect the indoor environment as well as to facilitate its climate control.

british thermal unit or BTU
The standard measure of heat energy. It takes one Btu to raise the temperature of one pound of water by one degree Fahrenheit at sea level

co-generation
The simultaneous production of electric or mechanical energy and useful heat energy from a single fuel source.

combustion efficiency
The ratio of energy released during combustion to the potential chemical energy available in the fuel.

demand-side management (DSM)
Actions taken by a utility or other agency which are expected to influence the amount or timing of a customers energy consumption.

discount rate
The interest rate used in calculating the present value of expected yearly benefits and costs.

economic efficiency
Allocation of human and natural resources in a way that results in the greatest net economic benefit, regardless of how benefits and costs are distributed within society.

economic potential forecast
The economic potential forecast is an estimate of the level of natural gas consumption that would occur if all equipment and building envelopes were upgraded to the level that is cost effective from society's perspective. All of the energy-efficiency technologies and measures that have a positive measure TRC are incorporated into the economic potential forecast. These technologies and measures are applied at either natural stock turnover rates or at designated years for immediate application.

energy audit
An on-site inspection and cataloguing of energy using equipment/buildings, energy consumption and the related end-uses. The purpose is to provide information to the customer and the utility. Audits are useful for load research, for DSM program design and for identification of specific energy savings measures.

energy conservation
Activities by energy users that result in a reduction of the energy used to provide services. Energy conservation can include a wide variety of behavioural or operational changes that result in energy savings..

Energy efficiency
Using less energy to perform the same function. For the purpose of this study, only energy savings achieved through physical or hardware installations are considered.

energy intensity
The ratio of energy consumed per application or end use. For example, cubic metres per square metre of heated office space per day, or cubic metres per tonne of aluminum produced. All else being equal, energy intensity increases as energy efficiency decreases.

emerging technologies
New energy-conserving technologies that are not yet market-ready, but may be market-ready over next 5 to 10 years. This category includes technologies that could be accelerated into the market during that period through targeted financial or technical support.

end use
The final application or final use to which energy is applied. End use is often used interchangeably with energy service.

energy savings
The reduction in use of energy from the pre retrofit baseline to the post retrofit energy use that result from efficient technologies or activities. In this document, the term "energy" refers specifically to energy derived from natural gas unless otherwise noted.

energy service
An amenity or service supplied jointly by energy and other components/equipment such as buildings and heating equipment. Examples of energy services include residential space heating, commercial cooking, aluminum smelting and public transit. The same energy service can frequently be supplied with different mixes of equipment and energy.

energy use index (EUI)
End use energy consumption divided by a specific parameter of production (e.g., m^3/unit)
environmental credit/environmental penalty
An increment or decrement to the cost of a resource or set of resources, to reflect the overall level of its/their environmental impact, relative to another resource or set of resources.

financial incentive
Certain financial features in the utility's DSM programs designed to motivate customer participation. They may include features designed to reduce a customer's net cash outlay, pay-back period or cost of finance to participate.

fuel share
The proportion of requirements for a specific service that is met using a certain fuel. In the Commercial sector, fuel shares are normalized on a floor area basis. For example, a natural gas fuel share of 90% for space heating in the Large Office sub sector implies that 90% of the sub sector floor space is heated using natural gas.

free rider
A program participant who would have implemented the program measure or practice in the absence of the program.

interactive effects
In the context of natural gas use, interactive effects refer to the increase in gas consumed by heating equipment required to offset a decrease in "waste" heat generated by more efficient electrical fixtures or appliances after retrofit or replacement.

kilowatt (kW)
One thousand watts; the most common unit of measurement of electric power. (The amount of energy transferred at a rate of one kilowatt for one hour is equal to one kilowatt hour.)

kilowatt hour (kWh)
The most common unit of measurement of electric energy. One kilowatt hour represents the power of one thousand watts for a period of one hour.

load forecast
An estimate of expected natural gas requirements that have to be met by the utility in future years.

load research
Research to disaggregate and analyze patterns of natural gas consumption by various subsectors and end-uses. Load Research supports the development of the load forecast and the design of demand-side management programs.

market transformation
A reduction in market barriers resulting from a market intervention, as evident by a set of market effects that lasts after the intervention has been withdrawn, reduced or changed.

measure total resource cost (TRC)
The Measure TRC is the net present value of energy savings that result from an investment in a energy efficiency measure. The Measure TRC is equal to its full or incremental capital cost (depending on application) plus any change (positive or negative) in the combined annual energy and operating & maintenance costs. This calculation includes among others, the following inputs: the avoided natural gas, electricity and water; the life of the measure; and the selected discount rate.

natural conservation
The future change in energy intensity or base usage that is expected to occur in the absence of utility DSM programs. Natural change represents the effects of energy related decisions that would have been made in the absence of the utility programs by both program participants and non-participants

Non-participant:
Any customer who was eligible but did not participate in the utility program under consideration in a given program year.

non-participant test (NPT)
A test measuring what happens to rates due to changes in utility revenues and operating costs caused by a program. Rates will go down if the avoided cost is greater than the sum of the revenue lost plus the program costs. This test indicates the direction and magnitude of the expected change in rate levels.

participant
An individual, household, business or other utility customer that received a service or financial assistance orffered through a particular utility program, set of utility programs or particular aspect of a utility program in a given program year.

rate
Generically refers to a utility's rate structure.

rate structure
The formulae used by a regulated gas utility to calculate charges for the use of natural gas..

rebates
A type of incentive provided to encourage the adoption of energy efficiceing practices, typically paid after the measure has been installed. There are typically two types of rebates: a Prescriptive Rebate, which is a prescribed financial incentive/unit for a prescribed list of products and a

customized rebate in which the financial incentive is determined using an analysis of the customer equipment and an agreement on the specific products to be installed.

reference case forecast
An estimate of the expected level of natural gas consumption that would occur over the study period in the absence of any new utility DSM market interventions after 2008. It is the baseline against which the scenarios of energy savings are calculated. The Reference Case forecast incorporates an estimation of "natural conservation," namely, changes in end-use efficiency over the study period that are projected to occur in the absence of new market interventions by the utility.

retrofit
Energy efficiency activities undertaken in existing residential or non residential buildings where existing inefficient equipment is replaced by efficient equipment.

saturation
The portion of floor area that receives a specific energy service. For example, a saturation of 86% for space cooling in the Large Office sub sector means that 86% of the sub sector floor space is cooled (regardless of fuel used to provide that cooling).

seasonal efficiency
The ratio of delivered useful energy relative to the input potential fuel energy determined over a full heating season (or year).

sector
A group of customers having a common type of economic activity. Enbridge Gas divides its customers into three principal sectors: Residential, Commercial and Industrial. Sectors are further divided into subsectors. For example, "Large Offices" is a sub sector of the Commercial sector.

service area
The portion of the Province of Ontario that receives service from Enbridge Gas.

service region
For the purposes of this study, the total Enbridge Gas service area is divided into two service regions. They are the Southern Region and the Eastern Region.

simple payback
The simple payback is generated to show the customer's financial perspective. Simple payback is a measure of the length of time required for the cumulative savings from a project to recover its initial investment cost, without taking into account the time value of money

strategic load growth
Utility action to increase (annual) total natural gas demand for specific end uses.

sub sectors
A classification of customers within a sector by common features. Residential subsectors are by type of home (SFD, duplex, apartment, etc.). Commercial subsectors are generally by type of

commercial service (office, retail, warehouse, etc.). Industrial subsectors are by product type (pulp and paper, solid wood products, chemicals, etc.).

supply curves
A curve illustrating the amount of energy (e.g., m^3) or societal benefit available at an appropriate screened price in ascending order of cost.

Total Resource Cost (TRC) Test
A test that compares the total costs of energy efficiency investments, including natural gas conservation programs, to the social cost of natural gas. Un-priced environmental and social costs may be accounted for by changing the cost of either the investment under consideration or the total cost of natural gas in such a way that relative un-priced impacts are reflected. It is used in designing and evaluating programs that are developed from the Energy Efficiency Potential study's results.

utility cost
The total financial cost incurred by the utility to acquire energy resources. For DSM, the costs include all utility program costs, including incentive costs.

watt
The basic unit of measurement of power, at a point in time as capacity or demand.

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #15

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 4, page 8

Please provide the following information with respect to Enbridge's actual/forecast number of power plant customers in the GTA Project Influence Area for each year from 2000 to 2025 inclusive:

a) Number of power plants;

b) Peak hour demands (TJ/hour);

c) Peak day demands (TJ/day); and

d) Annual demands (TJ/year).

RESPONSE

a) There are three large embedded power plants in the GTA Project Influence Area. One commenced gas service prior to 2000, one in 2006, and one in 2008. There is no additional demand from power plants forecasted from 2015 to 2025 in the GTA Project Influence Area.

b) Aggregated peak hour contract demand for the power plants is 5,500 GJ/hr.

c) Aggregated peak day contract demand for the power plants is 131,996 GJ/day.

d) Actual annual demand information for the power plants is confidential and not relevant in this application as the system is designed to accommodate the peak hourly demand.

Witness: E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #16

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex A, Tab 3, Schedule 4

The Government of Ontario is planning to reduce the province's greenhouse gas emissions, relative to 1990 levels, by: a) 6% by 2014; b) 15% by 2020; and c) 80% by 2050.

Does Enbridge have an analysis to show that the projected increase in natural gas consumption in the GTA Project Influence Area is consistent with a politically feasible and cost-effective strategy to achieve Ontario's greenhouse gas emission reduction goals? If yes, please provide.

RESPONSE

Enbridge has not analyzed the projected increase in natural gas consumption in the GTA Project Influence Area in relation to Ontario's greenhouse gas emission reduction goals. Such an analysis is properly the subject of a regional or provincial policy review.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #17

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex A, Tab 3, Schedule 8, page 1

Please state the peak hour (TJ/hour) or peak day (TJ/day) demand in the GTA Project Influence Area that would cause the pressure at Station B in the 2015/2016 heating season to drop below minimum system requirements.

RESPONSE

As summarized in Exhibit A, Tab 3, Schedule 4, Table 3, forecast peak load will drop the system below minimum system pressure required by winter 2015/16. Specifically a forecast load of 3037 10^3m^3/hr would cause the XHP system to drop below the minimum system pressure required.

Witness: E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #18

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex A, Tab 3, Schedule 7, page 3

Please explain why Enbridge believes that "[c]onservation efforts… cannot be expected to replace the capacity within the system due to the lowering of pressures on large diameter, higher pressure lines."

RESPONSE

Enbridge believes that the magnitude of conservation required to replace the capacity within the system due to the lowering of pressures on large diameter, higher pressure lines is too large to be achievable. Based on estimates consistent with those shown in the response to Environmental Defence Interrogatory #14 found at Exhibit I.A4.EGD.ED.14, the DSM requirement needed to lower the pressure as proposed in the NPS 26 and NPS 30 Don Valley line would be a greater than a 20-fold increase in the GTA. In addition to the sheer scale of the conservation that would be required, the certainty of achieving the conservation targets is unknown. Magnitude and certainty make conservation a non-viable option for replacing capacity as a result of lowering pressures in existing infrastructure.

The primary purpose of the application is for increased safety and reliability in the delivery of natural gas, as stated in Exhibit A, Tab 3, Schedule 1. Enbridge is of the opinion that even if load growth and lowered capacity were offset by efficiency gains, which we do not believe is a reasonable assumption, that the proposed facilities would not be significantly altered, as they are required to meet the other objectives of the project.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #19

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex A, Tab 3, Schedule 7, pages 15 & 16

In its analysis of alternatives, Enbridge states as follows:

As mentioned in Exhibit A, Tab 3, Schedule 2, the need for the pipeline NPS 36 XHP segment from Keele/CNR Station to the NPS 30 Don Valley line was originally identified as Parkway Phase 3. This project was initially planned in the early 1990's, then revisited in the early 2000's, but postponed until now since the additional west to east gas transportation volumes could be delivered by TransCanada under short haul contracts.

a) When did Enbridge start to analyse the potential for incremental DSM programs and budgets to defer the need for some or all of the proposed GTA Pipeline Project? Please provide copies of the written materials prepared by Enbridge in this regard corresponding to this start date.

b) Please state the dates (if any) when Enbridge consulted with the DSM Consultative regarding the potential for incremental DSM programs and budgets to avoid or defer the need for some or all of the proposed GTA Pipeline Project? Please provide copies of the written materials that were provided to the DSM Consultative participants on this matter.

RESPONSE

a) In the screening phase of potential alternatives increased DSM was reviewed but was screened out as an alternative. Although it had some potential for decreasing peak loads, DSM could not be expected to meet the other objectives, specifically dealing with the supply chain reliability issues, nor could it reasonably be expected to allow for lowering of pressures on the key supply lines within the GTA.

b) Enbridge did not consult with the DSM Consultative with respect to this project.

Witness: C. Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #20

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 7, pages 1-3

Has Enbridge analysed the potential for incremental DSM measures, programs and budgets to defer the need for all or part of the proposed GTA Pipeline Project? If yes, please provide copies of all of these analyses and studies.

RESPONSE

The GTA Project has multiple purposes. It meets customer growth, reduces operational risks, enhances safety and reliability, provides entry point diversity, improves supply chain diversity and reduces upstream supply risks and costs. (See Exhibit A, Tab 3, Schedule 1).

DSM may be able to address some of the growth demand, but not reliability, entry point and distribution system diversity, or supply chain needs. If there were no load growth, all of the project facilities would be required in order to meet the other objectives.

Considering a "growth only" scenario alone:

- The growth forecast has already incorporated conservation at current levels.
- To offset all the forecasted growth, it is estimated that an overall DSM budget twice the current level, with the entirety of the incremental spend used for the GTA Project Influence Area, is required every year moving forward.
- The "growth only" component of the GTA Project, namely the extension of the NPS 36 line from Sheppard north to McNicol Avenue is estimated to cost \$40M to \$50M.[1]

[1] Unclassified estimate.

Witnesses: J. Ramsay
R. Sigurdson
C. Fernandes

- The timeframe required to increase DSM programs is insufficient given the scale and date the delivered results are required.
- It is uncertain whether and when the conservation targets can be achieved, noting the fact that the Company has not fully utilized its budget opportunity historically.

Given the uncertainty and challenge in scaling DSM programs to address the growth objective, and given that reliability and upstream concerns (as stated in Exhibit A, Tab 3, Schedule 5) cannot be resolved by any DSM efforts, DSM measures are not a viable alternative to the GTA Project. As a result, no in-depth analysis of potential incremental DSM measures, programs and budgets was undertaken.

Witnesses: J. Ramsay
R. Sigurdson
C. Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #21

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 8, page 1

a) Please state the forecast dollar impact of the GTA Pipeline Project on Enbridge's revenue requirement in: a) 2016; b) 2017; and c) 2018.

b) Please state the forecast percentage increase in Enbridge's distribution rates in: a) 2016; b) 2017; and c) 2018 due to the GTA Pipeline Project. Please also provide the forecast percentage rate increases in each of these three years for each of Enbridge's customer classes (e.g., residential, small commercial, large commercial, small industrial, large industrial).

RESPONSE

a) The forecast revenue requirements of the project for 2016, 2017, and 2018 are $57.6 million, $57.0 million and $56.3 million[1].

b) The total revenue requirement of the GTA Project for 2016 is $57.6 million. TCPL's shared portion of Segment A is $11.8 million resulting in a net revenue requirement to be recovered from EGD's customers of $45.8 million. The estimated annual rate impact for 2016 (relative to existing April 1, 2013 QRAM rates) for the GTA Project by customer rate class is as follows:

[1] Please see response to Board Staff Interrogatory #48 found at Exhibit I.D5.EGD.STAFF.48 and the response to CME Interrogatory #10 found at I.A3.EGD.CME.10 for details.

Witnesses: K. Culbert
A. Kacicnik

		BUNDLED RATES		
Rate Class		Sales Service		T-Service
1		1.4%		2.1%
6		1.5%		2.9%
9		0.5%		0.9%
100		0.7%		1.9%
110		0.7%		1.9%
115		0.5%		1.3%
135		0.2%		0.6%
145		0.6%		1.5%
170		0.2%		0.7%
200		1.6%		3.8%
		UNBUNDLED RATES		
125		23.9%		
300		8.7%		

Based on the Rate 1 rate class average, a residential customer on sales or t-service will see an annual increase of approximately $11.6 annually or $1 per month. As the change in revenue requirement for 2017 and 2018 are a slight decrease, all other things being equal, there would be a slight decrease in rates for these years.

Please note the rate impacts depicted above are based solely on the increase in EGD's revenue requirement stemming from the GTA Project. However, as indicated at Exhibit E, Tab 1, Schedule 1, Page 8, the Company has identified significant savings in gas transportation costs resulting from the GTA proposal. These gas cost savings will flow through to customer's rates and bills through a reduction in EGD's annual forecast of gas costs (relative to today's status quo scenario). For 2016, the total savings identified for EGD's sales and western t-service customers as well as potential savings for its Ontario T-service customers is $148.9 million. EGD's sales and western t-service customer's portion is approximately $92.2 million. Therefore, the 2016 net impact on EGD's customer's bills would be a reduction in revenue requirement of $34.6 million ($57.6 – $92.2). The estimated annual rate impact for 2016 (relative to existing April 1, 2013 QRAM rates) for the

GTA Project and forecast gas transportation savings by customer rate class is as follows:

	BUNDLED RATES	
Rate Class	**Sales Service**	**T-Service**
1	-1.4%	-2.2%
6	-1.7%	-3.3%
9	-6.3%	-10.8%
100	-1.4%	-3.6%
110	-1.4%	-3.6%
115	0.5%	1.3%
135	-4.1%	-12.0%
145	-2.4%	-6.4%
170	-1.4%	-4.7%
200	-4.0%	-9.6%
	UNBUNDLED RATES	
125	23.9%	
300	8.7%	

Based on the Rate 1 rate class average, a residential customer on sales or t-service will see an annual decrease of approximately $10.6 annually or $1 per month.

Witnesses: K. Culbert
A. Kacicnik

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #22

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 3, page 11

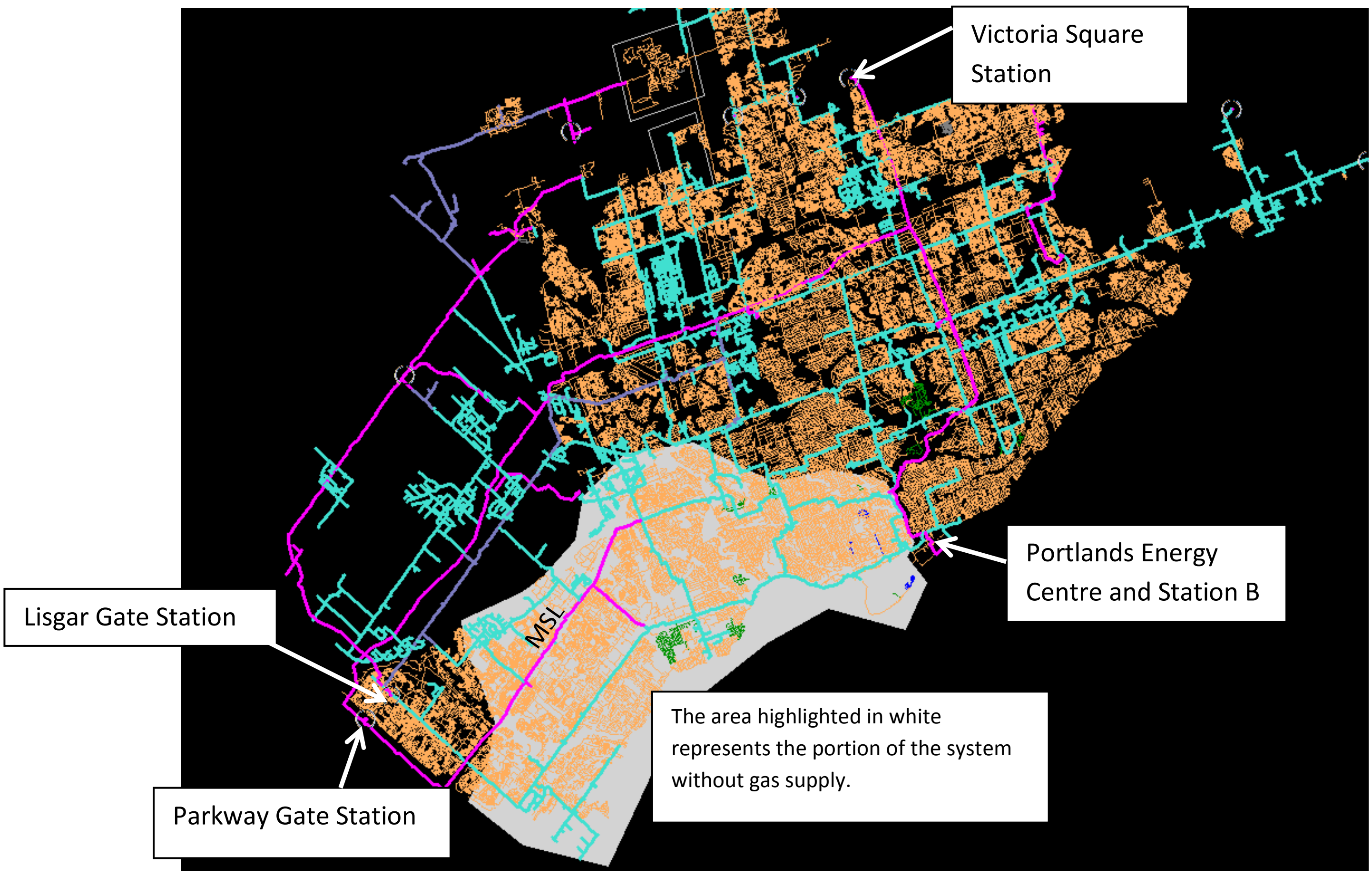
What is the probability of an outage of approximately 270,000 residential customers plus PEC at a 35 DD due to the loss of the Parkway Gate Station? Please provide Enbridge's studies to support its estimate.

RESPONSE

Enbridge has completed a network simulation at a 35DD that considered the loss of the Parkway Gate Station. This includes the loss of the Parkway North Pipeline and the MSL Pipeline. The results of this simulation are shown in Figure 1 on the following page. The estimated customer loss in the white highlighted area is 270,000 which includes downtown Toronto, Etobicoke and most of Mississauga. The highlighted area represents the estimated geographical area that would experience low pressures (please see Figure 1 below). Power generators in those areas would also lose supply. With the loss of supply at Parkway, the system flows are redirected to Lisgar and Victoria Square Stations. These stations are interconnected via the XHP grid, shown as purple in Figure 1 below, and will support much of the system to the north. However, this results in lower pressures on the Don Valley line at Station B, and with no flow on the MSL, the customer loss is concentrated around the MSL pipeline which extends into the downtown core of Toronto.

Witness: E. Naczynski

Figure 1: Estimated area of impact with loss of Parkway Gate Station



Enbridge has not completed a site specific study of Enbridge Parkway Gate Station to determine the probability of loss of this facility. Enbridge does not have details of the probability of loss of facilities relating to the loss of the Union Parkway Station or the loss of the Dawn to Parkway Transmission pipeline, as these facilities are owned and operated by Union.

Union's EB-2012-0433 discusses the reliability of Parkway. Please see Section 8, page 71, paragraph 29 to 30.

Witness: E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #23

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. A, Tab 3, Schedule 3, page 11

According to the Northeast Power Coordinating Council, the probability (or risk) of disconnecting firm load from our electricity system due to resource deficiencies shall be, on average, not more than one day in ten years. [Independent Electricity System Operator, *Ontario Reserve Margin Requirements: 2013-2017*, page 2]

> What is the probability of disconnecting firm load from Enbridge's gas distribution system due to resource deficiencies in the GTA Project Influence Area?

RESPONSE

In the EB-2011-0354 proceeding the Board approved an update to the Design Criteria used by the Company to determine its upstream supply, transportation and storage requirements. For 2014 and beyond the Company will be developing its supply portfolio based on the full implementation of the updated Design Criteria. The updated Design Criteria utilize a recurrence interval of 1 in 5 years. This corresponds to a 20% probability that actual weather conditions will be equal to or greater than design weather conditions in any given year. These design weather conditions are utilized to determine peak day demand.

In responding to this interrogatory the Company is assuming that "resource deficiencies" refers to either a lack of supplies and/or upset conditions related to upstream transportation or storage and/or upset conditions on distribution facilities. Assuming there are no upset conditions on upstream or distribution facilities the probability of not being able to meet demand is 20% in any given year.

Witness: J. Denomy

It should be noted that unsecured supplies and discretionary supplies comprise a large portion of the Company's supply portfolio. Should design conditions occur there is no guarantee that unsecured supplies will be available when required. Should the Tariff amendments requested by TransCanada in its Review & Variance Application with the National Energy Board be approved there is no guarantee that discretionary supplies will be available when required.

Witness: J. Denomy

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #24

INTERROGATORY

Issue A4: “What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?”

Reference: Ex. A, Tab 3, Schedule 4, page 1 & 2

Enbridge’s growth forecast relates to the “GTA Project Influence Area.” This is described by Enbridge as “the areas of the Enbridge distribution network where growth had a direct impact on the pressures at the current point of minimum system pressure, located at Station B.”

a) Please provide a map indicating the detailed boundary of the GTA Project Influence Area.

b) Please describe the boundary of the GTA Project Influence Area using street names and intersections.

c) Assuming that the load growth to be addressed by the proposed facilities were to be instead addressed by targeted DSM (and assuming that this is possible), could that DSM be implemented in any of the 152 smaller geographic areas inside the larger GTA Project Influence Area? For example, would targeted DSM need to be predominantly located in an area nearby to station B or in areas served by proposed segment B?

d) If targeted DSM would need to be located in a sub-area inside the larger GTA Project Influence Area, please:

   i. Provide a map and detailed written description of that DSM sub-area,

   ii. Explain why the project can be justified based on all growth within the GTA Project Influence Area but demand reductions in this same area could not address load growth issues, and

   iii. Provide additional set answers to Environmental Defence’s interrogatory numbers 2-15, 17, 25, and 26 based on this DSM sub-area (i.e. with necessary modifications to provide responses with respect to this sub-area rather than the entire GTA Pipeline Project Influence Area.

Witness: E. Naczynski

RESPONSE

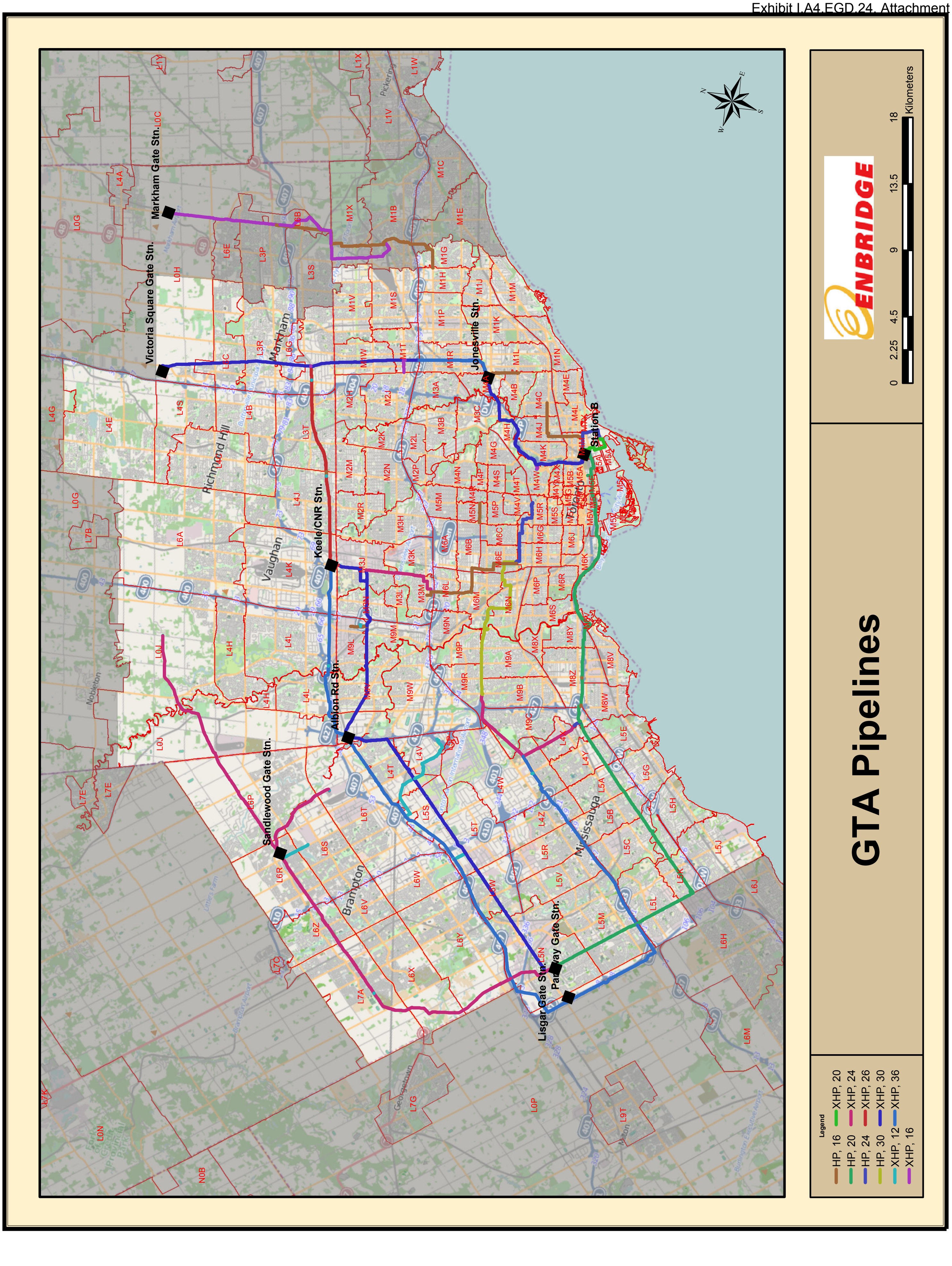
a) Please see the Attachment for a map with the boundaries of the GTA Project Influence Area.

b) Please see the Attachment for a map with the boundaries of the GTA Project Influence Area.

c) Enbridge does not believe that targeted DSM can eliminate the need for some or all of the proposed facilities as described in the response to Environmental Defence Interrogatory #20 found at Exhibit I.A4.EGD.ED.20.

d) Enbridge does not believe that targeted DSM can eliminate the need for some or all of the proposed facilities as described in the response to Environmental Defence Interrogatory #20 found at Exhibit I-A4.EGD.ED.20.

Witness: E. Naczynski


GTA Pipelines
ENBRIDGE
Legend
HP, 16
HP, 20
HP, 24
HP, 30
XHP, 12
XHP, 16
XHP, 20
XHP, 24
XHP, 26
XHP, 30
XHP, 36
0
2.25
4.5
9
13.5
18
Kilometers
Markham Gate Stn.
Victoria Square Gate Stn.
Jonesville Stn.
Station B
Keele/CNR Stn.
Albion Rd Stn.
Sandlewood Gate Stn.
Parkway Gate Stn.
Lisgar Gate Stn.
Richmond Hill
Markham
Vaughan
Brampton
Mississauga
Toronto
Pickering
Georgetown
Milton
Nobleton

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #25

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex A, Tab 3, Schedule 4 and 7

Please fill in Tables 1 to 5 appearing below. Please use the same figures as were used to create Enbridge's forecast appearing at Exhibit A, Tab 3, Schedule 4 (e.g. re forecast DSM impacts). For tables 1 to 3, please base the demand/supply balance on the forecast of actual demand, net of the forecast DSM. The tables are entitled as follows:

a) Table 1: GTA Project Influence Area Peak Hour Demand/Supply Balance: 2000 to 2025

b) Table 2: GTA Project Influence Area Peak Day Demand/Supply Balance: 2000 to 2025

c) Table 3: GTA Project Influence Area Annual Demand/Supply Balance: 2000 to 2025

d) Table 4: Impact of Enbridge's Year 2000 to Year 2025 DSM Programs on Demand for Natural Gas in GTA Influence Project Area

e) Table 5: Impact of Enbridge's Year 2000 to Year 2025 DSM Programs on Demand for Natural Gas in Ontario

Witnesses: J. Denomy
F. Oliver-Glasford
T. MacLean
E. Naczynski
J. Ramsay

Table 1: GTA Project Influence Area Peak Hour Demand/Supply Balance: 2000 to 2025

	2000	2001	2002																						2025
Peak Hour Demand (TJ/hour)																									
Existing Peak Hour Capacity (TJ/hour)																									
Capacity Surplus/Deficit (TJ/hour)																									
Proposed GTA Project Incremental Capacity (TJ/hour)																									
Capacity Surplus/Deficit with GTA Project in service (TJ/hour)																									

Table 2: GTA Project Influence Area Peak Day Demand/Supply Balance: 2000 to 2025

	2000	2001	2002																							2025
Peak Day Demand (TJ/day)																										
Existing Peak Day Capacity (TJ/day)																										
Capacity Surplus/Deficit (TJ/day)																										
Proposed GTA Project Incremental																										

Witnesses: J. Denomy
F. Oliver-Glasford
T. MacLean
E. Naczynski
J. Ramsay

Capacity (TJ/day)																										
Capacity Surplus/Deficit with GTA Project in service (TJ/day)																										

Table 3: GTA Project Influence Area Annual Demand/Supply Balance: 2000 to 2025

	2000	2001	2002																							2025
Annual Demand (TJ/year)																										
Existing Annual Capacity (TJ/year)																										
Capacity Surplus/Deficit (TJ/year)																										
Proposed GTA Project Incremental Capacity (TJ/year)																										
Capacity Surplus/Deficit with GTA Project in service (TJ/year)																										

Witnesses: J. Denomy
F. Oliver-Glasford
T. MacLean
E. Naczynski
J. Ramsay

Table 4: Impact of Enbridge's Year 2000 to Year 2025 DSM Programs on Demand for Natural Gas in GTA Project Influence Area

	Year 2000 DSM Programs	Year 2001 DSM Programs																								Year 2025 DSM Programs
Peak Hour Demand (TJ/hour)																										
Peak Day Demand (TJ/day)																										
Annual Demand (TJ/year)																										

Table 5: Impact of Enbridge's Year 2000 to Year 2025 DSM Programs on Demand for Natural Gas in Ontario

	Year 2000 DSM Programs	Year 2001 DSM Programs																								Year 2025 DSM Programs
Peak Hour Demand (TJ/hour)																										
Peak Day Demand (TJ/day)																										
Annual Demand (TJ/year)																										

Witnesses: J. Denomy
F. Oliver-Glasford
T. MacLean
E. Naczynski
J. Ramsay

RESPONSE

a) The response to a) b) and c) will be answered in aggregate.

Table 1 provides actual peak hour, peak day and annual demands for the GTA Project Influence Area. Actual peak hour data are measured at the gate station and are available back to 2008, whereas peak day demand and annual demands are available back to 2000. Since 2013 is not yet complete annual demand is provided to 2012. Peak hour and peak day data for 2013 assume that peak hour or peak day have already occurred. The data presented in Table 1 are not normalized for design conditions.

Table 1

GTA Project Influence Area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Peak Hour Demand (TJ)									95.7	96.9	93.0	100.5	88.7	102.6
Peak Day Demand (TJ)	1,949.9	1,625.5	1,721.1	2,033.0	2,128.8	2,099.1	1,664.0	2,035.9	1,849.1	1,925.9	1,895.3	1,995.8	1,883.3	2,065.7
Annual Demand (TJ)	270,442.3	252,939.9	269,011.2	273,582.6	278,974.8	277,267.3	254,287.5	275,386.8	277,375.8	269,756.5	264,007.1	273,960.7	253,704.6	

Total system demands for base loads and incremental load growth have been provided in the response to Environmental Defence Interrogatory #3 found at Exhibit I.A4.EGD.ED.3. In effort to assist with the understanding of available system capacity Table 2 provides an analysis that has been completed at Station B, the location that will experience the lowest pressures on the XHP grid.

Table 2

	Capacity Surplus / (Deficit)	Capacity Surplus / (Deficit)
2015 / 2016 Winter Existing System	(15 $10^3 m^3$/hr)	(10 TJ/day)
2015 / 2016 Winter with Proposed Facilities	210 $10^3 m^3$/hr	160 TJ/day
2024 / 2025 Winter with Proposed Facilities	170 $10^3 m^3$/hr	130 TJ/day

Witnesses: J. Denomy
F. Oliver-Glasford
T. MacLean
E. Naczynski
J. Ramsay

b) See the response to a) above.

c) See the response to b) above.

d) Table 4: Impact of Enbridge's Year 2000 to Year 2025 DSM Programs on Annual Demand for Natural Gas in GTA Project Influence Area. Please note that 2013 to 2025 figures are forecasts only.

Please see response to Environmental Defence Interrogatory# 14 found at Exhibit I.A4.ED.14 for peak day and peak hour DSM impacts on natural gas consumption in the GTA Project Influence Area.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual Demand (10^3m^3)	34,138	46,167	45,682	45,251	41,128	53,022	51,922	53,314	46,565	40,517	38,063	44,806	35,831	38,856	44,109	44,109	44,109	44,109	44,109	44,109	44,109	44,991	45,891	46,808	47,745	48,699

*2005 Program year includes three month stub period

e) Table 5: Impact of Enbridge's Year 2000 to Year 2025 DSM Programs on Annual Demand for Natural Gas in Ontario. Please note that 2013 to 2025 figures are forecasts only.

Please see response to Environmental Defence Interrogatory #14 found at Exhibit I.A4.EGD.ED.14 for peak day and peak hour DSM impacts on natural gas consumption in the Enbridge's total franchise area.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual Demand (10^3m^3)	58,859	79,599	78,761	78,020	70,910	91,418	89,520	91,921	80,285	69,857	65,625	77,252	61,778	66,993	76,049	76,049	76,049	76,049	76,049	76,049	76,049	77,570	79,122	80,704	82,318	83,964

*2005 Program year includes three month stub period

Witnesses: J. Denomy
F. Oliver-Glasford
T. MacLean
E. Naczynski
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #26

INTERROGATORY

Issue A4: “What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?”

Reference: Ex. A, Tab 3, Schedule 7, pages 1 – 3

a) Please provide Enbridge’s forecast annual province-wide DSM budgets for each year from 2013 to 2025 inclusive.

b) Please provide Enbridge’s forecast of the cumulative impact of its 2013 to 2025 DSM programs on the peak hour, peak day and annual demand for natural gas for each year from 2013 to 2025 inclusive.

c) Please provide Enbridge’s forecast expenditures on DSM activities occurring in the GTA Project Influence Area for each year from 2013 to 2025 inclusive.

d) Please provide Enbridge’s forecast of the cumulative impact of its 2013 to 2025 DSM programs on the peak hour, peak day and annual demands for natural gas in the GTA Project Influence Area for each year from 2013 to 2025 inclusive.

e) Please provide Enbridge’s forecast of its Ontario customers’ peak hour, peak day and annual demands for natural gas (net of DSM) for each year from 2013 to 2025 inclusive.

f) Please provide Enbridge’s forecast of its GTA Project Influence Area’s customers’ peak hour, peak day and annual demands for natural gas (net of DSM) for each year from 2013 to 2025 inclusive.

RESPONSE

26 a – d) Please see response to Environmental Defence Interrogatory #14 found at Exhibit I.A4.EGD.ED.14 (part a).

Witnesses: C. Fernandes
T. Maclean
F.Oliver-Glasford
J. Ramsay

26 e) The application deals with facilities in the GTA only. Enbridge has not compiled information for its entire franchise in a comparable fashion and this information is not available.

f) Please see response to I.A4.EGD.ED.5

Witnesses: C. Fernandes
T. Maclean
F.Oliver-Glasford
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #27

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference Ex. A, Tab 3, Schedule 7, pages 1 - 3

Please provide Enbridge's best estimates of the rise in its after-tax net income in each year from 2014 to 2025 (inclusive) if it implemented incremental DSM programs that were sufficient to avoid the need for its proposed new GTA pipelines from a load growth perspective? Please clearly state and show all your assumptions and analyses.

RESPONSE

As per the response to Environmental Defence Interrogatory #14 and #20 found at Exhibit I.A4.EGD.ED.14 and Exhibit I.A4.EGD.ED.20, Enbridge does not believe it is feasible to implement incremental DSM programs to offset the overall need for the GTA Project. The increase in DSM required to offset the load growth component of the GTA Project would impact the overall DSM framework and therefore any calculations of after-tax net income would be speculative at best.

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #28

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference: Ex. C, Tab 2, Schedule 1, Page 1

Please state Enbridge's incremental cost of connecting its system to Union's proposed Parkway West Gate Station (to achieve increased diversity of supply) assuming DSM has eliminated demand growth and hence the need for increased pipeline capacity to meet the needs of customers in the GTA Project Influence Area.

RESPONSE

Cost breakdown information is available only to those who have signed a Declaration and Undertaking as the information is confidential.

It should be noted that even if demand growth is eliminated, there is still the need for the pipeline. Please refer to Exhibit A, Tab 3, Schedule 1 for the purpose and need of the project.

Witness: T. Horton

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #28

INTERROGATORY

Issue A4: “What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?”

Reference: Ex. C, Tab 2, Schedule 1, Page 1

Please state Enbridge’s incremental cost of connecting its system to Union’s proposed Parkway West Gate Station (to achieve increased diversity of supply) assuming DSM has eliminated demand growth and hence the need for increased pipeline capacity to meet the needs of customers in the GTA Project Influence Area.

RESPONSE

Cost breakdown information is available only to those who have signed a Declaration and Undertaking as the information is confidential.

It should be noted that even if demand growth is eliminated, there is still the need for the pipeline. Please refer to Exhibit A, Tab 3, Schedule 1 for the purpose and need of the project.

Witness: T. Horton

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #29

INTERROGATORY

Issue A4: "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Reference Ex. A, Tab 3, Schedule 6

Please provide Enbridge's best estimates of the rise in its after-tax net income in each year from 2014 to 2025 inclusive if the OEB approves its proposed GTA pipeline project. Please clearly state and show all your assumptions and analyses.

RESPONSE

The current estimates of the 2015-2025[1] net income amounts associated with the proposed GTA Project are shown within the attached table[2]. The projected earnings amounts include an assumed 36% equity level of forecast rate base amounts with an allowed Return on Equity equivalent to the 2013 Board approved ROE % of 8.93%.

[1] The GTA Project is planned to be in service in 2015, therefore the net income amount in 2014 is not applicable.
[2] For reasons described in interrogatory response I.D5.EGD.Staff.48, the net income amounts assume Segment A's Bram West to Albion is a 36" pipeline.

Enbridge Gas Distribution GTA Project assumed earnings impacts

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Rate Base (A)	$ 113,621,514	$ 543,728,240	$ 527,457,354	$ 511,186,371	$ 494,915,292	$ 478,644,117	$ 462,874,907	$ 447,087,923	$ 430,781,104	$ 414,474,199	$ 398,167,218
Common Equity (B)	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%	36.00%
Allowed Return on Equity (C)	8.93%	8.93%	8.93%	8.93%	8.93%	8.93%	8.93%	8.93%	8.93%	8.93%	8.93%
Earnings (A x B x C)	$ 3,652,704	$ 17,479,775	$ 16,956,699	$ 16,433,619	$ 15,910,537	$ 15,387,451	$ 14,880,503	$ 14,372,983	$ 13,848,751	$ 13,324,517	$ 12,800,280

Notes; 1) Using data which assumes Segment A's Bram West to Albion is a 36" pipeline.
2) Using the 2013 OEB approved ROE% for approximating purposes.

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #39

INTERROGATORY

Issue A.4 "What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?"

Interrogatory No. A.4-ED-39 Reference: Ex. A, Tab 3, Schedule 1

a) Please provide a table indicating the following estimates for each year from 2014 to 2025 for the GTA Project Influence Area:

   i. The estimated reduction in peak hourly consumption (GJ/hour) resulting from industrial DSM as assumed in Enbridge's growth forecast at Exhibit A, Tab 3, Schedule 4;

   ii. The estimated reduction in peak hourly consumption (GJ/hour) resulting from the implementation of all industrial DSM programs with a TRC benefit-cost ratio of 1 or greater; and

   iii. The estimated yearly resource acquisition industrial DSM budget needed to implement all industrial DSM programs with a TRC benefit-cost ratio of 1 or greater.

   Please show your analysis and state all assumptions.

b) If targeted DSM necessary to defer or avoid the GTA Project must be located in a certain sub-area inside the overall GTA Project Influence Area (as discussed in Environmental Defence's interrogatory no. A.4-ED-24), please also provide the above-described table based on that targeted DSM sub-area.

Witnesses: F. Oliver-Glasford
T. MacLean
J.Ramsay

<u>RESPONSE</u>

a)

i. Please see below the chart requested in I.A4.EGD.ED.39a) i.

Please also note that Enbridge does not communicate, measure or interpret DSM reductions on a peak hour basis. The above calculations of DSM's impact on peak hour demand have been created using a set of theoretical assumptions listed in I.A4.ED.14 a). These assumptions include:

- the use of a linear conversion ratio to derive peak day from annual figures and peak hour from peak day;
    - In practice the conversion ratio will not be linear and will vary between DSM measures and customer segments.
- static cost effectiveness as conservation budgets increase (i.e. each incremental m3 saved is priced at the same as the first m3).

Peak Hour Demand reduction GTA Area	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
(10^3m^3)	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
GJ	54.5	54.5	54.5	54.5	54.5	54.5	54.5	54.5	54.5	54.5	54.5	54.5

ii. The data required to provide this analysis is not available to Enbridge. A 2008 DSM Potential Study filed as EB-2011-0295 Ex.B, Tab 2, Sch. 7, estimated the potential results from implementation of all industrial DSM programs with a TRC benefit-cost ratio of 1 or greater across the franchise area. While the GTA Project Area represents approximately 48% of the customers across the franchise area, it does not represent 48% of the industrial customers. As a result, the Company cannot extrapolate the Potential Study results to the GTA Area.

iii. See response to item (ii) above.

b) Please see the Response to Environmental Defence Interrogatory #24 at Exhibit I.A4.ED.24.

Witnesses: F. Oliver-Glasford
T. MacLean
J.Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #40

INTERROGATORY

Interrogatory No. A.4-ED-40 Reference: Ex. E, Tab 1, Schedule 1

Please provide Enbridge's best estimates of the economic benefits in each year from 2013 to 2025 inclusive of DSM measures that would be sufficient to avoid the need for increased pipeline capacity to meet the forecast rising demand for natural gas in the GTA Project Influence Area. For each year please fully break out the economic benefits according to major avoided cost categories, e.g., capital costs, gas commodity costs, upstream demand and fuel charges, operations and maintenance costs etc. Please also break out for each year the avoided peak hour, peak day and annual avoided gas volumes in TJ.

Please provide the avoided cost estimates in nominal and constant real dollars.

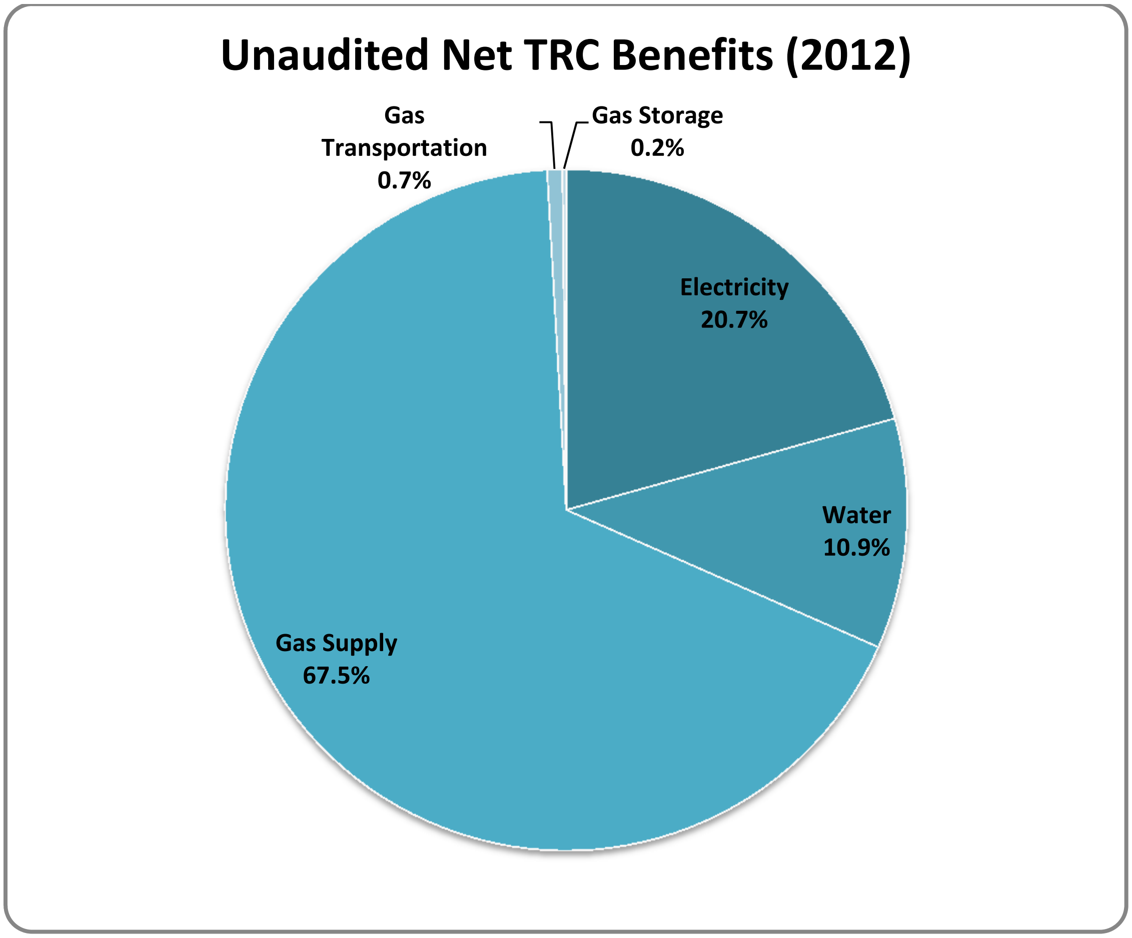
Please fully describe the facilities that will no longer be needed if DSM avoids the need for new pipeline capacity to meet the forecast rising demand for natural gas in the GTA Project Influence Area.

RESPONSE

Enbridge does not believe that increased DSM can realistically be expected to offset the forecast load growth as per Environmental Defence Interrogatory #14 at Exhibit I.A1.EGD.ED.14 (f). As per Environmental Defence Interrogatory # 34 at Exhibit I.A1.EGD.ED.34 the facilities would still be required even under a no load growth scenario.

In the interest of breaking out the economic benefits of Enbridge's DSM efforts, please see below the unaudited Net TRC Benefits of the Company's DSM activities in 2012 broken into major avoided cost categories. These figures use a discount rate to account for the present value of economic benefits in future years. For more detail regarding Enbridge's Avoided Cost calculation, please see EB-2012-0394 Exhibit B, Tab 2, Schedule 3.

Witnesses: C. Fernandes
F. Oliver-Glasford
T. Maclean
J. Ramsay



	Unaudited Net TRC Benefits (2012)
Electricity	$36,380,414
Water	$19,224,795
Gas Supply	$118,783,834
Gas Transportation	$1,268,019
Gas Storage	$312,408
TOTAL	**$175,969,470**

Witnesses: C. Fernandes
F. Oliver-Glasford
T. Maclean
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #41

INTERROGATORY

Interrogatory No. A.4-ED-41 Reference: Ex. A, Tab 3, Schedule 7, Page 1-3

a) How many customer representatives (i.e. energy solutions consultants) are employed by Enbridge on its commercial resource acquisition DSM programs?

b) Please state the number of commercial customers that Enbridge's customer representatives spoke with annually from 2008 to 2012 (inclusive). If possible, please also provide a breakdown by contact method, such as workshops, face-to-face contact, phone calls, etc.

c) Please state the number of commercial customer projects that are identified each year from 2008 to 2012 (inclusive). Of those projects, how many were implemented?

d) For each year from 2008 to 2012 (inclusive), please state the average reduction in peak hourly gas consumption per commercial DSM customer representative per year?

e) Please describe the means by which Enbridge contacts customers with respect to its commercial resource acquisition DSM programs. Please provide a breakdown the proportion of customers that are contacted by the various methods.

RESPONSE

a) While Enbridge's Commercial DSM energy solutions team currently consists of 25 personnel, the number of personnel in the group varies over time based on programs and market conditions. It is important to note, however, that this team alone is not representative of Enbridge's overall customer outreach strategy in the Commercial DSM sector. The Company works with a variety of partners on customer outreach including, but not limited to, engineering firms, consulting firms, industry associations, contractors and manufacturers. Any analysis of Enbridge's commercial DSM customer contact efforts would be incomplete without consideration of these external partners.

b) Enbridge does not track the number of conversations conducted by energy solutions consultants. Enbridge's energy solutions consultants frequently attend workshops, trade shows, association gatherings and other events both as public speakers and general participants. Enbridge would estimate the number of conversations to have taken place between 2008 and 2012 to be in the thousands.

c) Please see below a chart outlining the number of commercial units/participants tracked in Enbridge's Commercial DSM programs from 2008 to 2012. Commercial "customer projects", as requested, would include both custom projects and installations of prescriptive measures. Enbridge's primary tracking system tracks DSM prescriptive program results by unit of technology installed rather than by project. Some commercial customer sites may have more than one prescriptive measure installed in a given year.

Please note that the 2012 unit/participant numbers are currently unaudited and do not include low income/non-profit multi-residential projects which, under the previous framework, would have been accounted for in the commercial portfolio.

	2008	2009	2010	2011	2012
Commercial Units/Participants	25,055	44,653	40,071	31,612	10,752

d) Due to changes in personnel, programs, market conditions, and internal structure, it is difficult to accurately capture the number of customer representatives working in the commercial sector for historical years. As such, the below chart assumes that the current number of commercial customer representatives remains constant from 2008 to 2012.

Witnesses: F. Oliver-Glasford
T. MacLean
J.Ramsay

	2008	2009	2010	2011	2012
Estimated Reduction in Peak Hourly Consumptions resulting from Commercial Measures (10^3m^3)	15	13	14	19	16
# of Commercial Customer Representatives	25	25	25	25	25
Average Peak Hour Reduction per Commercial Customer Representative (10^3m^3)	0.58	0.54	0.58	0.78	0.63

Please also note that Enbridge does not communicate, measure or interpret DSM reductions on a peak hour basis. The above calculations of DSM's impact on peak hour demand have been created using a set of theoretical assumptions listed in Environmental Defence Interrogatory 14a) at Exhibit I. A4.EGD.ED.14 a). These assumptions include:

- the use of a linear conversion ratio to derive peak day from annual figures and peak hour from peak day;
  - In practice the conversion ratio will not be linear and will vary between DSM measures and customer segments.
- static cost effectiveness as conservation budgets increase (i.e. each incremental m3 saved is priced at the same as the first m3).

e) Enbridge contacts commercial customers through the following means:

- Direct Sales through customer representatives
- Indirect Sales through stakeholders such as contractors, engineers, distributors, manufacturers, associations, property management companies, etc.

Witnesses: F. Oliver-Glasford
T. MacLean
J.Ramsay

- Direct Marketing
- Tradeshows, Workshops, Industry Events, Conferences, etc.

Enbridge does not comprehensively track the proportion of customers that are contacted through the aforementioned means.

Witnesses: F. Oliver-Glasford
T. MacLean
J.Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO ENVIRONMENTAL DEFENCE INTERROGATORY #42

INTERROGATORY

Interrogatory No. A.4-ED-42 Reference: Ex. A, Tab 3, Schedule 7, Page 1-3

a) Please state the current total number of Enbridge's commercial customers. Please also provide a breakdown of those customers by type (such as schools, hotels, office buildings, etc.). Please provide all breakdowns of commercial customers by type that are available.

b) Please provide a breakdown of Enbridge's commercial customers by volume of use (i.e. what percentage of the total commercial gas volume would be consumed by the top 10%, 25%, 50%, 75% largest customers). Please indicate the boundaries of each percentile used by volume.

RESPONSE

a)

2012 EGD Commercial Customers	
Sector	## of Customers
Business & Financial Service Industries	15,602
Education Services	2,281
Government Services	701
Health, Social & Other Services	3,882
Hotels	480
Other Utility Industries (Cogen)	134
Recreational & Household Industries	2,915
Transportation and Storage and Utilities	958
Wholesale & Retail Trade	27,277
Other	91,326
	145,556

Witnesses: F. Ahmad
M. Suarez

b) The information available did not lend itself to an ordered grouping that would enable the calculation of total commercial gas volume for the top 10%, 25%, 50%, or 75% within the timeframe required. Instead, commercial volumes are provided here by sector.

2012 EGD Commercial Volumes	
Sector	Volumes (10^6m^3)
Business & Financial Service Industries	220
Education Services	233
Government Services	149
Health, Social & Other Services	191
Hotels	41
Other Utility Industries (Cogen)	389
Recreational & Household Industries	58
Transportation and Storage and Utilities	69
Wholesale & Retail Trade	308
Other	1,643
	3,301

Witnesses: F. Ahmad
M. Suarez

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
ENVIRONMENTAL DEFENCE INTERROGATORY #43

INTERROGATORY

Interrogatory No. A.4-ED-43 Reference: Ex. A, Tab 3, Schedule 7, Page 1-3

a) On average, how long does it currently take Enbridge to complete a commercial customer project (i.e. to begin to achieve savings) from (i) the date of first customer contact and (ii) the date of project application? Please explain.

RESPONSE

i) The sales cycle for Commercial customer projects with existing buildings in the Commercial sector can range from a few months to three years or more. The key factors affecting the sales cycle are:

- Type of technology
- Project scale and complexity
- Customer decision making and approval processes
- Seasonality and customer implementation processes

New Construction projects can have a sales cycle lasting five years or more. The time required for project development will depend on similar factors as for existing buildings. In addition, building owners / developers of new buildings may wait to begin construction until a specified portion of the building is leased. Depending on economic circumstances, a building's construction may be on hold for a year or more.

ii) The customer's application for the project incentive may be completed at various stages in the process. A comparison of the dates of the application and project completion is not a reliable indicator of the length of time to develop a project.

Witnesses: F. Oliver-Glasford
T. MacLean
J.Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
FEDERATION OF RENTAL-HOUSING PROVIDERS OF ONTARIO
INTERROGATORY #30

INTERROGATORY

REF: EB-2012-0451 EX. A, Tab 3 Schedule 3

Please provide a high level cost for the line described in A-1. 5f. assuming the rail line right-of-way or other suitable corridor resulted in limited land acquisition costs (i.e., please provide a high level cost for the construction of the alternative NPS 16 line at the required length)?

RESPONSE

The high level cost of a NPS 16 line $35-45 million excluding IDC and in constant dollars.

Witness: C. Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GAZ METRO INTERROGATORY #4

INTERROGATORY

Issue A4: *What are the alternatives to the proposed facilities? Are any alternatives to the proposed facilities preferable to the proposed facilities?*

Reference: Enbridge's Evidence
Exhibit A, Tab 3, Schedule 5, p. 21

Preamble: In its amendment dated May 15, 2015 Enbridge adds a new facility taken into account in the GTA Project. The creation by TransCanada of a new single point distributor delivery area called Parkway Enbridge CDA.

Request: Please elaborate on the new distributor delivery area.
Please elaborate on the impacts of the new distributor delivery area for ratemaking purposes.

RESPONSE

a) The new distributor area will be created by TransCanada removing the Parkway Enbridge meter from the existing Enbridge CDA and creating a new single point distributor delivery area called Parkway Enbridge CDA. Tolls for this path will be derived in accordance with TransCanada’s NEB approved point-to-point tolling methodology.

b) At this point in time, it is not known what the specific impact on TransCanada tolls will be due to the creation of this new distributor delivery area. The removal of the Parkway-Enbridge meter from the existing Enbridge CDA will impact both the load centre for the Enbridge CDA and the amount of billing determinants for the Enbridge CDA, all else equal.

   Both the NEB Decision related to RH-003-2011 and TransCanada’s Review and Variance Application contemplate five year fixed tolls on the Mainline and a toll stabilization account. Additional billing determinants and associated revenues under both tolling methodologies would flow into the toll stabilization account for future disposition after the five year period is complete, if not sooner. In addition, the methodology for deriving tolls after the five year period is not known at this point in time. Consequently, Enbridge cannot speculate specifically on what the impact on tolls will be.

Witnesses: J. Denomy
A. Kacicnik

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GEC INTERROGATORY #31

INTERROGATORY

Enbridge, Issue A.4.Alternatives, Ref: Exh. A, T3, S7, pp. 1-3, ¶3.

a) Did the Company evaluate the cost-effectiveness of replacing all or part of the proposed GTA Project with additional investment in DSM? If so, please provide all available documentation of this analysis.

b) Assuming that DSM could be made available on a timely and cost- effective basis, what amount of peak load reduction would be required each year – and in which area(s) – to defer the need for various components of the GTA project?

RESPONSE

a) and b)

Please refer to Environmental Defence Interrogatory #14 at Exhibit I.A4.EGD.ED.14.

Witness: C.Fernandes

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GEC INTERROGATORY #32

INTERROGATORY

Enbridge, Issue A.4.DSM Avoided Cost, Ref: Exh. A, T3, S7, pp. 1-3, ¶3.

a) Please provide the avoided costs that the Company has used in screening and evaluating its DSM programs for each year since 2003.

b) Please provide the derivation of the avoided costs that Enbridge has used in screening and evaluating its DSM programs for each year since 2003.

c) Please provide all workpapers and the derivation of all inputs supporting the avoided costs in EB-2012-0394, Exhibit B, Tab 2, Schedule 2, page 7.

d) Please explain how the Company has reflected the difference in load shape in the avoided costs applied to various end uses, including space heating, water heating, and industrial load.

e) Please explain how the Company estimates avoided costs of local transmission and distribution equipment due to DSM.

f) Please provide an electronic copy of the spreadsheet(s) used by the Company to conduct the TRC cost-effectiveness screening for its 2013-2014 DSM Plan (e.g. to produce the results reported in EB-2012-0394, Exh. B, T2, S3, pp. 2-3).

RESPONSE

a) Please refer to the following Ontario Energy Board (OEB) case numbers which provide the avoided costs and the derivation of the avoided costs that the Company has used in screening and evaluating its DSM programs for each year since 2003.

RP-2002-0133 Exhibit A7, Tab 3, Schedule 4;
RP-2003-0048 Exhibit A, Tab 8 Schedule 4;
RP-2003-0203 Exhibit A7, Tab 2, Schedule 3;

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

EB-2005-0001 Exhibit A7, Tab 5, Schedule 1;
EB-2006-0021 Exhibit A, Tab 9, Schedule 1;
EB-2009-0154 Exhibit B, Tab 3, Schedule 6;
EB-2009-0341Exhibit B, Tab 6, Schedule 1;
EB-2011-0295 Exhibit B, Tab 2, Schedule 2;
EB-2012-0394 Exhibit B, Tab 2, Schedule 2

b) Please see answer to part a) above.

c) Please refer to Tables 1 and 2 below for the commodity price forecast and the contracts and associated costs used to derive the avoided gas costs in EB-2012-0394, Exhibit B, Tab 2, Schedule 2, page 7.

Table 1

Natural Gas Price Forecast ($CAN / 103m3) - 2012 DSM Avoided Gas Costs

Price Point	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NYMEX	147.04	159.36	167.51	179.07	195.04	211.64	228.88	242.54	261.05	261.05
Empress	111.68	124.00	132.15	143.71	159.68	176.28	193.52	207.18	261.05	261.05
Chicago	150.46	162.87	171.03	182.65	198.74	215.45	232.77	246.42	264.97	264.97
Dawn	159.46	171.63	179.41	190.71	206.55	223.38	240.78	254.31	272.80	272.80
AECO	132.77	144.22	151.93	162.77	177.48	193.01	209.20	222.17	239.65	239.65
Alliance	127.17	138.62	146.33	157.17	171.88	187.41	203.60	216.57	234.05	234.05

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

Table 2

Summary of First Year (2012) Transportation, Storage and Peaking Inputs

	Col 1	Col 2	Col 3	Col 4
		Contract Volume (103M3/Day)	Demand Charges ($CAN/103M3/Month	Commodity Charges ($CAN/103M3)
A	Transportation			
	TransCanada			
	FT - CDA	1,684	2406.45	5.42
	FT - EDA	5,238	2406.45	5.42
	STS to CDA	7,532	63.97	0.01
	STS to EDA	2,139	182.62	0.29
	FT Dawn to CDA	3,975	282.42	0.51
	FT Dawn to EDA	3,025	585.14	1.22
	FT Parkway to CDA	2,270	118.54	0.13
	Vector			
	Tranche 1 & 2	4,899	277.07	
	Other Capacity*	2,799	NA	
	Alliance	2,125	1558.39	
	Union			
	M12 Easterly Dawn to Parkway	57,156	88.27	
	M12 Easterly Dawn to Kirkwall	1,881	74.51	
	M12 Westerly	11,568	20.64	
			Storage Space (103M3)	Storage Cost (CAN$/Month)
B	Leased Storage		594,990	331,953
			Demand Charges ($CAN/Month)	Commodity Charges ($CAN/103M3)
C	Peaking Service			
	CDA			
	Maximum		106,121	243.41
	Minimum		100,000	229.38
	EDA			
	Maximum		66,326	314.92
	Minimum		62,500	296.75

* Other Capacity is acquired in the secondary market and as such the demand charge associated with it cannot be made public.

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

d) For developing the various load shapes used to derive the avoided gas costs for space heating, water heating and industrial process, the Company uses the methodology filed in EBRO 490 (Exhibit D2, Tab 6, Schedule 1, Pages IV-25 to 45), and approved by the OEB in its EBRO 490 – Partial Decision dated August 29, 1995. The space heating profile was developed based on load research studies, which showed that space heating consumption was a function of heating degree days. Accordingly, the space heating load savings are realized predominantly in the winter months, especially the core winter months. Water heating load savings profile was developed based on samples of actual water heating usage by residential customers. The load savings profile for water heating is different than the space heating profile in that it is realized throughout the year emulating water heating consumption. The load profile for industrial process was developed from actual daily firm loads for the industrial customers. These savings, therefore, are different from the profiles of space heating and water heating. Industrial process savings profile is also realized throughout the year, emulating industrial usage of natural gas.

e) The avoided gas costs provided in EB-2012-0394, Exhibit B, Tab 2, Schedule 2, page 7 reflect gas commodity prices, upstream long-haul and short-haul transportation costs and storage costs. They do not include local transmission and distribution equipment costs.

f) The TRC cost-effectiveness screening spreadsheets will be provided under cover of a confidentiality agreement to the Audit Committees established for the years 2013 and 2014 during the course of the normal audit process and timelines.

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO GEC INTERROGATORY #33

INTERROGATORY

Enbridge, Issue A.4.DSM Avoided Cost, Ref: Exh. A, T3, S7, pp. 1-3, ¶3.

a) Please provide daily loads for the actual 2012–13 winter, for following areas, points, and pipeline segments:

   i. The GTA.

   ii. The GTA Project Influence Area.

   iii. Flow into Station B, transmission flow out of Station B, and deliveries to distribution at Station B.

   iv. Flow from the north into Maple.

   v. Flow from Maple east.

   vi. Flow from Maple west.

   vii. Deliveries at Victoria Station.

   viii. Deliveries at Lisgar Gate.

   ix. Deliveries at Parkway.

   x. Deliveries to PEC.

b) Please provide load-duration curves for normal and design years, for the existing system configuration, for the following areas, points, and pipeline segments:

   i. The GTA.

   ii. The GTA Project Influence Area.

   iii. Flow from the north into Maple.

Witnesses: J. Denomy
E. Naczynski

iv. Flow from Maple east.

v. Flow from Maple west.

vi. Station B.

vii. Deliveries at Victoria Station.

c) For normal and design years, please provide the load at Station B and at Victoria Station at the hour coincident with the GTA peak.

d) Please provide hourly loads for the actual 2012–13 winter, for the Don Valley.

e) Please provide the daily flow on each pipeline segment shown on Exh. A, T3, S6, Figure 1, for the GTA peak day of the 2012–13 winter.

f) Please provide the hourly flow on each pipeline segment shown on Exh. A, T3, S6, Figure 1, for the GTA peak hour of the 2012–13 winter.

RESPONSE

a) Please see Attachment 1 for total deliveries by day for the GTA Project Influence Area, Victoria Square, Parkway and Lisgar for the 2012-2013 winter. Flows north into Maple, flows from Maple east and flows from Maple west cannot be provided as this information is related to TransCanada. Enbridge declines to provide deliveries to PEC as this information is specific to an individual customer and confidential.

b) Please see response to BOMA Interrogatory #25 at Exhibit I.A1. EGD.BOMA.25 BOMA 25 d) ii) for map of operating system on peak day.

c) Please see response to BOMA Interrogatory #25d) at Exhibit I.A1. EGD.BOMA.25 d) ii) for map of operating system on peak.

d) Please see the Attachment 2 for hourly flows from Victoria Square. Gas flowing from Victoria Square feeds into the Don Valley line.

e) The daily flow can be approximated by taking the peak hour flow and multiplying by 20.

Witnesses: J. Denomy
E. Naczynski

f) See response to BOMA Interrogatory #25d) at Exhibit I.A1.EGD.BOMA.25 d) ii) for map of operating system on peak day.

Witnesses: J. Denomy
E. Naczynski

Gate Station (TJ/d)	Parkway	Lisgar	Victoria Square	GTA Project Influence Area
1-Nov-12	612.8	0.0	191.2	887.6
2-Nov-12	664.0	0.0	176.5	927.1
3-Nov-12	622.4	0.0	234.4	890.8
4-Nov-12	694.3	0.0	274.5	1009.7
5-Nov-12	789.2	0.0	324.5	1167.9
6-Nov-12	753.3	0.0	323.6	1135.9
7-Nov-12	687.5	0.0	313.4	1060.7
8-Nov-12	612.1	0.0	288.4	969.7
9-Nov-12	470.5	0.0	244.0	804.1
10-Nov-12	434.2	0.0	225.1	719.5
11-Nov-12	291.9	0.0	181.9	515.2
12-Nov-12	420.3	0.0	252.4	740.7
13-Nov-12	673.7	0.0	275.7	1007.2
14-Nov-12	551.9	0.0	272.3	952.3
15-Nov-12	605.9	0.0	288.3	971.6
16-Nov-12	491.5	0.0	260.9	804.2
17-Nov-12	458.4	0.0	253.3	791.6
18-Nov-12	492.5	0.0	275.0	815.6
19-Nov-12	518.4	0.0	278.2	831.1
20-Nov-12	486.1	0.0	270.3	803.7
21-Nov-12	494.1	0.0	250.6	803.3
22-Nov-12	369.6	0.0	187.8	636.2
23-Nov-12	525.2	0.0	256.7	875.1
24-Nov-12	676.8	0.0	297.0	1016.1
25-Nov-12	701.5	0.0	305.8	1058.1
26-Nov-12	784.3	0.0	326.1	1165.2
27-Nov-12	797.3	0.0	311.9	1155.9
28-Nov-12	802.9	0.0	329.5	1179.2
29-Nov-12	648.2	0.0	332.0	1081.7
30-Nov-12	1043.4	0.0	260.5	1378.9
1-Dec-12	655.7	0.0	284.8	1047.2
2-Dec-12	400.8	0.0	254.3	794.0
3-Dec-12	477.4	0.0	222.5	800.5
4-Dec-12	445.5	0.0	212.7	775.4
5-Dec-12	797.0	4.2	366.1	1270.0
6-Dec-12	673.3	0.0	355.1	1139.5
7-Dec-12	534.6	0.0	286.2	908.6
8-Dec-12	678.7	0.0	300.5	1020.4
9-Dec-12	756.1	0.0	274.5	1122.0
10-Dec-12	691.9	0.0	354.4	1150.0
11-Dec-12	813.2	0.0	339.8	1279.0
12-Dec-12	734.1	0.0	344.1	1186.1
13-Dec-12	660.1	0.0	297.9	1042.5
14-Dec-12	590.6	0.0	316.7	1030.2
15-Dec-12	693.4	0.0	316.4	1078.2
16-Dec-12	398.4	0.0	308.6	861.6
17-Dec-12	497.9	0.0	293.9	886.6
18-Dec-12	633.9	0.0	290.7	992.3
19-Dec-12	634.4	0.0	336.6	1052.9
20-Dec-12	711.6	0.0	319.5	1105.2
21-Dec-12	735.6	0.0	334.8	1165.9
22-Dec-12	675.4	0.0	345.2	1156.8

Gate Station (TJ/d)	Parkway	Lisgar	Victoria Square	GTA Project Influence Area
23-Dec-12	729.2	0.0	344.5	1168.4
24-Dec-12	612.3	0.0	332.3	1088.8
25-Dec-12	605.0	0.0	351.2	1086.8
26-Dec-12	935.5	0.0	366.1	1371.8
27-Dec-12	924.1	0.0	368.4	1406.4
28-Dec-12	843.7	0.0	374.1	1284.2
29-Dec-12	869.4	0.0	346.2	1299.1
30-Dec-12	818.6	0.0	334.1	1248.2
31-Dec-12	735.2	0.0	372.4	1211.4
1-Jan-13	856.3	0.0	427.3	1367.0
2-Jan-13	959.2	0.0	483.6	1492.7
3-Jan-13	979.6	0.0	393.2	1427.1
4-Jan-13	893.4	0.0	349.6	1287.1
5-Jan-13	751.1	0.0	314.1	1119.5
6-Jan-13	807.3	0.0	410.4	1278.4
7-Jan-13	876.3	0.0	407.3	1345.1
8-Jan-13	774.1	0.0	323.8	1183.3
9-Jan-13	700.0	0.0	318.7	1099.9
10-Jan-13	541.4	0.0	312.9	990.7
11-Jan-13	480.5	0.0	302.5	896.9
12-Jan-13	262.4	0.0	239.7	654.6
13-Jan-13	398.9	0.0	282.9	818.5
14-Jan-13	858.0	0.0	352.5	1261.5
15-Jan-13	826.1	0.0	375.2	1244.3
16-Jan-13	765.4	0.0	332.6	1187.6
17-Jan-13	1122.1	0.0	425.3	1637.8
18-Jan-13	887.1	0.0	396.3	1372.0
19-Jan-13	562.0	0.0	341.1	1037.9
20-Jan-13	980.4	0.0	419.3	1488.0
21-Jan-13	1290.6	0.0	466.2	1814.0
22-Jan-13	1431.6	0.0	570.1	2065.7
23-Jan-13	1149.2	227.3	517.9	2008.9
24-Jan-13	1190.0	147.8	578.1	1992.0
25-Jan-13	1174.9	0.6	522.2	1792.2
26-Jan-13	942.1	0.0	496.3	1532.6
27-Jan-13	898.3	0.0	434.5	1409.1
28-Jan-13	861.2	0.0	333.9	1269.5
29-Jan-13	699.1	0.0	357.4	1097.9
30-Jan-13	400.0	0.0	346.5	890.7
31-Jan-13	1022.7	0.0	413.5	1501.7
1-Feb-13	1142.0	0.0	438.4	1649.8
2-Feb-13	1117.0	0.0	458.4	1642.0
3-Feb-13	1114.6	0.0	453.0	1623.4
4-Feb-13	1210.4	0.0	491.2	1763.0
5-Feb-13	1002.5	0.0	500.1	1592.2
6-Feb-13	949.8	0.0	500.3	1574.8
7-Feb-13	1107.3	0.0	478.3	1653.0
8-Feb-13	1174.0	0.0	494.8	1735.0
9-Feb-13	986.4	0.0	479.2	1524.2
10-Feb-13	821.6	0.0	400.6	1279.1
11-Feb-13	774.5	0.0	355.7	1233.6
12-Feb-13	768.2	0.0	408.0	1289.9
13-Feb-13	798.7	0.0	376.7	1249.5
14-Feb-13	800.5	0.0	346.8	1225.2
15-Feb-13	911.8	0.0	399.7	1399.5
16-Feb-13	965.8	0.0	428.4	1465.8
17-Feb-13	1144.2	0.0	478.0	1679.8
18-Feb-13	900.5	0.0	419.8	1375.1

Gate Station (TJ/d)	Parkway	Lisgar	Victoria Square	GTA Project Influence Area
19-Feb-13	906.5	0.0	447.4	1462.7
20-Feb-13	1082.9	0.0	505.5	1697.5
21-Feb-13	1049.8	0.1	471.1	1610.6
22-Feb-13	873.4	0.0	434.6	1362.0
23-Feb-13	728.3	0.0	374.1	1191.7
24-Feb-13	714.2	0.0	393.9	1216.7
25-Feb-13	722.8	0.0	411.5	1233.1
26-Feb-13	727.7	0.0	419.4	1230.6
27-Feb-13	828.9	0.0	336.1	1239.5
28-Feb-13	840.0	0.0	320.6	1255.2
1-Mar-13	962.1	0.1	343.9	1385.0
2-Mar-13	979.3	0.0	368.0	1413.8
3-Mar-13	1030.5	0.1	359.1	1453.2
4-Mar-13	1005.2	0.1	326.0	1418.4
5-Mar-13	852.2	0.0	323.5	1285.8
6-Mar-13	685.6	0.0	357.7	1138.6
7-Mar-13	691.7	0.0	344.9	1114.3
8-Mar-13	636.4	0.0	319.1	1029.2
9-Mar-13	558.8	0.0	268.3	889.2
10-Mar-13	471.2	0.0	202.8	748.4
11-Mar-13	620.1	0.0	223.3	894.1
12-Mar-13	741.5	0.0	271.0	1098.3
13-Mar-13	999.5	0.0	284.8	1348.4
14-Mar-13	898.6	0.0	339.5	1304.5
15-Mar-13	865.0	0.0	298.2	1206.7
16-Mar-13	968.0	0.0	171.4	1288.6
17-Mar-13	949.4	0.0	295.9	1329.9
18-Mar-13	1032.3	0.0	261.3	1349.2
19-Mar-13	950.9	0.0	318.1	1403.1
20-Mar-13	1023.7	0.0	345.6	1422.5
21-Mar-13	897.5	0.0	421.5	1394.2
22-Mar-13	785.5	0.0	380.6	1218.6
23-Mar-13	714.6	0.0	312.0	1072.5
24-Mar-13	703.8	0.0	294.8	1074.5
25-Mar-13	610.8	0.0	314.1	1028.8
26-Mar-13	635.4	0.0	289.2	964.4
27-Mar-13	643.6	0.0	312.6	1031.9
28-Mar-13	544.3	0.0	274.2	919.3
29-Mar-13	496.5	0.0	249.6	777.8
30-Mar-13	474.3	0.0	212.0	716.1
31-Mar-13	595.7	0.0	200.7	829.9

Day/Hour	Victoria Square (TJ/hr)
11/1/12 11:00 AM	8.9
11/1/12 12:00 PM	9.6
11/1/12 1:00 PM	9.7
11/1/12 2:00 PM	9.2
11/1/12 3:00 PM	9.6
11/1/12 4:00 PM	10.6
11/1/12 5:00 PM	10.9
11/1/12 6:00 PM	11.4
11/1/12 7:00 PM	9.7
11/1/12 8:00 PM	9.0
11/1/12 9:00 PM	7.9
11/1/12 10:00 PM	7.3
11/1/12 11:00 PM	6.6
11/2/12 12:00 AM	6.1
11/2/12 1:00 AM	6.0
11/2/12 2:00 AM	6.0
11/2/12 3:00 AM	6.4
11/2/12 4:00 AM	5.4
11/2/12 5:00 AM	6.8
11/2/12 6:00 AM	6.1
11/2/12 7:00 AM	4.8
11/2/12 8:00 AM	4.0
11/2/12 9:00 AM	3.0
11/2/12 10:00 AM	4.6
11/2/12 11:00 AM	4.5
11/2/12 12:00 PM	5.2
11/2/12 1:00 PM	5.9
11/2/12 2:00 PM	6.5
11/2/12 3:00 PM	6.5
11/2/12 4:00 PM	7.0
11/2/12 5:00 PM	8.1
11/2/12 6:00 PM	8.5
11/2/12 7:00 PM	7.6
11/2/12 8:00 PM	7.2
11/2/12 9:00 PM	6.7
11/2/12 10:00 PM	5.9
11/2/12 11:00 PM	5.1
11/3/12 12:00 AM	4.5
11/3/12 1:00 AM	4.3
11/3/12 2:00 AM	4.4
11/3/12 3:00 AM	6.6
11/3/12 4:00 AM	6.6
11/3/12 5:00 AM	7.1
11/3/12 6:00 AM	8.5
11/3/12 7:00 AM	10.9

Day/Hour	Victoria Square (TJ/hr)
11/3/12 8:00 AM	12.7
11/3/12 9:00 AM	12.0
11/3/12 10:00 AM	11.0
11/3/12 11:00 AM	10.3
11/3/12 12:00 PM	9.7
11/3/12 1:00 PM	9.0
11/3/12 2:00 PM	8.6
11/3/12 3:00 PM	8.6
11/3/12 4:00 PM	9.1
11/3/12 5:00 PM	10.2
11/3/12 6:00 PM	10.6
11/3/12 7:00 PM	10.2
11/3/12 8:00 PM	9.8
11/3/12 9:00 PM	9.6
11/3/12 10:00 PM	9.2
11/3/12 11:00 PM	8.7
11/4/12 12:00 AM	8.4
11/4/12 1:00 AM	8.2
11/4/12 2:00 AM	8.2
11/4/12 3:00 AM	8.5
11/4/12 4:00 AM	8.8
11/4/12 5:00 AM	9.3
11/4/12 6:00 AM	10.4
11/4/12 7:00 AM	11.4
11/4/12 8:00 AM	12.2
11/4/12 9:00 AM	12.7
11/4/12 10:00 AM	12.8
11/4/12 11:00 AM	12.4
11/4/12 12:00 PM	11.9
11/4/12 1:00 PM	11.1
11/4/12 2:00 PM	10.6
11/4/12 3:00 PM	10.4
11/4/12 4:00 PM	10.7
11/4/12 5:00 PM	11.2
11/4/12 6:00 PM	11.6
11/4/12 7:00 PM	11.4
11/4/12 8:00 PM	11.3
11/4/12 9:00 PM	11.1
11/4/12 10:00 PM	10.6
11/4/12 11:00 PM	9.9
11/5/12 12:00 AM	9.3
11/5/12 1:00 AM	9.1
11/5/12 2:00 AM	9.4
11/5/12 3:00 AM	9.8
11/5/12 4:00 AM	10.2
11/5/12 5:00 AM	12.6

Day/Hour	Victoria Square (TJ/hr)
11/5/12 6:00 AM	14.6
11/5/12 7:00 AM	16.7
11/5/12 8:00 AM	16.7
11/5/12 9:00 AM	14.6
11/5/12 10:00 AM	13.7
11/5/12 11:00 AM	14.1
11/5/12 12:00 PM	14.6
11/5/12 1:00 PM	14.0
11/5/12 2:00 PM	13.8
11/5/12 3:00 PM	13.7
11/5/12 4:00 PM	13.6
11/5/12 5:00 PM	13.8
11/5/12 6:00 PM	15.6
11/5/12 7:00 PM	20.3
11/5/12 8:00 PM	19.7
11/5/12 9:00 PM	18.8
11/5/12 10:00 PM	17.0
11/5/12 11:00 PM	11.7
11/6/12 12:00 AM	10.8
11/6/12 1:00 AM	9.3
11/6/12 2:00 AM	9.3
11/6/12 3:00 AM	9.4
11/6/12 4:00 AM	9.8
11/6/12 5:00 AM	8.9
11/6/12 6:00 AM	11.2
11/6/12 7:00 AM	13.9
11/6/12 8:00 AM	14.9
11/6/12 9:00 AM	16.8
11/6/12 10:00 AM	13.9
11/6/12 11:00 AM	12.2
11/6/12 12:00 PM	13.8
11/6/12 1:00 PM	14.4
11/6/12 2:00 PM	15.0
11/6/12 3:00 PM	14.3
11/6/12 4:00 PM	14.4
11/6/12 5:00 PM	15.1
11/6/12 6:00 PM	15.9
11/6/12 7:00 PM	15.4
11/6/12 8:00 PM	15.5
11/6/12 9:00 PM	15.7
11/6/12 10:00 PM	15.1
11/6/12 11:00 PM	12.3
11/7/12 12:00 AM	10.9
11/7/12 1:00 AM	9.2
11/7/12 2:00 AM	8.9
11/7/12 3:00 AM	8.9

Day/Hour	Victoria Square (TJ/hr)
11/7/12 4:00 AM	9.2
11/7/12 5:00 AM	10.2
11/7/12 6:00 AM	12.9
11/7/12 7:00 AM	15.8
11/7/12 8:00 AM	17.3
11/7/12 9:00 AM	16.5
11/7/12 10:00 AM	14.5
11/7/12 11:00 AM	12.3
11/7/12 12:00 PM	12.8
11/7/12 1:00 PM	12.1
11/7/12 2:00 PM	11.6
11/7/12 3:00 PM	11.6
11/7/12 4:00 PM	11.9
11/7/12 5:00 PM	12.3
11/7/12 6:00 PM	13.8
11/7/12 7:00 PM	14.7
11/7/12 8:00 PM	14.3
11/7/12 9:00 PM	14.4
11/7/12 10:00 PM	13.1
11/7/12 11:00 PM	11.4
11/8/12 12:00 AM	10.2
11/8/12 1:00 AM	10.0
11/8/12 2:00 AM	10.1
11/8/12 3:00 AM	10.4
11/8/12 4:00 AM	11.1
11/8/12 5:00 AM	12.4
11/8/12 6:00 AM	15.0
11/8/12 7:00 AM	17.7
11/8/12 8:00 AM	19.1
11/8/12 9:00 AM	16.2
11/8/12 10:00 AM	12.8
11/8/12 11:00 AM	12.5
11/8/12 12:00 PM	11.8
11/8/12 1:00 PM	10.7
11/8/12 2:00 PM	10.4
11/8/12 3:00 PM	10.6
11/8/12 4:00 PM	11.5
11/8/12 5:00 PM	12.9
11/8/12 6:00 PM	15.1
11/8/12 7:00 PM	14.9
11/8/12 8:00 PM	14.5
11/8/12 9:00 PM	14.7
11/8/12 10:00 PM	13.7
11/8/12 11:00 PM	11.0
11/9/12 12:00 AM	9.0
11/9/12 1:00 AM	8.6

Day/Hour	Victoria Square (TJ/hr)
11/9/12 2:00 AM	8.6
11/9/12 3:00 AM	8.5
11/9/12 4:00 AM	8.7
11/9/12 5:00 AM	9.5
11/9/12 6:00 AM	11.9
11/9/12 7:00 AM	13.4
11/9/12 8:00 AM	13.8
11/9/12 9:00 AM	12.6
11/9/12 10:00 AM	11.3
11/9/12 11:00 AM	10.9
11/9/12 12:00 PM	11.2
11/9/12 1:00 PM	10.0
11/9/12 2:00 PM	10.2
11/9/12 3:00 PM	10.2
11/9/12 4:00 PM	10.5
11/9/12 5:00 PM	11.0
11/9/12 6:00 PM	11.9
11/9/12 7:00 PM	11.5
11/9/12 8:00 PM	10.5
11/9/12 9:00 PM	10.2
11/9/12 10:00 PM	9.8
11/9/12 11:00 PM	7.9
11/10/12 12:00 AM	8.7
11/10/12 1:00 AM	8.6
11/10/12 2:00 AM	8.2
11/10/12 3:00 AM	8.5
11/10/12 4:00 AM	8.6
11/10/12 5:00 AM	8.9
11/10/12 6:00 AM	9.7
11/10/12 7:00 AM	10.8
11/10/12 8:00 AM	11.9
11/10/12 9:00 AM	11.8
11/10/12 10:00 AM	11.7
11/10/12 11:00 AM	11.4
11/10/12 12:00 PM	11.1
11/10/12 1:00 PM	9.4
11/10/12 2:00 PM	8.8
11/10/12 3:00 PM	9.1
11/10/12 4:00 PM	9.7
11/10/12 5:00 PM	11.3
11/10/12 6:00 PM	11.8
11/10/12 7:00 PM	10.9
11/10/12 8:00 PM	10.6
11/10/12 9:00 PM	11.1
11/10/12 10:00 PM	12.1
11/10/12 11:00 PM	10.4

Day/Hour	Victoria Square (TJ/hr)
11/11/12 12:00 AM	8.4
11/11/12 1:00 AM	7.6
11/11/12 2:00 AM	7.2
11/11/12 3:00 AM	7.3
11/11/12 4:00 AM	7.4
11/11/12 5:00 AM	7.1
11/11/12 6:00 AM	7.8
11/11/12 7:00 AM	8.5
11/11/12 8:00 AM	9.1
11/11/12 9:00 AM	9.1
11/11/12 10:00 AM	8.0
11/11/12 11:00 AM	7.2
11/11/12 12:00 PM	7.3
11/11/12 1:00 PM	7.6
11/11/12 2:00 PM	7.3
11/11/12 3:00 PM	7.1
11/11/12 4:00 PM	7.0
11/11/12 5:00 PM	7.5
11/11/12 6:00 PM	8.0
11/11/12 7:00 PM	8.0
11/11/12 8:00 PM	8.4
11/11/12 9:00 PM	8.2
11/11/12 10:00 PM	7.9
11/11/12 11:00 PM	7.5
11/12/12 12:00 AM	7.2
11/12/12 1:00 AM	6.8
11/12/12 2:00 AM	6.5
11/12/12 3:00 AM	6.4
11/12/12 4:00 AM	6.3
11/12/12 5:00 AM	6.8
11/12/12 6:00 AM	8.0
11/12/12 7:00 AM	9.2
11/12/12 8:00 AM	9.9
11/12/12 9:00 AM	8.8
11/12/12 10:00 AM	8.5
11/12/12 11:00 AM	8.4
11/12/12 12:00 PM	8.3
11/12/12 1:00 PM	8.0
11/12/12 2:00 PM	7.1
11/12/12 3:00 PM	8.0
11/12/12 4:00 PM	9.8
11/12/12 5:00 PM	11.0
11/12/12 6:00 PM	11.5
11/12/12 7:00 PM	12.1
11/12/12 8:00 PM	11.9
11/12/12 9:00 PM	12.3

Day/Hour	Victoria Square (TJ/hr)
11/12/12 10:00 PM	10.5
11/12/12 11:00 PM	9.8
11/13/12 12:00 AM	9.7
11/13/12 1:00 AM	9.7
11/13/12 2:00 AM	9.8
11/13/12 3:00 AM	10.0
11/13/12 4:00 AM	9.9
11/13/12 5:00 AM	10.4
11/13/12 6:00 AM	11.6
11/13/12 7:00 AM	13.5
11/13/12 8:00 AM	15.0
11/13/12 9:00 AM	14.0
11/13/12 10:00 AM	13.2
11/13/12 11:00 AM	12.4
11/13/12 12:00 PM	12.2
11/13/12 1:00 PM	12.2
11/13/12 2:00 PM	13.0
11/13/12 3:00 PM	14.8
11/13/12 4:00 PM	16.5
11/13/12 5:00 PM	17.9
11/13/12 6:00 PM	18.4
11/13/12 7:00 PM	16.1
11/13/12 8:00 PM	14.3
11/13/12 9:00 PM	12.9
11/13/12 10:00 PM	10.6
11/13/12 11:00 PM	8.9
11/14/12 12:00 AM	7.9
11/14/12 1:00 AM	7.3
11/14/12 2:00 AM	7.2
11/14/12 3:00 AM	7.1
11/14/12 4:00 AM	7.5
11/14/12 5:00 AM	8.2
11/14/12 6:00 AM	10.1
11/14/12 7:00 AM	12.1
11/14/12 8:00 AM	13.0
11/14/12 9:00 AM	11.2
11/14/12 10:00 AM	11.4
11/14/12 11:00 AM	8.9
11/14/12 12:00 PM	9.3
11/14/12 1:00 PM	9.0
11/14/12 2:00 PM	8.8
11/14/12 3:00 PM	9.4
11/14/12 4:00 PM	11.2
11/14/12 5:00 PM	13.7
11/14/12 6:00 PM	14.7
11/14/12 7:00 PM	14.4

Day/Hour	Victoria Square (TJ/hr)
11/14/12 8:00 PM	13.2
11/14/12 9:00 PM	11.9
11/14/12 10:00 PM	11.4
11/14/12 11:00 PM	8.8
11/15/12 12:00 AM	7.8
11/15/12 1:00 AM	8.5
11/15/12 2:00 AM	8.1
11/15/12 3:00 AM	8.4
11/15/12 4:00 AM	8.5
11/15/12 5:00 AM	9.7
11/15/12 6:00 AM	11.8
11/15/12 7:00 AM	14.7
11/15/12 8:00 AM	15.6
11/15/12 9:00 AM	14.9
11/15/12 10:00 AM	13.9
11/15/12 11:00 AM	12.1
11/15/12 12:00 PM	11.0
11/15/12 1:00 PM	10.2
11/15/12 2:00 PM	9.6
11/15/12 3:00 PM	9.5
11/15/12 4:00 PM	10.1
11/15/12 5:00 PM	11.8
11/15/12 6:00 PM	13.1
11/15/12 7:00 PM	13.7
11/15/12 8:00 PM	13.4
11/15/12 9:00 PM	12.4
11/15/12 10:00 PM	12.1
11/15/12 11:00 PM	10.5
11/16/12 12:00 AM	9.7
11/16/12 1:00 AM	10.2
11/16/12 2:00 AM	10.3
11/16/12 3:00 AM	10.6
11/16/12 4:00 AM	11.0
11/16/12 5:00 AM	12.0
11/16/12 6:00 AM	13.7
11/16/12 7:00 AM	15.5
11/16/12 8:00 AM	16.3
11/16/12 9:00 AM	14.5
11/16/12 10:00 AM	11.9
11/16/12 11:00 AM	11.6
11/16/12 12:00 PM	10.8
11/16/12 1:00 PM	10.3
11/16/12 2:00 PM	9.9
11/16/12 3:00 PM	9.7
11/16/12 4:00 PM	10.0
11/16/12 5:00 PM	10.5

Day/Hour	Victoria Square (TJ/hr)
11/16/12 6:00 PM	10.9
11/16/12 7:00 PM	10.5
11/16/12 8:00 PM	10.1
11/16/12 9:00 PM	10.2
11/16/12 10:00 PM	10.2
11/16/12 11:00 PM	10.1
11/17/12 12:00 AM	9.8
11/17/12 1:00 AM	9.7
11/17/12 2:00 AM	9.7
11/17/12 3:00 AM	9.9
11/17/12 4:00 AM	10.2
11/17/12 5:00 AM	10.7
11/17/12 6:00 AM	11.7
11/17/12 7:00 AM	12.8
11/17/12 8:00 AM	13.8
11/17/12 9:00 AM	13.2
11/17/12 10:00 AM	11.5
11/17/12 11:00 AM	11.3
11/17/12 12:00 PM	9.9
11/17/12 1:00 PM	9.3
11/17/12 2:00 PM	8.8
11/17/12 3:00 PM	8.6
11/17/12 4:00 PM	8.9
11/17/12 5:00 PM	10.1
11/17/12 6:00 PM	10.8
11/17/12 7:00 PM	10.9
11/17/12 8:00 PM	10.8
11/17/12 9:00 PM	10.8
11/17/12 10:00 PM	10.7
11/17/12 11:00 PM	10.4
11/18/12 12:00 AM	10.1
11/18/12 1:00 AM	9.9
11/18/12 2:00 AM	9.9
11/18/12 3:00 AM	10.0
11/18/12 4:00 AM	10.3
11/18/12 5:00 AM	10.6
11/18/12 6:00 AM	11.3
11/18/12 7:00 AM	12.1
11/18/12 8:00 AM	12.6
11/18/12 9:00 AM	12.7
11/18/12 10:00 AM	12.5
11/18/12 11:00 AM	10.9
11/18/12 12:00 PM	9.6
11/18/12 1:00 PM	9.2
11/18/12 2:00 PM	8.7
11/18/12 3:00 PM	8.5

Day/Hour	Victoria Square (TJ/hr)
11/18/12 4:00 PM	9.1
11/18/12 5:00 PM	11.1
11/18/12 6:00 PM	12.6
11/18/12 7:00 PM	13.0
11/18/12 8:00 PM	13.1
11/18/12 9:00 PM	13.5
11/18/12 10:00 PM	13.5
11/18/12 11:00 PM	11.9
11/19/12 12:00 AM	11.4
11/19/12 1:00 AM	10.7
11/19/12 2:00 AM	10.4
11/19/12 3:00 AM	10.5
11/19/12 4:00 AM	10.6
11/19/12 5:00 AM	11.2
11/19/12 6:00 AM	12.6
11/19/12 7:00 AM	14.2
11/19/12 8:00 AM	15.7
11/19/12 9:00 AM	13.8
11/19/12 10:00 AM	12.2
11/19/12 11:00 AM	11.1
11/19/12 12:00 PM	10.2
11/19/12 1:00 PM	10.3
11/19/12 2:00 PM	10.3
11/19/12 3:00 PM	10.8
11/19/12 4:00 PM	11.5
11/19/12 5:00 PM	12.7
11/19/12 6:00 PM	13.8
11/19/12 7:00 PM	13.6
11/19/12 8:00 PM	13.5
11/19/12 9:00 PM	13.2
11/19/12 10:00 PM	12.8
11/19/12 11:00 PM	10.8
11/20/12 12:00 AM	9.8
11/20/12 1:00 AM	9.4
11/20/12 2:00 AM	9.5
11/20/12 3:00 AM	9.5
11/20/12 4:00 AM	9.9
11/20/12 5:00 AM	10.6
11/20/12 6:00 AM	12.0
11/20/12 7:00 AM	13.7
11/20/12 8:00 AM	14.6
11/20/12 9:00 AM	13.0
11/20/12 10:00 AM	11.7
11/20/12 11:00 AM	10.9
11/20/12 12:00 PM	10.3
11/20/12 1:00 PM	9.6

Day/Hour	Victoria Square (TJ/hr)
11/20/12 2:00 PM	9.1
11/20/12 3:00 PM	9.6
11/20/12 4:00 PM	10.6
11/20/12 5:00 PM	12.3
11/20/12 6:00 PM	12.8
11/20/12 7:00 PM	13.0
11/20/12 8:00 PM	12.7
11/20/12 9:00 PM	12.4
11/20/12 10:00 PM	12.4
11/20/12 11:00 PM	11.1
11/21/12 12:00 AM	10.0
11/21/12 1:00 AM	9.6
11/21/12 2:00 AM	9.5
11/21/12 3:00 AM	9.4
11/21/12 4:00 AM	9.7
11/21/12 5:00 AM	10.3
11/21/12 6:00 AM	11.8
11/21/12 7:00 AM	13.6
11/21/12 8:00 AM	14.5
11/21/12 9:00 AM	13.2
11/21/12 10:00 AM	11.9
11/21/12 11:00 AM	11.4
11/21/12 12:00 PM	11.1
11/21/12 1:00 PM	10.1
11/21/12 2:00 PM	9.2
11/21/12 3:00 PM	9.6
11/21/12 4:00 PM	10.2
11/21/12 5:00 PM	11.6
11/21/12 6:00 PM	12.8
11/21/12 7:00 PM	12.4
11/21/12 8:00 PM	12.4
11/21/12 9:00 PM	12.3
11/21/12 10:00 PM	10.2
11/21/12 11:00 PM	9.2
11/22/12 12:00 AM	8.7
11/22/12 1:00 AM	8.2
11/22/12 2:00 AM	8.0
11/22/12 3:00 AM	8.1
11/22/12 4:00 AM	8.4
11/22/12 5:00 AM	9.1
11/22/12 6:00 AM	10.7
11/22/12 7:00 AM	12.4
11/22/12 8:00 AM	13.4
11/22/12 9:00 AM	11.4
11/22/12 10:00 AM	9.5
11/22/12 11:00 AM	8.3

Day/Hour	Victoria Square (TJ/hr)
11/22/12 12:00 PM	7.6
11/22/12 1:00 PM	7.0
11/22/12 2:00 PM	6.3
11/22/12 3:00 PM	6.4
11/22/12 4:00 PM	6.1
11/22/12 5:00 PM	7.5
11/22/12 6:00 PM	8.4
11/22/12 7:00 PM	8.4
11/22/12 8:00 PM	8.2
11/22/12 9:00 PM	8.1
11/22/12 10:00 PM	8.1
11/22/12 11:00 PM	7.9
11/23/12 12:00 AM	7.2
11/23/12 1:00 AM	6.6
11/23/12 2:00 AM	6.4
11/23/12 3:00 AM	6.1
11/23/12 4:00 AM	6.3
11/23/12 5:00 AM	7.0
11/23/12 6:00 AM	8.4
11/23/12 7:00 AM	10.4
11/23/12 8:00 AM	11.1
11/23/12 9:00 AM	10.5
11/23/12 10:00 AM	9.5
11/23/12 11:00 AM	7.8
11/23/12 12:00 PM	7.9
11/23/12 1:00 PM	7.5
11/23/12 2:00 PM	7.6
11/23/12 3:00 PM	8.6
11/23/12 4:00 PM	9.2
11/23/12 5:00 PM	10.2
11/23/12 6:00 PM	10.7
11/23/12 7:00 PM	11.0
11/23/12 8:00 PM	11.3
11/23/12 9:00 PM	11.1
11/23/12 10:00 PM	11.2
11/23/12 11:00 PM	10.8
11/24/12 12:00 AM	10.4
11/24/12 1:00 AM	10.3
11/24/12 2:00 AM	10.3
11/24/12 3:00 AM	10.6
11/24/12 4:00 AM	10.7
11/24/12 5:00 AM	11.2
11/24/12 6:00 AM	12.3
11/24/12 7:00 AM	13.5
11/24/12 8:00 AM	14.4
11/24/12 9:00 AM	15.0

Day/Hour	Victoria Square (TJ/hr)
11/24/12 10:00 AM	13.2
11/24/12 11:00 AM	13.6
11/24/12 12:00 PM	12.7
11/24/12 1:00 PM	12.2
11/24/12 2:00 PM	11.6
11/24/12 3:00 PM	11.6
11/24/12 4:00 PM	12.0
11/24/12 5:00 PM	13.5
11/24/12 6:00 PM	14.1
11/24/12 7:00 PM	13.4
11/24/12 8:00 PM	13.6
11/24/12 9:00 PM	14.3
11/24/12 10:00 PM	13.9
11/24/12 11:00 PM	13.4
11/25/12 12:00 AM	12.0
11/25/12 1:00 AM	10.7
11/25/12 2:00 AM	10.5
11/25/12 3:00 AM	10.5
11/25/12 4:00 AM	10.7
11/25/12 5:00 AM	11.1
11/25/12 6:00 AM	12.0
11/25/12 7:00 AM	12.8
11/25/12 8:00 AM	11.7
11/25/12 9:00 AM	12.4
11/25/12 10:00 AM	12.2
11/25/12 11:00 AM	12.2
11/25/12 12:00 PM	13.5
11/25/12 1:00 PM	12.4
11/25/12 2:00 PM	11.4
11/25/12 3:00 PM	11.1
11/25/12 4:00 PM	11.5
11/25/12 5:00 PM	12.7
11/25/12 6:00 PM	13.2
11/25/12 7:00 PM	13.0
11/25/12 8:00 PM	12.5
11/25/12 9:00 PM	12.5
11/25/12 10:00 PM	12.1
11/25/12 11:00 PM	11.3
11/26/12 12:00 AM	11.0
11/26/12 1:00 AM	11.0
11/26/12 2:00 AM	10.8
11/26/12 3:00 AM	11.7
11/26/12 4:00 AM	11.5
11/26/12 5:00 AM	12.0
11/26/12 6:00 AM	13.8
11/26/12 7:00 AM	15.9

Day/Hour	Victoria Square (TJ/hr)
11/26/12 8:00 AM	17.9
11/26/12 9:00 AM	16.9
11/26/12 10:00 AM	14.7
11/26/12 11:00 AM	13.8
11/26/12 12:00 PM	13.1
11/26/12 1:00 PM	13.3
11/26/12 2:00 PM	13.0
11/26/12 3:00 PM	16.3
11/26/12 4:00 PM	17.3
11/26/12 5:00 PM	19.3
11/26/12 6:00 PM	20.8
11/26/12 7:00 PM	17.1
11/26/12 8:00 PM	15.4
11/26/12 9:00 PM	15.7
11/26/12 10:00 PM	14.7
11/26/12 11:00 PM	11.6
11/27/12 12:00 AM	10.3
11/27/12 1:00 AM	9.9
11/27/12 2:00 AM	9.9
11/27/12 3:00 AM	10.0
11/27/12 4:00 AM	10.3
11/27/12 5:00 AM	11.1
11/27/12 6:00 AM	13.7
11/27/12 7:00 AM	16.7
11/27/12 8:00 AM	17.9
11/27/12 9:00 AM	16.8
11/27/12 10:00 AM	14.6
11/27/12 11:00 AM	12.7
11/27/12 12:00 PM	12.1
11/27/12 1:00 PM	12.1
11/27/12 2:00 PM	12.3
11/27/12 3:00 PM	12.6
11/27/12 4:00 PM	13.8
11/27/12 5:00 PM	15.2
11/27/12 6:00 PM	16.0
11/27/12 7:00 PM	15.7
11/27/12 8:00 PM	15.4
11/27/12 9:00 PM	15.0
11/27/12 10:00 PM	14.7
11/27/12 11:00 PM	11.9
11/28/12 12:00 AM	10.0
11/28/12 1:00 AM	9.6
11/28/12 2:00 AM	9.7
11/28/12 3:00 AM	10.0
11/28/12 4:00 AM	8.8
11/28/12 5:00 AM	9.5

Day/Hour	Victoria Square (TJ/hr)
11/28/12 6:00 AM	11.2
11/28/12 7:00 AM	13.3
11/28/12 8:00 AM	16.1
11/28/12 9:00 AM	15.0
11/28/12 10:00 AM	13.8
11/28/12 11:00 AM	13.0
11/28/12 12:00 PM	13.0
11/28/12 1:00 PM	11.5
11/28/12 2:00 PM	11.6
11/28/12 3:00 PM	11.6
11/28/12 4:00 PM	12.9
11/28/12 5:00 PM	15.7
11/28/12 6:00 PM	16.8
11/28/12 7:00 PM	16.3
11/28/12 8:00 PM	15.7
11/28/12 9:00 PM	15.3
11/28/12 10:00 PM	14.4
11/28/12 11:00 PM	12.4
11/29/12 12:00 AM	10.4
11/29/12 1:00 AM	9.7
11/29/12 2:00 AM	9.7
11/29/12 3:00 AM	10.1
11/29/12 4:00 AM	10.6
11/29/12 5:00 AM	12.2
11/29/12 6:00 AM	15.3
11/29/12 7:00 AM	17.9
11/29/12 8:00 AM	19.3
11/29/12 9:00 AM	18.2
11/29/12 10:00 AM	15.9
11/29/12 11:00 AM	14.3
11/29/12 12:00 PM	12.6
11/29/12 1:00 PM	10.4
11/29/12 2:00 PM	10.3
11/29/12 3:00 PM	11.1
11/29/12 4:00 PM	12.2
11/29/12 5:00 PM	14.1
11/29/12 6:00 PM	15.1
11/29/12 7:00 PM	14.5
11/29/12 8:00 PM	14.4
11/29/12 9:00 PM	14.6
11/29/12 10:00 PM	14.5
11/29/12 11:00 PM	13.0
11/30/12 12:00 AM	11.1
11/30/12 1:00 AM	10.5
11/30/12 2:00 AM	10.4
11/30/12 3:00 AM	10.6

Day/Hour	Victoria Square (TJ/hr)
11/30/12 4:00 AM	11.9
11/30/12 5:00 AM	14.6
11/30/12 6:00 AM	17.4
11/30/12 7:00 AM	19.8
11/30/12 8:00 AM	20.9
11/30/12 9:00 AM	20.0
11/30/12 10:00 AM	18.9
11/30/12 11:00 AM	17.2
11/30/12 12:00 PM	17.8
11/30/12 1:00 PM	17.8
11/30/12 2:00 PM	18.0
11/30/12 3:00 PM	19.3
11/30/12 4:00 PM	21.1
11/30/12 5:00 PM	21.6
11/30/12 6:00 PM	21.9
11/30/12 7:00 PM	16.7
11/30/12 8:00 PM	16.1
11/30/12 9:00 PM	16.3
11/30/12 10:00 PM	9.0
11/30/12 11:00 PM	1.2
12/1/12 12:00 AM	1.3
12/1/12 1:00 AM	1.4
12/1/12 2:00 AM	1.6
12/1/12 3:00 AM	1.7
12/1/12 4:00 AM	4.7
12/1/12 5:00 AM	6.3
12/1/12 6:00 AM	6.9
12/1/12 7:00 AM	8.0
12/1/12 8:00 AM	8.8
12/1/12 9:00 AM	8.6
12/1/12 10:00 AM	6.8
12/1/12 11:00 AM	4.1
12/1/12 12:00 PM	9.6
12/1/12 1:00 PM	10.9
12/1/12 2:00 PM	11.4
12/1/12 3:00 PM	16.8
12/1/12 4:00 PM	17.2
12/1/12 5:00 PM	17.8
12/1/12 6:00 PM	18.0
12/1/12 7:00 PM	16.2
12/1/12 8:00 PM	15.8
12/1/12 9:00 PM	12.4
12/1/12 10:00 PM	4.3
12/1/12 11:00 PM	2.3
12/2/12 12:00 AM	3.0
12/2/12 1:00 AM	10.7

Day/Hour	Victoria Square (TJ/hr)
12/2/12 2:00 AM	9.4
12/2/12 3:00 AM	10.1
12/2/12 4:00 AM	10.8
12/2/12 5:00 AM	9.2
12/2/12 6:00 AM	9.0
12/2/12 7:00 AM	8.5
12/2/12 8:00 AM	8.9
12/2/12 9:00 AM	9.2
12/2/12 10:00 AM	10.0
12/2/12 11:00 AM	10.6
12/2/12 12:00 PM	10.4
12/2/12 1:00 PM	9.9
12/2/12 2:00 PM	9.3
12/2/12 3:00 PM	9.2
12/2/12 4:00 PM	9.2
12/2/12 5:00 PM	9.9
12/2/12 6:00 PM	9.6
12/2/12 7:00 PM	8.6
12/2/12 8:00 PM	8.3
12/2/12 9:00 PM	11.4
12/2/12 10:00 PM	11.3
12/2/12 11:00 PM	10.2
12/3/12 12:00 AM	11.4
12/3/12 1:00 AM	10.2
12/3/12 2:00 AM	10.0
12/3/12 3:00 AM	10.5
12/3/12 4:00 AM	10.8
12/3/12 5:00 AM	11.1
12/3/12 6:00 AM	12.6
12/3/12 7:00 AM	14.1
12/3/12 8:00 AM	14.7
12/3/12 9:00 AM	13.4
12/3/12 10:00 AM	12.6
12/3/12 11:00 AM	10.7
12/3/12 12:00 PM	10.5
12/3/12 1:00 PM	10.7
12/3/12 2:00 PM	10.4
12/3/12 3:00 PM	10.2
12/3/12 4:00 PM	10.6
12/3/12 5:00 PM	12.0
12/3/12 6:00 PM	11.9
12/3/12 7:00 PM	11.9
12/3/12 8:00 PM	10.8
12/3/12 9:00 PM	10.4
12/3/12 10:00 PM	9.9
12/3/12 11:00 PM	8.2

Day/Hour	Victoria Square (TJ/hr)
12/4/12 12:00 AM	7.0
12/4/12 1:00 AM	6.7
12/4/12 2:00 AM	6.4
12/4/12 3:00 AM	6.3
12/4/12 4:00 AM	6.5
12/4/12 5:00 AM	6.6
12/4/12 6:00 AM	7.7
12/4/12 7:00 AM	9.0
12/4/12 8:00 AM	9.6
12/4/12 9:00 AM	8.8
12/4/12 10:00 AM	7.2
12/4/12 11:00 AM	6.1
12/4/12 12:00 PM	6.6
12/4/12 1:00 PM	6.4
12/4/12 2:00 PM	6.6
12/4/12 3:00 PM	7.0
12/4/12 4:00 PM	7.2
12/4/12 5:00 PM	8.3
12/4/12 6:00 PM	9.0
12/4/12 7:00 PM	8.9
12/4/12 8:00 PM	8.8
12/4/12 9:00 PM	8.9
12/4/12 10:00 PM	8.6
12/4/12 11:00 PM	7.5
12/5/12 12:00 AM	7.0
12/5/12 1:00 AM	6.8
12/5/12 2:00 AM	6.8
12/5/12 3:00 AM	7.3
12/5/12 4:00 AM	7.9
12/5/12 5:00 AM	8.8
12/5/12 6:00 AM	10.6
12/5/12 7:00 AM	13.1
12/5/12 8:00 AM	14.1
12/5/12 9:00 AM	15.7
12/5/12 10:00 AM	15.4
12/5/12 11:00 AM	13.2
12/5/12 12:00 PM	12.4
12/5/12 1:00 PM	12.9
12/5/12 2:00 PM	13.5
12/5/12 3:00 PM	14.8
12/5/12 4:00 PM	19.0
12/5/12 5:00 PM	21.6
12/5/12 6:00 PM	20.2
12/5/12 7:00 PM	18.1
12/5/12 8:00 PM	15.8
12/5/12 9:00 PM	14.8

Day/Hour	Victoria Square (TJ/hr)
12/5/12 10:00 PM	15.7
12/5/12 11:00 PM	13.9
12/6/12 12:00 AM	11.7
12/6/12 1:00 AM	11.0
12/6/12 2:00 AM	11.1
12/6/12 3:00 AM	12.4
12/6/12 4:00 AM	12.5
12/6/12 5:00 AM	14.5
12/6/12 6:00 AM	19.3
12/6/12 7:00 AM	22.5
12/6/12 8:00 AM	24.0
12/6/12 9:00 AM	21.2
12/6/12 10:00 AM	14.2
12/6/12 11:00 AM	10.8
12/6/12 12:00 PM	11.2
12/6/12 1:00 PM	14.3
12/6/12 2:00 PM	16.8
12/6/12 3:00 PM	17.4
12/6/12 4:00 PM	18.0
12/6/12 5:00 PM	18.8
12/6/12 6:00 PM	19.4
12/6/12 7:00 PM	20.0
12/6/12 8:00 PM	18.9
12/6/12 9:00 PM	18.4
12/6/12 10:00 PM	14.8
12/6/12 11:00 PM	12.5
12/7/12 12:00 AM	11.7
12/7/12 1:00 AM	11.3
12/7/12 2:00 AM	11.1
12/7/12 3:00 AM	11.1
12/7/12 4:00 AM	10.5
12/7/12 5:00 AM	11.2
12/7/12 6:00 AM	12.5
12/7/12 7:00 AM	13.8
12/7/12 8:00 AM	15.5
12/7/12 9:00 AM	14.2
12/7/12 10:00 AM	12.9
12/7/12 11:00 AM	12.5
12/7/12 12:00 PM	12.2
12/7/12 1:00 PM	11.9
12/7/12 2:00 PM	11.3
12/7/12 3:00 PM	11.2
12/7/12 4:00 PM	12.4
12/7/12 5:00 PM	13.9
12/7/12 6:00 PM	14.2
12/7/12 7:00 PM	14.8

Day/Hour	Victoria Square (TJ/hr)
12/7/12 8:00 PM	13.9
12/7/12 9:00 PM	13.5
12/7/12 10:00 PM	13.2
12/7/12 11:00 PM	11.9
12/8/12 12:00 AM	10.9
12/8/12 1:00 AM	9.1
12/8/12 2:00 AM	8.8
12/8/12 3:00 AM	8.8
12/8/12 4:00 AM	8.8
12/8/12 5:00 AM	9.5
12/8/12 6:00 AM	10.3
12/8/12 7:00 AM	11.1
12/8/12 8:00 AM	12.2
12/8/12 9:00 AM	12.1
12/8/12 10:00 AM	11.9
12/8/12 11:00 AM	11.6
12/8/12 12:00 PM	11.4
12/8/12 1:00 PM	11.5
12/8/12 2:00 PM	11.7
12/8/12 3:00 PM	12.1
12/8/12 4:00 PM	12.8
12/8/12 5:00 PM	13.7
12/8/12 6:00 PM	12.9
12/8/12 7:00 PM	13.7
12/8/12 8:00 PM	13.8
12/8/12 9:00 PM	13.9
12/8/12 10:00 PM	13.7
12/8/12 11:00 PM	13.4
12/9/12 12:00 AM	12.2
12/9/12 1:00 AM	11.7
12/9/12 2:00 AM	11.9
12/9/12 3:00 AM	12.3
12/9/12 4:00 AM	12.4
12/9/12 5:00 AM	13.0
12/9/12 6:00 AM	13.1
12/9/12 7:00 AM	13.4
12/9/12 8:00 AM	15.7
12/9/12 9:00 AM	13.0
12/9/12 10:00 AM	10.1
12/9/12 11:00 AM	8.2
12/9/12 12:00 PM	6.0
12/9/12 1:00 PM	5.3
12/9/12 2:00 PM	5.6
12/9/12 3:00 PM	6.3
12/9/12 4:00 PM	9.0
12/9/12 5:00 PM	10.1

Day/Hour	Victoria Square (TJ/hr)
12/9/12 6:00 PM	13.8
12/9/12 7:00 PM	14.8
12/9/12 8:00 PM	14.3
12/9/12 9:00 PM	16.7
12/9/12 10:00 PM	15.3
12/9/12 11:00 PM	13.8
12/10/12 12:00 AM	12.2
12/10/12 1:00 AM	11.5
12/10/12 2:00 AM	11.1
12/10/12 3:00 AM	10.9
12/10/12 4:00 AM	10.9
12/10/12 5:00 AM	11.5
12/10/12 6:00 AM	13.2
12/10/12 7:00 AM	12.8
12/10/12 8:00 AM	12.1
12/10/12 9:00 AM	11.0
12/10/12 10:00 AM	11.0
12/10/12 11:00 AM	11.3
12/10/12 12:00 PM	12.8
12/10/12 1:00 PM	12.8
12/10/12 2:00 PM	12.9
12/10/12 3:00 PM	13.7
12/10/12 4:00 PM	14.8
12/10/12 5:00 PM	16.6
12/10/12 6:00 PM	17.0
12/10/12 7:00 PM	15.8
12/10/12 8:00 PM	18.0
12/10/12 9:00 PM	18.5
12/10/12 10:00 PM	18.2
12/10/12 11:00 PM	16.0
12/11/12 12:00 AM	12.6
12/11/12 1:00 AM	12.4
12/11/12 2:00 AM	12.6
12/11/12 3:00 AM	13.2
12/11/12 4:00 AM	14.1
12/11/12 5:00 AM	15.3
12/11/12 6:00 AM	16.6
12/11/12 7:00 AM	17.2
12/11/12 8:00 AM	14.3
12/11/12 9:00 AM	12.7
12/11/12 10:00 AM	13.8
12/11/12 11:00 AM	14.3
12/11/12 12:00 PM	14.1
12/11/12 1:00 PM	14.5
12/11/12 2:00 PM	14.2
12/11/12 3:00 PM	14.7

Day/Hour	Victoria Square (TJ/hr)
12/11/12 4:00 PM	15.9
12/11/12 5:00 PM	16.3
12/11/12 6:00 PM	15.9
12/11/12 7:00 PM	15.5
12/11/12 8:00 PM	15.0
12/11/12 9:00 PM	14.7
12/11/12 10:00 PM	13.7
12/11/12 11:00 PM	11.8
12/12/12 12:00 AM	11.8
12/12/12 1:00 AM	11.5
12/12/12 2:00 AM	11.7
12/12/12 3:00 AM	12.0
12/12/12 4:00 AM	12.5
12/12/12 5:00 AM	13.5
12/12/12 6:00 AM	15.1
12/12/12 7:00 AM	17.1
12/12/12 8:00 AM	17.9
12/12/12 9:00 AM	16.6
12/12/12 10:00 AM	15.4
12/12/12 11:00 AM	14.0
12/12/12 12:00 PM	13.3
12/12/12 1:00 PM	12.6
12/12/12 2:00 PM	12.4
12/12/12 3:00 PM	13.7
12/12/12 4:00 PM	15.1
12/12/12 5:00 PM	16.9
12/12/12 6:00 PM	17.7
12/12/12 7:00 PM	17.0
12/12/12 8:00 PM	16.9
12/12/12 9:00 PM	16.8
12/12/12 10:00 PM	15.8
12/12/12 11:00 PM	12.1
12/13/12 12:00 AM	10.5
12/13/12 1:00 AM	9.9
12/13/12 2:00 AM	9.9
12/13/12 3:00 AM	11.1
12/13/12 4:00 AM	11.9
12/13/12 5:00 AM	12.9
12/13/12 6:00 AM	14.5
12/13/12 7:00 AM	16.5
12/13/12 8:00 AM	17.5
12/13/12 9:00 AM	16.0
12/13/12 10:00 AM	13.7
12/13/12 11:00 AM	12.2
12/13/12 12:00 PM	11.5
12/13/12 1:00 PM	11.4

Day/Hour	Victoria Square (TJ/hr)
12/13/12 2:00 PM	11.2
12/13/12 3:00 PM	11.4
12/13/12 4:00 PM	12.4
12/13/12 5:00 PM	13.7
12/13/12 6:00 PM	14.4
12/13/12 7:00 PM	14.0
12/13/12 8:00 PM	14.0
12/13/12 9:00 PM	13.4
12/13/12 10:00 PM	12.6
12/13/12 11:00 PM	10.7
12/14/12 12:00 AM	9.8
12/14/12 1:00 AM	9.6
12/14/12 2:00 AM	9.9
12/14/12 3:00 AM	10.1
12/14/12 4:00 AM	10.4
12/14/12 5:00 AM	11.3
12/14/12 6:00 AM	13.0
12/14/12 7:00 AM	15.1
12/14/12 8:00 AM	16.2
12/14/12 9:00 AM	15.7
12/14/12 10:00 AM	14.1
12/14/12 11:00 AM	11.9
12/14/12 12:00 PM	10.8
12/14/12 1:00 PM	10.3
12/14/12 2:00 PM	10.1
12/14/12 3:00 PM	11.4
12/14/12 4:00 PM	13.5
12/14/12 5:00 PM	15.5
12/14/12 6:00 PM	16.9
12/14/12 7:00 PM	16.2
12/14/12 8:00 PM	15.0
12/14/12 9:00 PM	15.0
12/14/12 10:00 PM	15.7
12/14/12 11:00 PM	14.1
12/15/12 12:00 AM	11.9
12/15/12 1:00 AM	11.4
12/15/12 2:00 AM	11.4
12/15/12 3:00 AM	11.6
12/15/12 4:00 AM	11.9
12/15/12 5:00 AM	12.4
12/15/12 6:00 AM	13.1
12/15/12 7:00 AM	14.0
12/15/12 8:00 AM	13.8
12/15/12 9:00 AM	14.3
12/15/12 10:00 AM	14.4
12/15/12 11:00 AM	14.2

Day/Hour	Victoria Square (TJ/hr)
12/15/12 12:00 PM	15.0
12/15/12 1:00 PM	14.8
12/15/12 2:00 PM	14.7
12/15/12 3:00 PM	14.5
12/15/12 4:00 PM	14.5
12/15/12 5:00 PM	14.6
12/15/12 6:00 PM	14.2
12/15/12 7:00 PM	13.8
12/15/12 8:00 PM	13.7
12/15/12 9:00 PM	13.6
12/15/12 10:00 PM	13.3
12/15/12 11:00 PM	12.7
12/16/12 12:00 AM	12.0
12/16/12 1:00 AM	11.7
12/16/12 2:00 AM	11.5
12/16/12 3:00 AM	11.4
12/16/12 4:00 AM	11.5
12/16/12 5:00 AM	11.6
12/16/12 6:00 AM	12.0
12/16/12 7:00 AM	12.7
12/16/12 8:00 AM	12.6
12/16/12 9:00 AM	12.5
12/16/12 10:00 AM	12.4
12/16/12 11:00 AM	14.0
12/16/12 12:00 PM	14.0
12/16/12 1:00 PM	14.4
12/16/12 2:00 PM	14.5
12/16/12 3:00 PM	14.0
12/16/12 4:00 PM	13.9
12/16/12 5:00 PM	15.2
12/16/12 6:00 PM	15.3
12/16/12 7:00 PM	15.5
12/16/12 8:00 PM	14.2
12/16/12 9:00 PM	13.7
12/16/12 10:00 PM	13.4
12/16/12 11:00 PM	11.6
12/17/12 12:00 AM	9.7
12/17/12 1:00 AM	9.4
12/17/12 2:00 AM	9.3
12/17/12 3:00 AM	9.7
12/17/12 4:00 AM	10.0
12/17/12 5:00 AM	10.7
12/17/12 6:00 AM	11.7
12/17/12 7:00 AM	13.2
12/17/12 8:00 AM	13.9
12/17/12 9:00 AM	15.9

Day/Hour	Victoria Square (TJ/hr)
12/17/12 10:00 AM	16.6
12/17/12 11:00 AM	13.7
12/17/12 12:00 PM	11.8
12/17/12 1:00 PM	11.7
12/17/12 2:00 PM	12.1
12/17/12 3:00 PM	13.2
12/17/12 4:00 PM	14.5
12/17/12 5:00 PM	15.1
12/17/12 6:00 PM	15.2
12/17/12 7:00 PM	13.5
12/17/12 8:00 PM	12.8
12/17/12 9:00 PM	12.5
12/17/12 10:00 PM	12.0
12/17/12 11:00 PM	9.2
12/18/12 12:00 AM	10.2
12/18/12 1:00 AM	9.7
12/18/12 2:00 AM	9.6
12/18/12 3:00 AM	9.8
12/18/12 4:00 AM	10.1
12/18/12 5:00 AM	10.7
12/18/12 6:00 AM	12.0
12/18/12 7:00 AM	13.9
12/18/12 8:00 AM	14.6
12/18/12 9:00 AM	13.9
12/18/12 10:00 AM	13.1
12/18/12 11:00 AM	12.5
12/18/12 12:00 PM	12.0
12/18/12 1:00 PM	11.5
12/18/12 2:00 PM	11.4
12/18/12 3:00 PM	12.3
12/18/12 4:00 PM	13.8
12/18/12 5:00 PM	15.2
12/18/12 6:00 PM	14.2
12/18/12 7:00 PM	11.8
12/18/12 8:00 PM	11.9
12/18/12 9:00 PM	12.0
12/18/12 10:00 PM	11.7
12/18/12 11:00 PM	8.8
12/19/12 12:00 AM	7.6
12/19/12 1:00 AM	7.4
12/19/12 2:00 AM	7.3
12/19/12 3:00 AM	8.2
12/19/12 4:00 AM	11.2
12/19/12 5:00 AM	11.8
12/19/12 6:00 AM	13.6
12/19/12 7:00 AM	15.9

Day/Hour	Victoria Square (TJ/hr)
12/19/12 8:00 AM	16.9
12/19/12 9:00 AM	15.8
12/19/12 10:00 AM	14.0
12/19/12 11:00 AM	12.9
12/19/12 12:00 PM	12.4
12/19/12 1:00 PM	12.3
12/19/12 2:00 PM	12.1
12/19/12 3:00 PM	13.1
12/19/12 4:00 PM	14.5
12/19/12 5:00 PM	16.5
12/19/12 6:00 PM	16.5
12/19/12 7:00 PM	16.5
12/19/12 8:00 PM	16.8
12/19/12 9:00 PM	16.6
12/19/12 10:00 PM	15.9
12/19/12 11:00 PM	14.7
12/20/12 12:00 AM	12.5
12/20/12 1:00 AM	11.4
12/20/12 2:00 AM	11.4
12/20/12 3:00 AM	11.6
12/20/12 4:00 AM	11.7
12/20/12 5:00 AM	12.5
12/20/12 6:00 AM	13.9
12/20/12 7:00 AM	15.2
12/20/12 8:00 AM	16.1
12/20/12 9:00 AM	15.2
12/20/12 10:00 AM	14.2
12/20/12 11:00 AM	14.3
12/20/12 12:00 PM	14.9
12/20/12 1:00 PM	15.5
12/20/12 2:00 PM	15.3
12/20/12 3:00 PM	15.7
12/20/12 4:00 PM	16.4
12/20/12 5:00 PM	17.7
12/20/12 6:00 PM	18.5
12/20/12 7:00 PM	17.9
12/20/12 8:00 PM	17.5
12/20/12 9:00 PM	16.3
12/20/12 10:00 PM	15.1
12/20/12 11:00 PM	13.0
12/21/12 12:00 AM	10.3
12/21/12 1:00 AM	7.9
12/21/12 2:00 AM	7.4
12/21/12 3:00 AM	7.3
12/21/12 4:00 AM	7.9
12/21/12 5:00 AM	9.2

Day/Hour	Victoria Square (TJ/hr)
12/21/12 6:00 AM	10.5
12/21/12 7:00 AM	13.1
12/21/12 8:00 AM	14.7
12/21/12 9:00 AM	14.1
12/21/12 10:00 AM	14.4
12/21/12 11:00 AM	11.3
12/21/12 12:00 PM	12.0
12/21/12 1:00 PM	10.9
12/21/12 2:00 PM	10.7
12/21/12 3:00 PM	11.0
12/21/12 4:00 PM	12.5
12/21/12 5:00 PM	14.9
12/21/12 6:00 PM	15.0
12/21/12 7:00 PM	14.8
12/21/12 8:00 PM	15.5
12/21/12 9:00 PM	15.6
12/21/12 10:00 PM	15.5
12/21/12 11:00 PM	13.7
12/22/12 12:00 AM	12.5
12/22/12 1:00 AM	12.0
12/22/12 2:00 AM	11.9
12/22/12 3:00 AM	11.9
12/22/12 4:00 AM	12.2
12/22/12 5:00 AM	12.9
12/22/12 6:00 AM	14.1
12/22/12 7:00 AM	16.0
12/22/12 8:00 AM	16.8
12/22/12 9:00 AM	18.1
12/22/12 10:00 AM	18.0
12/22/12 11:00 AM	18.1
12/22/12 12:00 PM	16.9
12/22/12 1:00 PM	15.6
12/22/12 2:00 PM	14.6
12/22/12 3:00 PM	14.7
12/22/12 4:00 PM	15.0
12/22/12 5:00 PM	16.3
12/22/12 6:00 PM	16.8
12/22/12 7:00 PM	16.5
12/22/12 8:00 PM	16.1
12/22/12 9:00 PM	15.4
12/22/12 10:00 PM	13.7
12/22/12 11:00 PM	12.6
12/23/12 12:00 AM	11.8
12/23/12 1:00 AM	11.1
12/23/12 2:00 AM	11.0
12/23/12 3:00 AM	11.1

Day/Hour	Victoria Square (TJ/hr)
12/23/12 4:00 AM	11.2
12/23/12 5:00 AM	12.0
12/23/12 6:00 AM	12.8
12/23/12 7:00 AM	13.9
12/23/12 8:00 AM	14.5
12/23/12 9:00 AM	15.4
12/23/12 10:00 AM	15.9
12/23/12 11:00 AM	14.4
12/23/12 12:00 PM	14.7
12/23/12 1:00 PM	13.3
12/23/12 2:00 PM	13.2
12/23/12 3:00 PM	14.2
12/23/12 4:00 PM	14.2
12/23/12 5:00 PM	15.3
12/23/12 6:00 PM	16.2
12/23/12 7:00 PM	15.9
12/23/12 8:00 PM	15.9
12/23/12 9:00 PM	15.9
12/23/12 10:00 PM	15.0
12/23/12 11:00 PM	13.2
12/24/12 12:00 AM	12.3
12/24/12 1:00 AM	12.0
12/24/12 2:00 AM	11.8
12/24/12 3:00 AM	11.9
12/24/12 4:00 AM	12.1
12/24/12 5:00 AM	12.8
12/24/12 6:00 AM	14.1
12/24/12 7:00 AM	15.7
12/24/12 8:00 AM	16.1
12/24/12 9:00 AM	16.7
12/24/12 10:00 AM	16.1
12/24/12 11:00 AM	13.0
12/24/12 12:00 PM	13.1
12/24/12 1:00 PM	13.3
12/24/12 2:00 PM	13.0
12/24/12 3:00 PM	12.9
12/24/12 4:00 PM	13.3
12/24/12 5:00 PM	13.3
12/24/12 6:00 PM	13.7
12/24/12 7:00 PM	14.7
12/24/12 8:00 PM	14.1
12/24/12 9:00 PM	13.9
12/24/12 10:00 PM	13.6
12/24/12 11:00 PM	13.2
12/25/12 12:00 AM	12.9
12/25/12 1:00 AM	12.8

Day/Hour	Victoria Square (TJ/hr)
12/25/12 2:00 AM	13.0
12/25/12 3:00 AM	13.2
12/25/12 4:00 AM	13.4
12/25/12 5:00 AM	13.9
12/25/12 6:00 AM	14.8
12/25/12 7:00 AM	15.6
12/25/12 8:00 AM	15.6
12/25/12 9:00 AM	15.4
12/25/12 10:00 AM	15.4
12/25/12 11:00 AM	15.3
12/25/12 12:00 PM	14.9
12/25/12 1:00 PM	14.4
12/25/12 2:00 PM	13.8
12/25/12 3:00 PM	13.9
12/25/12 4:00 PM	14.2
12/25/12 5:00 PM	14.4
12/25/12 6:00 PM	14.4
12/25/12 7:00 PM	14.0
12/25/12 8:00 PM	13.8
12/25/12 9:00 PM	13.7
12/25/12 10:00 PM	13.8
12/25/12 11:00 PM	13.5
12/26/12 12:00 AM	13.2
12/26/12 1:00 AM	13.0
12/26/12 2:00 AM	13.0
12/26/12 3:00 AM	13.2
12/26/12 4:00 AM	13.8
12/26/12 5:00 AM	14.6
12/26/12 6:00 AM	15.8
12/26/12 7:00 AM	17.0
12/26/12 8:00 AM	17.4
12/26/12 9:00 AM	17.8
12/26/12 10:00 AM	18.2
12/26/12 11:00 AM	16.0
12/26/12 12:00 PM	12.7
12/26/12 1:00 PM	11.6
12/26/12 2:00 PM	11.2
12/26/12 3:00 PM	12.5
12/26/12 4:00 PM	13.8
12/26/12 5:00 PM	13.3
12/26/12 6:00 PM	13.4
12/26/12 7:00 PM	14.9
12/26/12 8:00 PM	14.9
12/26/12 9:00 PM	16.8
12/26/12 10:00 PM	17.5
12/26/12 11:00 PM	17.0

Day/Hour	Victoria Square (TJ/hr)
12/27/12 12:00 AM	16.3
12/27/12 1:00 AM	16.0
12/27/12 2:00 AM	16.0
12/27/12 3:00 AM	15.9
12/27/12 4:00 AM	16.3
12/27/12 5:00 AM	16.9
12/27/12 6:00 AM	18.0
12/27/12 7:00 AM	17.8
12/27/12 8:00 AM	17.3
12/27/12 9:00 AM	17.3
12/27/12 10:00 AM	16.3
12/27/12 11:00 AM	14.3
12/27/12 12:00 PM	12.0
12/27/12 1:00 PM	12.1
12/27/12 2:00 PM	11.7
12/27/12 3:00 PM	11.7
12/27/12 4:00 PM	12.4
12/27/12 5:00 PM	13.3
12/27/12 6:00 PM	15.5
12/27/12 7:00 PM	16.2
12/27/12 8:00 PM	16.1
12/27/12 9:00 PM	16.2
12/27/12 10:00 PM	16.7
12/27/12 11:00 PM	16.1
12/28/12 12:00 AM	15.4
12/28/12 1:00 AM	13.9
12/28/12 2:00 AM	13.9
12/28/12 3:00 AM	14.3
12/28/12 4:00 AM	16.6
12/28/12 5:00 AM	16.8
12/28/12 6:00 AM	17.9
12/28/12 7:00 AM	19.1
12/28/12 8:00 AM	19.4
12/28/12 9:00 AM	19.4
12/28/12 10:00 AM	19.5
12/28/12 11:00 AM	18.1
12/28/12 12:00 PM	18.5
12/28/12 1:00 PM	18.2
12/28/12 2:00 PM	18.2
12/28/12 3:00 PM	18.0
12/28/12 4:00 PM	17.9
12/28/12 5:00 PM	18.0
12/28/12 6:00 PM	17.9
12/28/12 7:00 PM	17.3
12/28/12 8:00 PM	16.5
12/28/12 9:00 PM	15.1

Day/Hour	Victoria Square (TJ/hr)
12/28/12 10:00 PM	13.4
12/28/12 11:00 PM	12.7
12/29/12 12:00 AM	12.4
12/29/12 1:00 AM	12.2
12/29/12 2:00 AM	12.1
12/29/12 3:00 AM	12.1
12/29/12 4:00 AM	12.4
12/29/12 5:00 AM	12.9
12/29/12 6:00 AM	13.9
12/29/12 7:00 AM	14.9
12/29/12 8:00 AM	15.7
12/29/12 9:00 AM	16.4
12/29/12 10:00 AM	16.5
12/29/12 11:00 AM	16.1
12/29/12 12:00 PM	15.7
12/29/12 1:00 PM	15.6
12/29/12 2:00 PM	15.4
12/29/12 3:00 PM	15.3
12/29/12 4:00 PM	15.5
12/29/12 5:00 PM	15.3
12/29/12 6:00 PM	15.3
12/29/12 7:00 PM	14.7
12/29/12 8:00 PM	14.3
12/29/12 9:00 PM	13.0
12/29/12 10:00 PM	10.9
12/29/12 11:00 PM	11.0
12/30/12 12:00 AM	10.7
12/30/12 1:00 AM	10.7
12/30/12 2:00 AM	10.6
12/30/12 3:00 AM	11.9
12/30/12 4:00 AM	13.7
12/30/12 5:00 AM	14.4
12/30/12 6:00 AM	15.4
12/30/12 7:00 AM	16.5
12/30/12 8:00 AM	17.0
12/30/12 9:00 AM	17.5
12/30/12 10:00 AM	16.5
12/30/12 11:00 AM	15.4
12/30/12 12:00 PM	14.0
12/30/12 1:00 PM	13.7
12/30/12 2:00 PM	13.5
12/30/12 3:00 PM	14.6
12/30/12 4:00 PM	14.9
12/30/12 5:00 PM	15.0
12/30/12 6:00 PM	14.9
12/30/12 7:00 PM	14.1

Day/Hour	Victoria Square (TJ/hr)
12/30/12 8:00 PM	13.5
12/30/12 9:00 PM	13.1
12/30/12 10:00 PM	12.8
12/30/12 11:00 PM	12.1
12/31/12 12:00 AM	11.5
12/31/12 1:00 AM	11.4
12/31/12 2:00 AM	11.5
12/31/12 3:00 AM	11.9
12/31/12 4:00 AM	11.8
12/31/12 5:00 AM	12.7
12/31/12 6:00 AM	14.2
12/31/12 7:00 AM	15.8
12/31/12 8:00 AM	17.1
12/31/12 9:00 AM	17.4
12/31/12 10:00 AM	17.3
12/31/12 11:00 AM	16.2
12/31/12 12:00 PM	16.5
12/31/12 1:00 PM	16.5
12/31/12 2:00 PM	15.6
12/31/12 3:00 PM	16.1
12/31/12 4:00 PM	16.6
12/31/12 5:00 PM	16.8
12/31/12 6:00 PM	16.6
12/31/12 7:00 PM	15.9
12/31/12 8:00 PM	15.2
12/31/12 9:00 PM	14.6
12/31/12 10:00 PM	14.0
12/31/12 11:00 PM	13.5
1/1/13 12:00 AM	13.2
1/1/13 1:00 AM	12.9
1/1/13 2:00 AM	13.6
1/1/13 3:00 AM	14.0
1/1/13 4:00 AM	14.3
1/1/13 5:00 AM	14.9
1/1/13 6:00 AM	15.9
1/1/13 7:00 AM	17.0
1/1/13 8:00 AM	17.3
1/1/13 9:00 AM	17.7
1/1/13 10:00 AM	17.5
1/1/13 11:00 AM	16.5
1/1/13 12:00 PM	16.2
1/1/13 1:00 PM	15.8
1/1/13 2:00 PM	15.6
1/1/13 3:00 PM	15.7
1/1/13 4:00 PM	16.3
1/1/13 5:00 PM	17.6

Day/Hour	Victoria Square (TJ/hr)
1/1/13 6:00 PM	18.5
1/1/13 7:00 PM	18.4
1/1/13 8:00 PM	18.3
1/1/13 9:00 PM	18.7
1/1/13 10:00 PM	18.3
1/1/13 11:00 PM	17.4
1/2/13 12:00 AM	16.5
1/2/13 1:00 AM	15.9
1/2/13 2:00 AM	16.4
1/2/13 3:00 AM	16.6
1/2/13 4:00 AM	17.0
1/2/13 5:00 AM	18.0
1/2/13 6:00 AM	19.9
1/2/13 7:00 AM	21.4
1/2/13 8:00 AM	22.3
1/2/13 9:00 AM	21.8
1/2/13 10:00 AM	20.4
1/2/13 11:00 AM	19.7
1/2/13 12:00 PM	20.4
1/2/13 1:00 PM	20.6
1/2/13 2:00 PM	22.6
1/2/13 3:00 PM	23.0
1/2/13 4:00 PM	23.4
1/2/13 5:00 PM	23.6
1/2/13 6:00 PM	22.6
1/2/13 7:00 PM	22.7
1/2/13 8:00 PM	22.5
1/2/13 9:00 PM	21.7
1/2/13 10:00 PM	21.0
1/2/13 11:00 PM	19.7
1/3/13 12:00 AM	16.5
1/3/13 1:00 AM	15.5
1/3/13 2:00 AM	15.7
1/3/13 3:00 AM	16.0
1/3/13 4:00 AM	16.7
1/3/13 5:00 AM	18.8
1/3/13 6:00 AM	20.6
1/3/13 7:00 AM	22.1
1/3/13 8:00 AM	23.2
1/3/13 9:00 AM	22.8
1/3/13 10:00 AM	20.1
1/3/13 11:00 AM	19.3
1/3/13 12:00 PM	18.6
1/3/13 1:00 PM	18.2
1/3/13 2:00 PM	17.5
1/3/13 3:00 PM	17.2

Day/Hour	Victoria Square (TJ/hr)
1/3/13 4:00 PM	17.2
1/3/13 5:00 PM	17.6
1/3/13 6:00 PM	18.9
1/3/13 7:00 PM	19.0
1/3/13 8:00 PM	18.4
1/3/13 9:00 PM	18.3
1/3/13 10:00 PM	16.7
1/3/13 11:00 PM	15.5
1/4/13 12:00 AM	14.0
1/4/13 1:00 AM	12.8
1/4/13 2:00 AM	12.7
1/4/13 3:00 AM	12.9
1/4/13 4:00 AM	13.5
1/4/13 5:00 AM	14.5
1/4/13 6:00 AM	15.9
1/4/13 7:00 AM	15.4
1/4/13 8:00 AM	14.2
1/4/13 9:00 AM	14.0
1/4/13 10:00 AM	13.3
1/4/13 11:00 AM	12.7
1/4/13 12:00 PM	11.7
1/4/13 1:00 PM	11.8
1/4/13 2:00 PM	11.7
1/4/13 3:00 PM	11.7
1/4/13 4:00 PM	11.9
1/4/13 5:00 PM	12.1
1/4/13 6:00 PM	12.1
1/4/13 7:00 PM	13.8
1/4/13 8:00 PM	16.0
1/4/13 9:00 PM	16.0
1/4/13 10:00 PM	15.7
1/4/13 11:00 PM	16.1
1/5/13 12:00 AM	15.7
1/5/13 1:00 AM	15.2
1/5/13 2:00 AM	14.9
1/5/13 3:00 AM	14.8
1/5/13 4:00 AM	15.1
1/5/13 5:00 AM	14.9
1/5/13 6:00 AM	15.5
1/5/13 7:00 AM	16.3
1/5/13 8:00 AM	17.0
1/5/13 9:00 AM	17.5
1/5/13 10:00 AM	17.4
1/5/13 11:00 AM	13.9
1/5/13 12:00 PM	13.1
1/5/13 1:00 PM	12.3

Day/Hour	Victoria Square (TJ/hr)
1/5/13 2:00 PM	11.7
1/5/13 3:00 PM	12.2
1/5/13 4:00 PM	12.1
1/5/13 5:00 PM	13.1
1/5/13 6:00 PM	13.6
1/5/13 7:00 PM	13.5
1/5/13 8:00 PM	13.1
1/5/13 9:00 PM	12.5
1/5/13 10:00 PM	12.7
1/5/13 11:00 PM	13.3
1/6/13 12:00 AM	12.7
1/6/13 1:00 AM	12.3
1/6/13 2:00 AM	12.0
1/6/13 3:00 AM	11.9
1/6/13 4:00 AM	12.2
1/6/13 5:00 AM	12.6
1/6/13 6:00 AM	13.8
1/6/13 7:00 AM	15.9
1/6/13 8:00 AM	16.5
1/6/13 9:00 AM	17.3
1/6/13 10:00 AM	17.0
1/6/13 11:00 AM	16.0
1/6/13 12:00 PM	16.1
1/6/13 1:00 PM	15.7
1/6/13 2:00 PM	15.7
1/6/13 3:00 PM	15.7
1/6/13 4:00 PM	15.7
1/6/13 5:00 PM	16.0
1/6/13 6:00 PM	16.7
1/6/13 7:00 PM	16.4
1/6/13 8:00 PM	15.9
1/6/13 9:00 PM	15.5
1/6/13 10:00 PM	15.9
1/6/13 11:00 PM	15.5
1/7/13 12:00 AM	15.0
1/7/13 1:00 AM	14.5
1/7/13 2:00 AM	14.5
1/7/13 3:00 AM	14.9
1/7/13 4:00 AM	15.5
1/7/13 5:00 AM	16.6
1/7/13 6:00 AM	19.5
1/7/13 7:00 AM	22.6
1/7/13 8:00 AM	25.0
1/7/13 9:00 AM	24.6
1/7/13 10:00 AM	21.3
1/7/13 11:00 AM	19.4

Day/Hour	Victoria Square (TJ/hr)
1/7/13 12:00 PM	19.4
1/7/13 1:00 PM	20.0
1/7/13 2:00 PM	20.0
1/7/13 3:00 PM	19.5
1/7/13 4:00 PM	19.7
1/7/13 5:00 PM	20.7
1/7/13 6:00 PM	21.1
1/7/13 7:00 PM	20.7
1/7/13 8:00 PM	19.5
1/7/13 9:00 PM	16.9
1/7/13 10:00 PM	12.4
1/7/13 11:00 PM	11.2
1/8/13 12:00 AM	15.5
1/8/13 1:00 AM	15.0
1/8/13 2:00 AM	14.8
1/8/13 3:00 AM	13.9
1/8/13 4:00 AM	13.7
1/8/13 5:00 AM	14.4
1/8/13 6:00 AM	15.9
1/8/13 7:00 AM	17.8
1/8/13 8:00 AM	18.9
1/8/13 9:00 AM	18.3
1/8/13 10:00 AM	17.2
1/8/13 11:00 AM	15.2
1/8/13 12:00 PM	14.5
1/8/13 1:00 PM	13.2
1/8/13 2:00 PM	12.2
1/8/13 3:00 PM	12.0
1/8/13 4:00 PM	12.6
1/8/13 5:00 PM	13.9
1/8/13 6:00 PM	14.7
1/8/13 7:00 PM	14.4
1/8/13 8:00 PM	14.0
1/8/13 9:00 PM	12.4
1/8/13 10:00 PM	9.3
1/8/13 11:00 PM	8.6
1/9/13 12:00 AM	7.8
1/9/13 1:00 AM	8.9
1/9/13 2:00 AM	11.4
1/9/13 3:00 AM	11.5
1/9/13 4:00 AM	11.9
1/9/13 5:00 AM	12.7
1/9/13 6:00 AM	14.3
1/9/13 7:00 AM	16.1
1/9/13 8:00 AM	16.9
1/9/13 9:00 AM	15.4

Day/Hour	Victoria Square (TJ/hr)
1/9/13 10:00 AM	14.0
1/9/13 11:00 AM	13.4
1/9/13 12:00 PM	12.6
1/9/13 1:00 PM	12.3
1/9/13 2:00 PM	13.3
1/9/13 3:00 PM	12.4
1/9/13 4:00 PM	12.5
1/9/13 5:00 PM	13.4
1/9/13 6:00 PM	14.6
1/9/13 7:00 PM	14.4
1/9/13 8:00 PM	14.4
1/9/13 9:00 PM	14.3
1/9/13 10:00 PM	13.8
1/9/13 11:00 PM	13.0
1/10/13 12:00 AM	11.0
1/10/13 1:00 AM	10.3
1/10/13 2:00 AM	10.0
1/10/13 3:00 AM	10.3
1/10/13 4:00 AM	13.3
1/10/13 5:00 AM	13.1
1/10/13 6:00 AM	14.5
1/10/13 7:00 AM	16.4
1/10/13 8:00 AM	17.4
1/10/13 9:00 AM	16.5
1/10/13 10:00 AM	14.1
1/10/13 11:00 AM	11.9
1/10/13 12:00 PM	11.1
1/10/13 1:00 PM	10.3
1/10/13 2:00 PM	10.7
1/10/13 3:00 PM	10.5
1/10/13 4:00 PM	11.0
1/10/13 5:00 PM	12.2
1/10/13 6:00 PM	13.2
1/10/13 7:00 PM	13.1
1/10/13 8:00 PM	12.9
1/10/13 9:00 PM	12.6
1/10/13 10:00 PM	12.4
1/10/13 11:00 PM	12.8
1/11/13 12:00 AM	12.8
1/11/13 1:00 AM	12.4
1/11/13 2:00 AM	12.2
1/11/13 3:00 AM	12.3
1/11/13 4:00 AM	12.4
1/11/13 5:00 AM	13.3
1/11/13 6:00 AM	14.7
1/11/13 7:00 AM	16.4

Day/Hour	Victoria Square (TJ/hr)
1/11/13 8:00 AM	17.2
1/11/13 9:00 AM	16.4
1/11/13 10:00 AM	15.5
1/11/13 11:00 AM	14.3
1/11/13 12:00 PM	14.4
1/11/13 1:00 PM	13.9
1/11/13 2:00 PM	13.6
1/11/13 3:00 PM	13.6
1/11/13 4:00 PM	13.8
1/11/13 5:00 PM	14.0
1/11/13 6:00 PM	14.0
1/11/13 7:00 PM	13.4
1/11/13 8:00 PM	12.9
1/11/13 9:00 PM	12.4
1/11/13 10:00 PM	12.0
1/11/13 11:00 PM	11.5
1/12/13 12:00 AM	11.0
1/12/13 1:00 AM	10.8
1/12/13 2:00 AM	10.6
1/12/13 3:00 AM	10.9
1/12/13 4:00 AM	10.9
1/12/13 5:00 AM	11.2
1/12/13 6:00 AM	11.7
1/12/13 7:00 AM	12.3
1/12/13 8:00 AM	13.1
1/12/13 9:00 AM	13.1
1/12/13 10:00 AM	12.9
1/12/13 11:00 AM	11.2
1/12/13 12:00 PM	10.7
1/12/13 1:00 PM	10.1
1/12/13 2:00 PM	9.6
1/12/13 3:00 PM	9.4
1/12/13 4:00 PM	9.4
1/12/13 5:00 PM	9.9
1/12/13 6:00 PM	10.0
1/12/13 7:00 PM	9.8
1/12/13 8:00 PM	9.5
1/12/13 9:00 PM	9.4
1/12/13 10:00 PM	9.1
1/12/13 11:00 PM	9.0
1/13/13 12:00 AM	9.6
1/13/13 1:00 AM	9.4
1/13/13 2:00 AM	9.3
1/13/13 3:00 AM	9.3
1/13/13 4:00 AM	9.5
1/13/13 5:00 AM	10.1

Day/Hour	Victoria Square (TJ/hr)
1/13/13 6:00 AM	10.3
1/13/13 7:00 AM	10.8
1/13/13 8:00 AM	11.3
1/13/13 9:00 AM	11.5
1/13/13 10:00 AM	11.6
1/13/13 11:00 AM	10.3
1/13/13 12:00 PM	10.6
1/13/13 1:00 PM	10.1
1/13/13 2:00 PM	9.6
1/13/13 3:00 PM	9.0
1/13/13 4:00 PM	9.1
1/13/13 5:00 PM	9.5
1/13/13 6:00 PM	9.8
1/13/13 7:00 PM	9.9
1/13/13 8:00 PM	10.0
1/13/13 9:00 PM	10.4
1/13/13 10:00 PM	10.2
1/13/13 11:00 PM	10.1
1/14/13 12:00 AM	10.4
1/14/13 1:00 AM	10.4
1/14/13 2:00 AM	10.5
1/14/13 3:00 AM	10.8
1/14/13 4:00 AM	11.1
1/14/13 5:00 AM	11.8
1/14/13 6:00 AM	13.6
1/14/13 7:00 AM	17.7
1/14/13 8:00 AM	19.6
1/14/13 9:00 AM	19.0
1/14/13 10:00 AM	19.6
1/14/13 11:00 AM	14.4
1/14/13 12:00 PM	13.3
1/14/13 1:00 PM	13.3
1/14/13 2:00 PM	13.3
1/14/13 3:00 PM	13.3
1/14/13 4:00 PM	13.6
1/14/13 5:00 PM	14.1
1/14/13 6:00 PM	14.0
1/14/13 7:00 PM	13.7
1/14/13 8:00 PM	13.5
1/14/13 9:00 PM	13.3
1/14/13 10:00 PM	13.0
1/14/13 11:00 PM	13.3
1/15/13 12:00 AM	13.5
1/15/13 1:00 AM	13.1
1/15/13 2:00 AM	13.3
1/15/13 3:00 AM	13.7

Day/Hour	Victoria Square (TJ/hr)
1/15/13 4:00 AM	14.3
1/15/13 5:00 AM	14.9
1/15/13 6:00 AM	16.6
1/15/13 7:00 AM	20.2
1/15/13 8:00 AM	22.3
1/15/13 9:00 AM	21.5
1/15/13 10:00 AM	18.3
1/15/13 11:00 AM	15.6
1/15/13 12:00 PM	14.3
1/15/13 1:00 PM	14.3
1/15/13 2:00 PM	14.3
1/15/13 3:00 PM	14.8
1/15/13 4:00 PM	16.0
1/15/13 5:00 PM	18.5
1/15/13 6:00 PM	19.2
1/15/13 7:00 PM	18.6
1/15/13 8:00 PM	17.7
1/15/13 9:00 PM	17.4
1/15/13 10:00 PM	16.9
1/15/13 11:00 PM	15.4
1/16/13 12:00 AM	13.0
1/16/13 1:00 AM	12.1
1/16/13 2:00 AM	12.1
1/16/13 3:00 AM	12.4
1/16/13 4:00 AM	12.8
1/16/13 5:00 AM	13.1
1/16/13 6:00 AM	15.5
1/16/13 7:00 AM	17.9
1/16/13 8:00 AM	19.0
1/16/13 9:00 AM	17.4
1/16/13 10:00 AM	14.2
1/16/13 11:00 AM	12.5
1/16/13 12:00 PM	11.9
1/16/13 1:00 PM	11.6
1/16/13 2:00 PM	11.2
1/16/13 3:00 PM	10.9
1/16/13 4:00 PM	11.6
1/16/13 5:00 PM	13.6
1/16/13 6:00 PM	15.3
1/16/13 7:00 PM	15.1
1/16/13 8:00 PM	14.9
1/16/13 9:00 PM	14.6
1/16/13 10:00 PM	14.2
1/16/13 11:00 PM	13.4
1/17/13 12:00 AM	11.6
1/17/13 1:00 AM	10.6

Day/Hour	Victoria Square (TJ/hr)
1/17/13 2:00 AM	10.3
1/17/13 3:00 AM	10.3
1/17/13 4:00 AM	12.3
1/17/13 5:00 AM	14.5
1/17/13 6:00 AM	16.6
1/17/13 7:00 AM	20.9
1/17/13 8:00 AM	23.0
1/17/13 9:00 AM	23.5
1/17/13 10:00 AM	23.0
1/17/13 11:00 AM	19.0
1/17/13 12:00 PM	18.0
1/17/13 1:00 PM	16.3
1/17/13 2:00 PM	17.3
1/17/13 3:00 PM	18.8
1/17/13 4:00 PM	21.0
1/17/13 5:00 PM	21.5
1/17/13 6:00 PM	22.7
1/17/13 7:00 PM	23.1
1/17/13 8:00 PM	22.4
1/17/13 9:00 PM	18.7
1/17/13 10:00 PM	13.1
1/17/13 11:00 PM	12.8
1/18/13 12:00 AM	10.4
1/18/13 1:00 AM	8.5
1/18/13 2:00 AM	7.3
1/18/13 3:00 AM	9.1
1/18/13 4:00 AM	11.4
1/18/13 5:00 AM	16.2
1/18/13 6:00 AM	21.2
1/18/13 7:00 AM	23.9
1/18/13 8:00 AM	22.9
1/18/13 9:00 AM	22.7
1/18/13 10:00 AM	21.1
1/18/13 11:00 AM	19.6
1/18/13 12:00 PM	21.4
1/18/13 1:00 PM	20.6
1/18/13 2:00 PM	19.9
1/18/13 3:00 PM	21.1
1/18/13 4:00 PM	22.5
1/18/13 5:00 PM	22.9
1/18/13 6:00 PM	23.3
1/18/13 7:00 PM	23.0
1/18/13 8:00 PM	21.2
1/18/13 9:00 PM	20.0
1/18/13 10:00 PM	17.3
1/18/13 11:00 PM	13.5

Day/Hour	Victoria Square (TJ/hr)
1/19/13 12:00 AM	11.2
1/19/13 1:00 AM	11.0
1/19/13 2:00 AM	10.5
1/19/13 3:00 AM	9.5
1/19/13 4:00 AM	8.4
1/19/13 5:00 AM	9.5
1/19/13 6:00 AM	10.3
1/19/13 7:00 AM	12.0
1/19/13 8:00 AM	12.2
1/19/13 9:00 AM	12.3
1/19/13 10:00 AM	13.6
1/19/13 11:00 AM	11.9
1/19/13 12:00 PM	13.5
1/19/13 1:00 PM	13.0
1/19/13 2:00 PM	12.7
1/19/13 3:00 PM	12.5
1/19/13 4:00 PM	12.8
1/19/13 5:00 PM	13.0
1/19/13 6:00 PM	13.0
1/19/13 7:00 PM	12.4
1/19/13 8:00 PM	11.8
1/19/13 9:00 PM	11.6
1/19/13 10:00 PM	11.5
1/19/13 11:00 PM	10.9
1/20/13 12:00 AM	10.1
1/20/13 1:00 AM	9.7
1/20/13 2:00 AM	9.5
1/20/13 3:00 AM	9.7
1/20/13 4:00 AM	11.3
1/20/13 5:00 AM	13.1
1/20/13 6:00 AM	17.4
1/20/13 7:00 AM	22.8
1/20/13 8:00 AM	27.7
1/20/13 9:00 AM	29.5
1/20/13 10:00 AM	29.5
1/20/13 11:00 AM	23.5
1/20/13 12:00 PM	17.1
1/20/13 1:00 PM	17.3
1/20/13 2:00 PM	17.3
1/20/13 3:00 PM	17.5
1/20/13 4:00 PM	17.9
1/20/13 5:00 PM	18.7
1/20/13 6:00 PM	19.3
1/20/13 7:00 PM	19.0
1/20/13 8:00 PM	19.1
1/20/13 9:00 PM	19.0

Day/Hour	Victoria Square (TJ/hr)
1/20/13 10:00 PM	18.8
1/20/13 11:00 PM	18.0
1/21/13 12:00 AM	16.2
1/21/13 1:00 AM	16.3
1/21/13 2:00 AM	16.4
1/21/13 3:00 AM	16.6
1/21/13 4:00 AM	17.1
1/21/13 5:00 AM	17.9
1/21/13 6:00 AM	19.0
1/21/13 7:00 AM	19.0
1/21/13 8:00 AM	19.6
1/21/13 9:00 AM	13.9
1/21/13 10:00 AM	10.6
1/21/13 11:00 AM	12.0
1/21/13 12:00 PM	14.7
1/21/13 1:00 PM	16.4
1/21/13 2:00 PM	16.8
1/21/13 3:00 PM	16.9
1/21/13 4:00 PM	18.0
1/21/13 5:00 PM	18.9
1/21/13 6:00 PM	20.7
1/21/13 7:00 PM	21.6
1/21/13 8:00 PM	21.7
1/21/13 9:00 PM	21.8
1/21/13 10:00 PM	21.8
1/21/13 11:00 PM	20.8
1/22/13 12:00 AM	19.1
1/22/13 1:00 AM	18.1
1/22/13 2:00 AM	18.5
1/22/13 3:00 AM	18.9
1/22/13 4:00 AM	19.4
1/22/13 5:00 AM	20.7
1/22/13 6:00 AM	21.9
1/22/13 7:00 AM	23.2
1/22/13 8:00 AM	24.2
1/22/13 9:00 AM	23.7
1/22/13 10:00 AM	22.5
1/22/13 11:00 AM	21.9
1/22/13 12:00 PM	21.5
1/22/13 1:00 PM	22.8
1/22/13 2:00 PM	23.0
1/22/13 3:00 PM	22.8
1/22/13 4:00 PM	23.0
1/22/13 5:00 PM	22.7
1/22/13 6:00 PM	23.7
1/22/13 7:00 PM	23.6

Day/Hour	Victoria Square (TJ/hr)
1/22/13 8:00 PM	23.3
1/22/13 9:00 PM	24.1
1/22/13 10:00 PM	24.8
1/22/13 11:00 PM	24.0
1/23/13 12:00 AM	23.4
1/23/13 1:00 AM	23.4
1/23/13 2:00 AM	23.3
1/23/13 3:00 AM	24.1
1/23/13 4:00 AM	24.9
1/23/13 5:00 AM	26.3
1/23/13 6:00 AM	27.8
1/23/13 7:00 AM	28.4
1/23/13 8:00 AM	29.6
1/23/13 9:00 AM	26.3
1/23/13 10:00 AM	19.2
1/23/13 11:00 AM	18.5
1/23/13 12:00 PM	18.6
1/23/13 1:00 PM	18.1
1/23/13 2:00 PM	17.0
1/23/13 3:00 PM	16.3
1/23/13 4:00 PM	17.6
1/23/13 5:00 PM	17.9
1/23/13 6:00 PM	19.2
1/23/13 7:00 PM	22.9
1/23/13 8:00 PM	22.1
1/23/13 9:00 PM	22.4
1/23/13 10:00 PM	22.5
1/23/13 11:00 PM	21.8
1/24/13 12:00 AM	20.6
1/24/13 1:00 AM	20.6
1/24/13 2:00 AM	20.8
1/24/13 3:00 AM	21.2
1/24/13 4:00 AM	21.6
1/24/13 5:00 AM	22.3
1/24/13 6:00 AM	23.6
1/24/13 7:00 AM	27.6
1/24/13 8:00 AM	28.6
1/24/13 9:00 AM	28.1
1/24/13 10:00 AM	27.9
1/24/13 11:00 AM	26.5
1/24/13 12:00 PM	23.4
1/24/13 1:00 PM	22.8
1/24/13 2:00 PM	22.5
1/24/13 3:00 PM	22.6
1/24/13 4:00 PM	22.5
1/24/13 5:00 PM	23.3

Day/Hour	Victoria Square (TJ/hr)
1/24/13 6:00 PM	23.7
1/24/13 7:00 PM	23.0
1/24/13 8:00 PM	22.4
1/24/13 9:00 PM	23.7
1/24/13 10:00 PM	24.3
1/24/13 11:00 PM	23.4
1/25/13 12:00 AM	22.9
1/25/13 1:00 AM	22.6
1/25/13 2:00 AM	22.8
1/25/13 3:00 AM	23.1
1/25/13 4:00 AM	23.5
1/25/13 5:00 AM	23.9
1/25/13 6:00 AM	24.3
1/25/13 7:00 AM	26.1
1/25/13 8:00 AM	28.5
1/25/13 9:00 AM	27.9
1/25/13 10:00 AM	27.4
1/25/13 11:00 AM	26.9
1/25/13 12:00 PM	26.7
1/25/13 1:00 PM	26.6
1/25/13 2:00 PM	26.5
1/25/13 3:00 PM	26.3
1/25/13 4:00 PM	26.3
1/25/13 5:00 PM	25.0
1/25/13 6:00 PM	23.4
1/25/13 7:00 PM	22.7
1/25/13 8:00 PM	23.0
1/25/13 9:00 PM	19.3
1/25/13 10:00 PM	16.0
1/25/13 11:00 PM	15.2
1/26/13 12:00 AM	13.9
1/26/13 1:00 AM	14.3
1/26/13 2:00 AM	14.2
1/26/13 3:00 AM	14.4
1/26/13 4:00 AM	16.8
1/26/13 5:00 AM	20.3
1/26/13 6:00 AM	20.5
1/26/13 7:00 AM	21.6
1/26/13 8:00 AM	21.6
1/26/13 9:00 AM	23.4
1/26/13 10:00 AM	22.6
1/26/13 11:00 AM	20.2
1/26/13 12:00 PM	21.0
1/26/13 1:00 PM	19.9
1/26/13 2:00 PM	21.0
1/26/13 3:00 PM	21.0

Day/Hour	Victoria Square (TJ/hr)
1/26/13 4:00 PM	20.6
1/26/13 5:00 PM	21.2
1/26/13 6:00 PM	22.7
1/26/13 7:00 PM	22.3
1/26/13 8:00 PM	22.5
1/26/13 9:00 PM	22.2
1/26/13 10:00 PM	22.0
1/26/13 11:00 PM	21.1
1/27/13 12:00 AM	18.8
1/27/13 1:00 AM	16.8
1/27/13 2:00 AM	15.4
1/27/13 3:00 AM	15.8
1/27/13 4:00 AM	16.5
1/27/13 5:00 AM	17.6
1/27/13 6:00 AM	19.2
1/27/13 7:00 AM	22.1
1/27/13 8:00 AM	23.3
1/27/13 9:00 AM	23.7
1/27/13 10:00 AM	23.0
1/27/13 11:00 AM	20.2
1/27/13 12:00 PM	17.6
1/27/13 1:00 PM	16.4
1/27/13 2:00 PM	16.8
1/27/13 3:00 PM	18.2
1/27/13 4:00 PM	20.5
1/27/13 5:00 PM	21.7
1/27/13 6:00 PM	23.0
1/27/13 7:00 PM	22.8
1/27/13 8:00 PM	22.3
1/27/13 9:00 PM	19.7
1/27/13 10:00 PM	16.1
1/27/13 11:00 PM	15.1
1/28/13 12:00 AM	13.8
1/28/13 1:00 AM	13.1
1/28/13 2:00 AM	12.7
1/28/13 3:00 AM	12.6
1/28/13 4:00 AM	13.0
1/28/13 5:00 AM	14.7
1/28/13 6:00 AM	16.9
1/28/13 7:00 AM	20.9
1/28/13 8:00 AM	22.5
1/28/13 9:00 AM	22.1
1/28/13 10:00 AM	21.8
1/28/13 11:00 AM	18.5
1/28/13 12:00 PM	15.3
1/28/13 1:00 PM	15.9

Day/Hour	Victoria Square (TJ/hr)
1/28/13 2:00 PM	16.2
1/28/13 3:00 PM	15.7
1/28/13 4:00 PM	15.3
1/28/13 5:00 PM	15.4
1/28/13 6:00 PM	15.9
1/28/13 7:00 PM	15.5
1/28/13 8:00 PM	14.7
1/28/13 9:00 PM	14.1
1/28/13 10:00 PM	13.4
1/28/13 11:00 PM	12.3
1/29/13 12:00 AM	8.1
1/29/13 1:00 AM	7.1
1/29/13 2:00 AM	8.1
1/29/13 3:00 AM	8.2
1/29/13 4:00 AM	8.6
1/29/13 5:00 AM	9.3
1/29/13 6:00 AM	11.8
1/29/13 7:00 AM	16.0
1/29/13 8:00 AM	18.6
1/29/13 9:00 AM	19.5
1/29/13 10:00 AM	20.6
1/29/13 11:00 AM	18.4
1/29/13 12:00 PM	19.5
1/29/13 1:00 PM	18.0
1/29/13 2:00 PM	17.8
1/29/13 3:00 PM	17.9
1/29/13 4:00 PM	18.1
1/29/13 5:00 PM	17.9
1/29/13 6:00 PM	18.1
1/29/13 7:00 PM	16.7
1/29/13 8:00 PM	16.0
1/29/13 9:00 PM	14.1
1/29/13 10:00 PM	13.3
1/29/13 11:00 PM	12.4
1/30/13 12:00 AM	11.3
1/30/13 1:00 AM	10.6
1/30/13 2:00 AM	10.2
1/30/13 3:00 AM	10.0
1/30/13 4:00 AM	11.9
1/30/13 5:00 AM	11.9
1/30/13 6:00 AM	14.1
1/30/13 7:00 AM	14.1
1/30/13 8:00 AM	14.0
1/30/13 9:00 AM	13.7
1/30/13 10:00 AM	13.7
1/30/13 11:00 AM	13.7

Day/Hour	Victoria Square (TJ/hr)
1/30/13 12:00 PM	13.7
1/30/13 1:00 PM	13.3
1/30/13 2:00 PM	13.0
1/30/13 3:00 PM	13.0
1/30/13 4:00 PM	12.9
1/30/13 5:00 PM	13.2
1/30/13 6:00 PM	13.6
1/30/13 7:00 PM	13.4
1/30/13 8:00 PM	13.3
1/30/13 9:00 PM	11.1
1/30/13 10:00 PM	9.2
1/30/13 11:00 PM	10.9
1/31/13 12:00 AM	8.7
1/31/13 1:00 AM	7.5
1/31/13 2:00 AM	7.8
1/31/13 3:00 AM	9.1
1/31/13 4:00 AM	12.1
1/31/13 5:00 AM	16.0
1/31/13 6:00 AM	19.1
1/31/13 7:00 AM	22.8
1/31/13 8:00 AM	25.4
1/31/13 9:00 AM	28.1
1/31/13 10:00 AM	28.8
1/31/13 11:00 AM	23.9
1/31/13 12:00 PM	20.0
1/31/13 1:00 PM	18.0
1/31/13 2:00 PM	17.2
1/31/13 3:00 PM	17.4
1/31/13 4:00 PM	17.9
1/31/13 5:00 PM	18.6
1/31/13 6:00 PM	18.8
1/31/13 7:00 PM	18.2
1/31/13 8:00 PM	18.4
1/31/13 9:00 PM	17.5
1/31/13 10:00 PM	17.6
1/31/13 11:00 PM	16.5
2/1/13 12:00 AM	10.9
2/1/13 1:00 AM	10.3
2/1/13 2:00 AM	10.1
2/1/13 3:00 AM	11.2
2/1/13 4:00 AM	15.7
2/1/13 5:00 AM	16.8
2/1/13 6:00 AM	18.8
2/1/13 7:00 AM	20.9
2/1/13 8:00 AM	22.3
2/1/13 9:00 AM	23.2

Day/Hour	Victoria Square (TJ/hr)
2/1/13 10:00 AM	18.1
2/1/13 11:00 AM	14.6
2/1/13 12:00 PM	15.1
2/1/13 1:00 PM	15.7
2/1/13 2:00 PM	15.7
2/1/13 3:00 PM	15.6
2/1/13 4:00 PM	17.0
2/1/13 5:00 PM	19.7
2/1/13 6:00 PM	20.2
2/1/13 7:00 PM	20.3
2/1/13 8:00 PM	19.4
2/1/13 9:00 PM	19.2
2/1/13 10:00 PM	18.9
2/1/13 11:00 PM	18.2
2/2/13 12:00 AM	17.4
2/2/13 1:00 AM	16.2
2/2/13 2:00 AM	16.0
2/2/13 3:00 AM	16.4
2/2/13 4:00 AM	17.9
2/2/13 5:00 AM	18.4
2/2/13 6:00 AM	20.5
2/2/13 7:00 AM	21.3
2/2/13 8:00 AM	21.4
2/2/13 9:00 AM	22.1
2/2/13 10:00 AM	22.1
2/2/13 11:00 AM	19.5
2/2/13 12:00 PM	17.7
2/2/13 1:00 PM	17.0
2/2/13 2:00 PM	16.6
2/2/13 3:00 PM	15.9
2/2/13 4:00 PM	15.6
2/2/13 5:00 PM	15.4
2/2/13 6:00 PM	17.3
2/2/13 7:00 PM	20.0
2/2/13 8:00 PM	20.8
2/2/13 9:00 PM	21.3
2/2/13 10:00 PM	21.1
2/2/13 11:00 PM	20.5
2/3/13 12:00 AM	19.2
2/3/13 1:00 AM	18.3
2/3/13 2:00 AM	18.4
2/3/13 3:00 AM	18.9
2/3/13 4:00 AM	19.3
2/3/13 5:00 AM	20.8
2/3/13 6:00 AM	21.8
2/3/13 7:00 AM	22.5

Day/Hour	Victoria Square (TJ/hr)
2/3/13 8:00 AM	23.1
2/3/13 9:00 AM	23.3
2/3/13 10:00 AM	22.9
2/3/13 11:00 AM	19.2
2/3/13 12:00 PM	17.5
2/3/13 1:00 PM	16.7
2/3/13 2:00 PM	17.0
2/3/13 3:00 PM	17.2
2/3/13 4:00 PM	18.0
2/3/13 5:00 PM	17.9
2/3/13 6:00 PM	18.8
2/3/13 7:00 PM	18.5
2/3/13 8:00 PM	19.1
2/3/13 9:00 PM	19.3
2/3/13 10:00 PM	18.7
2/3/13 11:00 PM	18.7
2/4/13 12:00 AM	16.6
2/4/13 1:00 AM	15.9
2/4/13 2:00 AM	16.1
2/4/13 3:00 AM	16.4
2/4/13 4:00 AM	16.7
2/4/13 5:00 AM	17.3
2/4/13 6:00 AM	19.2
2/4/13 7:00 AM	23.7
2/4/13 8:00 AM	26.6
2/4/13 9:00 AM	25.9
2/4/13 10:00 AM	23.8
2/4/13 11:00 AM	22.7
2/4/13 12:00 PM	21.9
2/4/13 1:00 PM	20.9
2/4/13 2:00 PM	20.3
2/4/13 3:00 PM	21.0
2/4/13 4:00 PM	22.2
2/4/13 5:00 PM	21.8
2/4/13 6:00 PM	22.5
2/4/13 7:00 PM	21.7
2/4/13 8:00 PM	20.2
2/4/13 9:00 PM	20.0
2/4/13 10:00 PM	20.2
2/4/13 11:00 PM	19.4
2/5/13 12:00 AM	17.0
2/5/13 1:00 AM	15.3
2/5/13 2:00 AM	14.3
2/5/13 3:00 AM	15.4
2/5/13 4:00 AM	19.4
2/5/13 5:00 AM	19.8

Day/Hour	Victoria Square (TJ/hr)
2/5/13 6:00 AM	20.4
2/5/13 7:00 AM	23.6
2/5/13 8:00 AM	26.2
2/5/13 9:00 AM	24.4
2/5/13 10:00 AM	22.9
2/5/13 11:00 AM	22.6
2/5/13 12:00 PM	22.7
2/5/13 1:00 PM	23.6
2/5/13 2:00 PM	24.0
2/5/13 3:00 PM	23.4
2/5/13 4:00 PM	22.3
2/5/13 5:00 PM	23.4
2/5/13 6:00 PM	23.5
2/5/13 7:00 PM	23.7
2/5/13 8:00 PM	23.6
2/5/13 9:00 PM	21.4
2/5/13 10:00 PM	19.7
2/5/13 11:00 PM	19.5
2/6/13 12:00 AM	15.8
2/6/13 1:00 AM	13.6
2/6/13 2:00 AM	12.6
2/6/13 3:00 AM	13.0
2/6/13 4:00 AM	14.6
2/6/13 5:00 AM	17.1
2/6/13 6:00 AM	21.0
2/6/13 7:00 AM	24.9
2/6/13 8:00 AM	25.9
2/6/13 9:00 AM	24.9
2/6/13 10:00 AM	22.1
2/6/13 11:00 AM	20.4
2/6/13 12:00 PM	20.1
2/6/13 1:00 PM	19.9
2/6/13 2:00 PM	19.2
2/6/13 3:00 PM	17.9
2/6/13 4:00 PM	17.7
2/6/13 5:00 PM	20.7
2/6/13 6:00 PM	21.9
2/6/13 7:00 PM	22.6
2/6/13 8:00 PM	22.0
2/6/13 9:00 PM	22.0
2/6/13 10:00 PM	21.9
2/6/13 11:00 PM	21.5
2/7/13 12:00 AM	19.6
2/7/13 1:00 AM	16.8
2/7/13 2:00 AM	16.0
2/7/13 3:00 AM	16.8

Day/Hour	Victoria Square (TJ/hr)
2/7/13 4:00 AM	17.4
2/7/13 5:00 AM	17.7
2/7/13 6:00 AM	19.3
2/7/13 7:00 AM	24.3
2/7/13 8:00 AM	29.1
2/7/13 9:00 AM	28.5
2/7/13 10:00 AM	26.9
2/7/13 11:00 AM	24.5
2/7/13 12:00 PM	24.5
2/7/13 1:00 PM	22.9
2/7/13 2:00 PM	22.8
2/7/13 3:00 PM	24.2
2/7/13 4:00 PM	25.3
2/7/13 5:00 PM	25.7
2/7/13 6:00 PM	24.0
2/7/13 7:00 PM	21.7
2/7/13 8:00 PM	20.2
2/7/13 9:00 PM	20.5
2/7/13 10:00 PM	20.1
2/7/13 11:00 PM	18.0
2/8/13 12:00 AM	14.1
2/8/13 1:00 AM	13.5
2/8/13 2:00 AM	13.6
2/8/13 3:00 AM	13.5
2/8/13 4:00 AM	13.0
2/8/13 5:00 AM	14.0
2/8/13 6:00 AM	16.2
2/8/13 7:00 AM	19.2
2/8/13 8:00 AM	23.6
2/8/13 9:00 AM	22.2
2/8/13 10:00 AM	21.9
2/8/13 11:00 AM	21.4
2/8/13 12:00 PM	21.5
2/8/13 1:00 PM	21.1
2/8/13 2:00 PM	21.0
2/8/13 3:00 PM	20.4
2/8/13 4:00 PM	20.0
2/8/13 5:00 PM	20.4
2/8/13 6:00 PM	20.4
2/8/13 7:00 PM	20.4
2/8/13 8:00 PM	20.4
2/8/13 9:00 PM	20.7
2/8/13 10:00 PM	20.5
2/8/13 11:00 PM	19.9
2/9/13 12:00 AM	18.1
2/9/13 1:00 AM	17.3

Day/Hour	Victoria Square (TJ/hr)
2/9/13 2:00 AM	17.0
2/9/13 3:00 AM	17.6
2/9/13 4:00 AM	18.0
2/9/13 5:00 AM	18.7
2/9/13 6:00 AM	19.5
2/9/13 7:00 AM	22.0
2/9/13 8:00 AM	24.5
2/9/13 9:00 AM	25.3
2/9/13 10:00 AM	23.6
2/9/13 11:00 AM	22.1
2/9/13 12:00 PM	21.8
2/9/13 1:00 PM	20.1
2/9/13 2:00 PM	19.0
2/9/13 3:00 PM	18.3
2/9/13 4:00 PM	18.2
2/9/13 5:00 PM	19.0
2/9/13 6:00 PM	20.6
2/9/13 7:00 PM	22.1
2/9/13 8:00 PM	22.2
2/9/13 9:00 PM	22.0
2/9/13 10:00 PM	21.4
2/9/13 11:00 PM	20.1
2/10/13 12:00 AM	19.3
2/10/13 1:00 AM	16.9
2/10/13 2:00 AM	16.3
2/10/13 3:00 AM	16.7
2/10/13 4:00 AM	17.1
2/10/13 5:00 AM	17.7
2/10/13 6:00 AM	19.6
2/10/13 7:00 AM	18.3
2/10/13 8:00 AM	20.1
2/10/13 9:00 AM	20.3
2/10/13 10:00 AM	17.3
2/10/13 11:00 AM	19.3
2/10/13 12:00 PM	19.5
2/10/13 1:00 PM	18.9
2/10/13 2:00 PM	18.5
2/10/13 3:00 PM	18.5
2/10/13 4:00 PM	18.2
2/10/13 5:00 PM	18.6
2/10/13 6:00 PM	20.8
2/10/13 7:00 PM	20.9
2/10/13 8:00 PM	19.2
2/10/13 9:00 PM	19.0
2/10/13 10:00 PM	18.6
2/10/13 11:00 PM	17.6

Day/Hour	Victoria Square (TJ/hr)
2/11/13 12:00 AM	13.6
2/11/13 1:00 AM	12.0
2/11/13 2:00 AM	11.6
2/11/13 3:00 AM	11.3
2/11/13 4:00 AM	12.2
2/11/13 5:00 AM	13.1
2/11/13 6:00 AM	14.7
2/11/13 7:00 AM	16.5
2/11/13 8:00 AM	17.4
2/11/13 9:00 AM	15.8
2/11/13 10:00 AM	14.2
2/11/13 11:00 AM	13.1
2/11/13 12:00 PM	12.2
2/11/13 1:00 PM	11.1
2/11/13 2:00 PM	12.1
2/11/13 3:00 PM	13.8
2/11/13 4:00 PM	15.9
2/11/13 5:00 PM	17.8
2/11/13 6:00 PM	18.0
2/11/13 7:00 PM	17.6
2/11/13 8:00 PM	17.1
2/11/13 9:00 PM	16.7
2/11/13 10:00 PM	14.4
2/11/13 11:00 PM	13.0
2/12/13 12:00 AM	12.4
2/12/13 1:00 AM	11.8
2/12/13 2:00 AM	11.1
2/12/13 3:00 AM	11.2
2/12/13 4:00 AM	11.4
2/12/13 5:00 AM	12.8
2/12/13 6:00 AM	15.2
2/12/13 7:00 AM	17.4
2/12/13 8:00 AM	19.6
2/12/13 9:00 AM	18.7
2/12/13 10:00 AM	17.6
2/12/13 11:00 AM	16.1
2/12/13 12:00 PM	15.5
2/12/13 1:00 PM	15.0
2/12/13 2:00 PM	15.0
2/12/13 3:00 PM	17.4
2/12/13 4:00 PM	19.0
2/12/13 5:00 PM	20.6
2/12/13 6:00 PM	22.0
2/12/13 7:00 PM	20.9
2/12/13 8:00 PM	19.8
2/12/13 9:00 PM	18.8

Day/Hour	Victoria Square (TJ/hr)
2/12/13 10:00 PM	19.0
2/12/13 11:00 PM	18.4
2/13/13 12:00 AM	15.0
2/13/13 1:00 AM	14.1
2/13/13 2:00 AM	13.9
2/13/13 3:00 AM	13.8
2/13/13 4:00 AM	13.0
2/13/13 5:00 AM	13.0
2/13/13 6:00 AM	14.2
2/13/13 7:00 AM	17.2
2/13/13 8:00 AM	21.2
2/13/13 9:00 AM	20.2
2/13/13 10:00 AM	18.1
2/13/13 11:00 AM	16.5
2/13/13 12:00 PM	16.8
2/13/13 1:00 PM	15.9
2/13/13 2:00 PM	14.1
2/13/13 3:00 PM	13.7
2/13/13 4:00 PM	13.9
2/13/13 5:00 PM	16.3
2/13/13 6:00 PM	17.8
2/13/13 7:00 PM	18.1
2/13/13 8:00 PM	18.2
2/13/13 9:00 PM	17.9
2/13/13 10:00 PM	17.9
2/13/13 11:00 PM	16.1
2/14/13 12:00 AM	13.6
2/14/13 1:00 AM	11.1
2/14/13 2:00 AM	10.9
2/14/13 3:00 AM	11.1
2/14/13 4:00 AM	11.5
2/14/13 5:00 AM	13.8
2/14/13 6:00 AM	15.3
2/14/13 7:00 AM	17.5
2/14/13 8:00 AM	18.9
2/14/13 9:00 AM	17.7
2/14/13 10:00 AM	16.2
2/14/13 11:00 AM	15.2
2/14/13 12:00 PM	13.9
2/14/13 1:00 PM	14.1
2/14/13 2:00 PM	14.3
2/14/13 3:00 PM	15.0
2/14/13 4:00 PM	15.8
2/14/13 5:00 PM	16.5
2/14/13 6:00 PM	16.2
2/14/13 7:00 PM	15.7

Day/Hour	Victoria Square (TJ/hr)
2/14/13 8:00 PM	15.2
2/14/13 9:00 PM	15.3
2/14/13 10:00 PM	14.9
2/14/13 11:00 PM	13.3
2/15/13 12:00 AM	11.7
2/15/13 1:00 AM	11.1
2/15/13 2:00 AM	10.7
2/15/13 3:00 AM	10.9
2/15/13 4:00 AM	11.1
2/15/13 5:00 AM	12.0
2/15/13 6:00 AM	14.2
2/15/13 7:00 AM	16.8
2/15/13 8:00 AM	18.4
2/15/13 9:00 AM	17.7
2/15/13 10:00 AM	17.0
2/15/13 11:00 AM	16.3
2/15/13 12:00 PM	15.8
2/15/13 1:00 PM	15.5
2/15/13 2:00 PM	15.4
2/15/13 3:00 PM	15.4
2/15/13 4:00 PM	16.2
2/15/13 5:00 PM	17.0
2/15/13 6:00 PM	18.6
2/15/13 7:00 PM	19.1
2/15/13 8:00 PM	17.0
2/15/13 9:00 PM	16.4
2/15/13 10:00 PM	16.8
2/15/13 11:00 PM	16.6
2/16/13 12:00 AM	16.9
2/16/13 1:00 AM	15.3
2/16/13 2:00 AM	14.8
2/16/13 3:00 AM	15.2
2/16/13 4:00 AM	15.8
2/16/13 5:00 AM	16.1
2/16/13 6:00 AM	16.8
2/16/13 7:00 AM	17.8
2/16/13 8:00 AM	17.9
2/16/13 9:00 AM	18.2
2/16/13 10:00 AM	17.1
2/16/13 11:00 AM	16.1
2/16/13 12:00 PM	15.8
2/16/13 1:00 PM	15.2
2/16/13 2:00 PM	15.2
2/16/13 3:00 PM	15.6
2/16/13 4:00 PM	15.8
2/16/13 5:00 PM	16.3

Day/Hour	Victoria Square (TJ/hr)
2/16/13 6:00 PM	16.9
2/16/13 7:00 PM	17.1
2/16/13 8:00 PM	17.4
2/16/13 9:00 PM	17.1
2/16/13 10:00 PM	16.8
2/16/13 11:00 PM	16.4
2/17/13 12:00 AM	16.9
2/17/13 1:00 AM	16.9
2/17/13 2:00 AM	17.2
2/17/13 3:00 AM	17.8
2/17/13 4:00 AM	18.6
2/17/13 5:00 AM	19.5
2/17/13 6:00 AM	20.6
2/17/13 7:00 AM	24.3
2/17/13 8:00 AM	29.1
2/17/13 9:00 AM	27.7
2/17/13 10:00 AM	25.7
2/17/13 11:00 AM	20.8
2/17/13 12:00 PM	16.4
2/17/13 1:00 PM	15.8
2/17/13 2:00 PM	18.5
2/17/13 3:00 PM	16.2
2/17/13 4:00 PM	17.4
2/17/13 5:00 PM	18.3
2/17/13 6:00 PM	17.3
2/17/13 7:00 PM	20.2
2/17/13 8:00 PM	21.0
2/17/13 9:00 PM	20.9
2/17/13 10:00 PM	20.4
2/17/13 11:00 PM	19.4
2/18/13 12:00 AM	18.9
2/18/13 1:00 AM	18.4
2/18/13 2:00 AM	18.7
2/18/13 3:00 AM	19.4
2/18/13 4:00 AM	20.1
2/18/13 5:00 AM	19.1
2/18/13 6:00 AM	19.8
2/18/13 7:00 AM	22.5
2/18/13 8:00 AM	24.2
2/18/13 9:00 AM	23.6
2/18/13 10:00 AM	22.2
2/18/13 11:00 AM	20.8
2/18/13 12:00 PM	20.1
2/18/13 1:00 PM	19.2
2/18/13 2:00 PM	18.6
2/18/13 3:00 PM	18.6

Day/Hour	Victoria Square (TJ/hr)
2/18/13 4:00 PM	19.1
2/18/13 5:00 PM	19.1
2/18/13 6:00 PM	19.9
2/18/13 7:00 PM	20.5
2/18/13 8:00 PM	19.7
2/18/13 9:00 PM	19.6
2/18/13 10:00 PM	19.1
2/18/13 11:00 PM	17.1
2/19/13 12:00 AM	14.0
2/19/13 1:00 AM	12.5
2/19/13 2:00 AM	12.3
2/19/13 3:00 AM	12.4
2/19/13 4:00 AM	13.2
2/19/13 5:00 AM	14.5
2/19/13 6:00 AM	16.0
2/19/13 7:00 AM	16.6
2/19/13 8:00 AM	16.8
2/19/13 9:00 AM	15.7
2/19/13 10:00 AM	16.2
2/19/13 11:00 AM	17.4
2/19/13 12:00 PM	19.0
2/19/13 1:00 PM	18.6
2/19/13 2:00 PM	17.3
2/19/13 3:00 PM	17.7
2/19/13 4:00 PM	18.4
2/19/13 5:00 PM	19.3
2/19/13 6:00 PM	20.1
2/19/13 7:00 PM	20.3
2/19/13 8:00 PM	20.1
2/19/13 9:00 PM	20.9
2/19/13 10:00 PM	20.4
2/19/13 11:00 PM	17.1
2/20/13 12:00 AM	15.5
2/20/13 1:00 AM	15.6
2/20/13 2:00 AM	15.7
2/20/13 3:00 AM	16.3
2/20/13 4:00 AM	17.2
2/20/13 5:00 AM	18.7
2/20/13 6:00 AM	23.5
2/20/13 7:00 AM	26.3
2/20/13 8:00 AM	26.4
2/20/13 9:00 AM	23.3
2/20/13 10:00 AM	20.3
2/20/13 11:00 AM	19.5
2/20/13 12:00 PM	18.5
2/20/13 1:00 PM	18.0

Day/Hour	Victoria Square (TJ/hr)
2/20/13 2:00 PM	18.3
2/20/13 3:00 PM	18.3
2/20/13 4:00 PM	20.6
2/20/13 5:00 PM	21.4
2/20/13 6:00 PM	21.9
2/20/13 7:00 PM	22.1
2/20/13 8:00 PM	20.3
2/20/13 9:00 PM	20.5
2/20/13 10:00 PM	20.9
2/20/13 11:00 PM	20.3
2/21/13 12:00 AM	18.9
2/21/13 1:00 AM	18.2
2/21/13 2:00 AM	18.5
2/21/13 3:00 AM	19.2
2/21/13 4:00 AM	19.7
2/21/13 5:00 AM	21.0
2/21/13 6:00 AM	23.5
2/21/13 7:00 AM	25.0
2/21/13 8:00 AM	28.8
2/21/13 9:00 AM	28.3
2/21/13 10:00 AM	25.8
2/21/13 11:00 AM	22.8
2/21/13 12:00 PM	19.5
2/21/13 1:00 PM	18.1
2/21/13 2:00 PM	17.4
2/21/13 3:00 PM	17.0
2/21/13 4:00 PM	18.1
2/21/13 5:00 PM	18.9
2/21/13 6:00 PM	20.3
2/21/13 7:00 PM	21.3
2/21/13 8:00 PM	20.0
2/21/13 9:00 PM	20.0
2/21/13 10:00 PM	19.6
2/21/13 11:00 PM	18.9
2/22/13 12:00 AM	18.8
2/22/13 1:00 AM	17.6
2/22/13 2:00 AM	17.3
2/22/13 3:00 AM	17.6
2/22/13 4:00 AM	17.1
2/22/13 5:00 AM	17.9
2/22/13 6:00 AM	20.7
2/22/13 7:00 AM	20.2
2/22/13 8:00 AM	21.1
2/22/13 9:00 AM	19.6
2/22/13 10:00 AM	18.0
2/22/13 11:00 AM	20.1

Day/Hour	Victoria Square (TJ/hr)
2/22/13 12:00 PM	21.2
2/22/13 1:00 PM	21.0
2/22/13 2:00 PM	21.5
2/22/13 3:00 PM	22.8
2/22/13 4:00 PM	23.3
2/22/13 5:00 PM	23.5
2/22/13 6:00 PM	22.7
2/22/13 7:00 PM	21.8
2/22/13 8:00 PM	20.9
2/22/13 9:00 PM	19.7
2/22/13 10:00 PM	18.8
2/22/13 11:00 PM	17.6
2/23/13 12:00 AM	16.6
2/23/13 1:00 AM	13.6
2/23/13 2:00 AM	12.5
2/23/13 3:00 AM	12.4
2/23/13 4:00 AM	12.4
2/23/13 5:00 AM	13.0
2/23/13 6:00 AM	13.8
2/23/13 7:00 AM	14.7
2/23/13 8:00 AM	15.2
2/23/13 9:00 AM	15.8
2/23/13 10:00 AM	16.2
2/23/13 11:00 AM	15.0
2/23/13 12:00 PM	15.5
2/23/13 1:00 PM	15.1
2/23/13 2:00 PM	14.5
2/23/13 3:00 PM	15.4
2/23/13 4:00 PM	16.2
2/23/13 5:00 PM	17.4
2/23/13 6:00 PM	17.6
2/23/13 7:00 PM	17.3
2/23/13 8:00 PM	16.5
2/23/13 9:00 PM	15.9
2/23/13 10:00 PM	16.3
2/23/13 11:00 PM	14.4
2/24/13 12:00 AM	12.5
2/24/13 1:00 AM	12.0
2/24/13 2:00 AM	11.8
2/24/13 3:00 AM	11.8
2/24/13 4:00 AM	14.3
2/24/13 5:00 AM	15.5
2/24/13 6:00 AM	16.0
2/24/13 7:00 AM	17.0
2/24/13 8:00 AM	17.9
2/24/13 9:00 AM	18.3

Day/Hour	Victoria Square (TJ/hr)
2/24/13 10:00 AM	17.7
2/24/13 11:00 AM	16.4
2/24/13 12:00 PM	15.7
2/24/13 1:00 PM	15.7
2/24/13 2:00 PM	15.1
2/24/13 3:00 PM	14.6
2/24/13 4:00 PM	15.3
2/24/13 5:00 PM	16.1
2/24/13 6:00 PM	16.5
2/24/13 7:00 PM	17.1
2/24/13 8:00 PM	17.3
2/24/13 9:00 PM	17.1
2/24/13 10:00 PM	16.6
2/24/13 11:00 PM	16.0
2/25/13 12:00 AM	15.3
2/25/13 1:00 AM	13.9
2/25/13 2:00 AM	13.2
2/25/13 3:00 AM	13.2
2/25/13 4:00 AM	13.7
2/25/13 5:00 AM	14.8
2/25/13 6:00 AM	16.9
2/25/13 7:00 AM	20.0
2/25/13 8:00 AM	22.9
2/25/13 9:00 AM	22.0
2/25/13 10:00 AM	20.6
2/25/13 11:00 AM	19.2
2/25/13 12:00 PM	18.3
2/25/13 1:00 PM	17.7
2/25/13 2:00 PM	17.7
2/25/13 3:00 PM	17.7
2/25/13 4:00 PM	18.5
2/25/13 5:00 PM	19.8
2/25/13 6:00 PM	19.7
2/25/13 7:00 PM	19.8
2/25/13 8:00 PM	18.7
2/25/13 9:00 PM	18.4
2/25/13 10:00 PM	17.6
2/25/13 11:00 PM	16.9
2/26/13 12:00 AM	14.2
2/26/13 1:00 AM	13.0
2/26/13 2:00 AM	12.7
2/26/13 3:00 AM	12.9
2/26/13 4:00 AM	13.2
2/26/13 5:00 AM	13.9
2/26/13 6:00 AM	15.8
2/26/13 7:00 AM	19.2

Day/Hour	Victoria Square (TJ/hr)
2/26/13 8:00 AM	21.9
2/26/13 9:00 AM	20.1
2/26/13 10:00 AM	18.4
2/26/13 11:00 AM	17.4
2/26/13 12:00 PM	16.7
2/26/13 1:00 PM	16.4
2/26/13 2:00 PM	16.5
2/26/13 3:00 PM	16.8
2/26/13 4:00 PM	17.3
2/26/13 5:00 PM	18.5
2/26/13 6:00 PM	19.3
2/26/13 7:00 PM	19.8
2/26/13 8:00 PM	19.1
2/26/13 9:00 PM	18.6
2/26/13 10:00 PM	18.3
2/26/13 11:00 PM	18.2
2/27/13 12:00 AM	15.5
2/27/13 1:00 AM	14.3
2/27/13 2:00 AM	14.2
2/27/13 3:00 AM	14.3
2/27/13 4:00 AM	14.4
2/27/13 5:00 AM	14.1
2/27/13 6:00 AM	15.5
2/27/13 7:00 AM	19.2
2/27/13 8:00 AM	21.8
2/27/13 9:00 AM	22.0
2/27/13 10:00 AM	20.8
2/27/13 11:00 AM	17.4
2/27/13 12:00 PM	15.8
2/27/13 1:00 PM	13.8
2/27/13 2:00 PM	13.8
2/27/13 3:00 PM	14.4
2/27/13 4:00 PM	14.3
2/27/13 5:00 PM	14.6
2/27/13 6:00 PM	14.8
2/27/13 7:00 PM	15.0
2/27/13 8:00 PM	14.4
2/27/13 9:00 PM	14.2
2/27/13 10:00 PM	13.7
2/27/13 11:00 PM	13.3
2/28/13 12:00 AM	13.5
2/28/13 1:00 AM	12.9
2/28/13 2:00 AM	12.7
2/28/13 3:00 AM	12.0
2/28/13 4:00 AM	12.0
2/28/13 5:00 AM	12.7

Day/Hour	Victoria Square (TJ/hr)
2/28/13 6:00 AM	12.9
2/28/13 7:00 AM	16.1
2/28/13 8:00 AM	13.9
2/28/13 9:00 AM	12.3
2/28/13 10:00 AM	12.0
2/28/13 11:00 AM	11.0
2/28/13 12:00 PM	10.4
2/28/13 1:00 PM	9.7
2/28/13 2:00 PM	9.7
2/28/13 3:00 PM	9.9
2/28/13 4:00 PM	10.4
2/28/13 5:00 PM	11.5
2/28/13 6:00 PM	12.9
2/28/13 7:00 PM	13.2
2/28/13 8:00 PM	13.0
2/28/13 9:00 PM	12.9
2/28/13 10:00 PM	12.5
2/28/13 11:00 PM	13.4
3/1/13 12:00 AM	13.4
3/1/13 1:00 AM	12.8
3/1/13 2:00 AM	13.2
3/1/13 3:00 AM	13.7
3/1/13 4:00 AM	14.1
3/1/13 5:00 AM	15.4
3/1/13 6:00 AM	17.3
3/1/13 7:00 AM	19.0
3/1/13 8:00 AM	18.5
3/1/13 9:00 AM	16.7
3/1/13 10:00 AM	14.6
3/1/13 11:00 AM	13.5
3/1/13 12:00 PM	13.7
3/1/13 1:00 PM	14.5
3/1/13 2:00 PM	14.0
3/1/13 3:00 PM	14.3
3/1/13 4:00 PM	15.0
3/1/13 5:00 PM	18.1
3/1/13 6:00 PM	20.1
3/1/13 7:00 PM	15.8
3/1/13 8:00 PM	16.0
3/1/13 9:00 PM	14.3
3/1/13 10:00 PM	12.9
3/1/13 11:00 PM	10.8
3/2/13 12:00 AM	9.1
3/2/13 1:00 AM	8.7
3/2/13 2:00 AM	10.8
3/2/13 3:00 AM	12.3

Day/Hour	Victoria Square (TJ/hr)
3/2/13 4:00 AM	12.8
3/2/13 5:00 AM	13.5
3/2/13 6:00 AM	14.9
3/2/13 7:00 AM	15.7
3/2/13 8:00 AM	17.3
3/2/13 9:00 AM	17.3
3/2/13 10:00 AM	16.5
3/2/13 11:00 AM	14.2
3/2/13 12:00 PM	11.9
3/2/13 1:00 PM	10.9
3/2/13 2:00 PM	9.9
3/2/13 3:00 PM	8.9
3/2/13 4:00 PM	11.0
3/2/13 5:00 PM	12.8
3/2/13 6:00 PM	14.2
3/2/13 7:00 PM	21.1
3/2/13 8:00 PM	19.2
3/2/13 9:00 PM	18.3
3/2/13 10:00 PM	18.0
3/2/13 11:00 PM	17.4
3/3/13 12:00 AM	14.0
3/3/13 1:00 AM	14.2
3/3/13 2:00 AM	15.4
3/3/13 3:00 AM	15.9
3/3/13 4:00 AM	18.4
3/3/13 5:00 AM	18.0
3/3/13 6:00 AM	17.6
3/3/13 7:00 AM	18.7
3/3/13 8:00 AM	19.8
3/3/13 9:00 AM	20.1
3/3/13 10:00 AM	19.7
3/3/13 11:00 AM	18.4
3/3/13 12:00 PM	13.3
3/3/13 1:00 PM	12.2
3/3/13 2:00 PM	11.9
3/3/13 3:00 PM	12.1
3/3/13 4:00 PM	12.3
3/3/13 5:00 PM	13.1
3/3/13 6:00 PM	14.0
3/3/13 7:00 PM	14.5
3/3/13 8:00 PM	14.2
3/3/13 9:00 PM	13.9
3/3/13 10:00 PM	15.2
3/3/13 11:00 PM	14.2
3/4/13 12:00 AM	13.7
3/4/13 1:00 AM	13.5

Day/Hour	Victoria Square (TJ/hr)
3/4/13 2:00 AM	13.6
3/4/13 3:00 AM	14.1
3/4/13 4:00 AM	15.3
3/4/13 5:00 AM	16.5
3/4/13 6:00 AM	19.2
3/4/13 7:00 AM	21.2
3/4/13 8:00 AM	20.3
3/4/13 9:00 AM	17.2
3/4/13 10:00 AM	15.3
3/4/13 11:00 AM	14.1
3/4/13 12:00 PM	12.8
3/4/13 1:00 PM	11.9
3/4/13 2:00 PM	11.2
3/4/13 3:00 PM	11.0
3/4/13 4:00 PM	11.5
3/4/13 5:00 PM	12.4
3/4/13 6:00 PM	14.8
3/4/13 7:00 PM	15.5
3/4/13 8:00 PM	15.3
3/4/13 9:00 PM	15.1
3/4/13 10:00 PM	14.8
3/4/13 11:00 PM	14.2
3/5/13 12:00 AM	13.6
3/5/13 1:00 AM	13.3
3/5/13 2:00 AM	13.4
3/5/13 3:00 AM	13.8
3/5/13 4:00 AM	13.7
3/5/13 5:00 AM	10.5
3/5/13 6:00 AM	12.4
3/5/13 7:00 AM	15.7
3/5/13 8:00 AM	17.8
3/5/13 9:00 AM	14.9
3/5/13 10:00 AM	13.1
3/5/13 11:00 AM	12.1
3/5/13 12:00 PM	11.3
3/5/13 1:00 PM	10.6
3/5/13 2:00 PM	10.2
3/5/13 3:00 PM	12.9
3/5/13 4:00 PM	13.5
3/5/13 5:00 PM	14.4
3/5/13 6:00 PM	14.8
3/5/13 7:00 PM	15.5
3/5/13 8:00 PM	15.3
3/5/13 9:00 PM	14.6
3/5/13 10:00 PM	14.5
3/5/13 11:00 PM	14.2

Day/Hour	Victoria Square (TJ/hr)
3/6/13 12:00 AM	13.3
3/6/13 1:00 AM	12.2
3/6/13 2:00 AM	12.0
3/6/13 3:00 AM	12.0
3/6/13 4:00 AM	12.5
3/6/13 5:00 AM	13.5
3/6/13 6:00 AM	15.1
3/6/13 7:00 AM	15.4
3/6/13 8:00 AM	17.6
3/6/13 9:00 AM	15.7
3/6/13 10:00 AM	13.4
3/6/13 11:00 AM	15.2
3/6/13 12:00 PM	15.3
3/6/13 1:00 PM	14.4
3/6/13 2:00 PM	14.0
3/6/13 3:00 PM	14.0
3/6/13 4:00 PM	14.9
3/6/13 5:00 PM	15.1
3/6/13 6:00 PM	15.9
3/6/13 7:00 PM	15.7
3/6/13 8:00 PM	15.1
3/6/13 9:00 PM	14.7
3/6/13 10:00 PM	14.5
3/6/13 11:00 PM	13.7
3/7/13 12:00 AM	11.9
3/7/13 1:00 AM	11.1
3/7/13 2:00 AM	11.0
3/7/13 3:00 AM	11.6
3/7/13 4:00 AM	12.7
3/7/13 5:00 AM	13.5
3/7/13 6:00 AM	14.9
3/7/13 7:00 AM	17.6
3/7/13 8:00 AM	22.2
3/7/13 9:00 AM	20.6
3/7/13 10:00 AM	18.4
3/7/13 11:00 AM	16.4
3/7/13 12:00 PM	15.0
3/7/13 1:00 PM	14.3
3/7/13 2:00 PM	13.5
3/7/13 3:00 PM	11.7
3/7/13 4:00 PM	11.0
3/7/13 5:00 PM	12.0
3/7/13 6:00 PM	13.0
3/7/13 7:00 PM	15.1
3/7/13 8:00 PM	15.8
3/7/13 9:00 PM	15.5

Day/Hour	Victoria Square (TJ/hr)
3/7/13 10:00 PM	15.3
3/7/13 11:00 PM	14.5
3/8/13 12:00 AM	12.5
3/8/13 1:00 AM	11.8
3/8/13 2:00 AM	11.7
3/8/13 3:00 AM	11.9
3/8/13 4:00 AM	12.1
3/8/13 5:00 AM	12.7
3/8/13 6:00 AM	14.1
3/8/13 7:00 AM	17.9
3/8/13 8:00 AM	20.1
3/8/13 9:00 AM	18.7
3/8/13 10:00 AM	16.2
3/8/13 11:00 AM	13.6
3/8/13 12:00 PM	12.8
3/8/13 1:00 PM	12.6
3/8/13 2:00 PM	12.9
3/8/13 3:00 PM	12.7
3/8/13 4:00 PM	12.7
3/8/13 5:00 PM	12.1
3/8/13 6:00 PM	12.1
3/8/13 7:00 PM	12.8
3/8/13 8:00 PM	12.8
3/8/13 9:00 PM	14.1
3/8/13 10:00 PM	14.4
3/8/13 11:00 PM	13.3
3/9/13 12:00 AM	12.4
3/9/13 1:00 AM	11.7
3/9/13 2:00 AM	11.8
3/9/13 3:00 AM	11.7
3/9/13 4:00 AM	12.1
3/9/13 5:00 AM	13.6
3/9/13 6:00 AM	12.0
3/9/13 7:00 AM	12.1
3/9/13 8:00 AM	12.8
3/9/13 9:00 AM	11.0
3/9/13 10:00 AM	11.9
3/9/13 11:00 AM	11.9
3/9/13 12:00 PM	11.1
3/9/13 1:00 PM	10.6
3/9/13 2:00 PM	9.9
3/9/13 3:00 PM	9.4
3/9/13 4:00 PM	9.4
3/9/13 5:00 PM	9.9
3/9/13 6:00 PM	10.6
3/9/13 7:00 PM	11.8

Day/Hour	Victoria Square (TJ/hr)
3/9/13 8:00 PM	12.1
3/9/13 9:00 PM	11.9
3/9/13 10:00 PM	11.7
3/9/13 11:00 PM	11.5
3/10/13 12:00 AM	11.0
3/10/13 1:00 AM	10.5
3/10/13 2:00 AM	10.4
3/10/13 3:00 AM	10.4
3/10/13 4:00 AM	10.3
3/10/13 5:00 AM	10.8
3/10/13 6:00 AM	12.3
3/10/13 7:00 AM	13.5
3/10/13 8:00 AM	12.8
3/10/13 9:00 AM	12.8
3/10/13 10:00 AM	11.5
3/10/13 11:00 AM	9.6
3/10/13 12:00 PM	9.5
3/10/13 1:00 PM	8.4
3/10/13 2:00 PM	7.7
3/10/13 3:00 PM	7.1
3/10/13 4:00 PM	7.0
3/10/13 5:00 PM	7.5
3/10/13 6:00 PM	8.0
3/10/13 7:00 PM	8.6
3/10/13 8:00 PM	8.5
3/10/13 9:00 PM	8.4
3/10/13 10:00 PM	8.3
3/10/13 11:00 PM	8.0
3/11/13 12:00 AM	7.5
3/11/13 1:00 AM	7.3
3/11/13 2:00 AM	7.1
3/11/13 3:00 AM	7.3
3/11/13 4:00 AM	8.1
3/11/13 5:00 AM	8.0
3/11/13 6:00 AM	9.5
3/11/13 7:00 AM	11.2
3/11/13 8:00 AM	10.8
3/11/13 9:00 AM	9.9
3/11/13 10:00 AM	9.3
3/11/13 11:00 AM	9.2
3/11/13 12:00 PM	8.4
3/11/13 1:00 PM	8.0
3/11/13 2:00 PM	9.3
3/11/13 3:00 PM	10.5
3/11/13 4:00 PM	11.2
3/11/13 5:00 PM	11.5

Day/Hour	Victoria Square (TJ/hr)
3/11/13 6:00 PM	8.2
3/11/13 7:00 PM	9.8
3/11/13 8:00 PM	9.9
3/11/13 9:00 PM	10.3
3/11/13 10:00 PM	9.9
3/11/13 11:00 PM	7.2
3/12/13 12:00 AM	6.1
3/12/13 1:00 AM	6.0
3/12/13 2:00 AM	6.6
3/12/13 3:00 AM	7.4
3/12/13 4:00 AM	8.1
3/12/13 5:00 AM	9.3
3/12/13 6:00 AM	11.5
3/12/13 7:00 AM	13.0
3/12/13 8:00 AM	12.7
3/12/13 9:00 AM	10.8
3/12/13 10:00 AM	8.6
3/12/13 11:00 AM	9.5
3/12/13 12:00 PM	10.4
3/12/13 1:00 PM	10.9
3/12/13 2:00 PM	11.1
3/12/13 3:00 PM	11.6
3/12/13 4:00 PM	13.0
3/12/13 5:00 PM	12.8
3/12/13 6:00 PM	12.6
3/12/13 7:00 PM	12.3
3/12/13 8:00 PM	12.5
3/12/13 9:00 PM	12.0
3/12/13 10:00 PM	11.5
3/12/13 11:00 PM	10.0
3/13/13 12:00 AM	9.5
3/13/13 1:00 AM	9.2
3/13/13 2:00 AM	8.6
3/13/13 3:00 AM	8.8
3/13/13 4:00 AM	8.8
3/13/13 5:00 AM	10.8
3/13/13 6:00 AM	13.5
3/13/13 7:00 AM	16.2
3/13/13 8:00 AM	18.2
3/13/13 9:00 AM	17.9
3/13/13 10:00 AM	17.8
3/13/13 11:00 AM	14.6
3/13/13 12:00 PM	13.1
3/13/13 1:00 PM	12.0
3/13/13 2:00 PM	11.7
3/13/13 3:00 PM	12.5

Day/Hour	Victoria Square (TJ/hr)
3/13/13 4:00 PM	12.7
3/13/13 5:00 PM	13.9
3/13/13 6:00 PM	14.9
3/13/13 7:00 PM	15.4
3/13/13 8:00 PM	12.6
3/13/13 9:00 PM	10.5
3/13/13 10:00 PM	10.3
3/13/13 11:00 PM	9.4
3/14/13 12:00 AM	9.1
3/14/13 1:00 AM	9.1
3/14/13 2:00 AM	9.1
3/14/13 3:00 AM	7.7
3/14/13 4:00 AM	5.5
3/14/13 5:00 AM	7.1
3/14/13 6:00 AM	10.1
3/14/13 7:00 AM	11.6
3/14/13 8:00 AM	15.2
3/14/13 9:00 AM	16.7
3/14/13 10:00 AM	17.6
3/14/13 11:00 AM	17.8
3/14/13 12:00 PM	15.0
3/14/13 1:00 PM	14.0
3/14/13 2:00 PM	13.8
3/14/13 3:00 PM	13.3
3/14/13 4:00 PM	13.4
3/14/13 5:00 PM	14.0
3/14/13 6:00 PM	14.9
3/14/13 7:00 PM	16.3
3/14/13 8:00 PM	16.7
3/14/13 9:00 PM	16.1
3/14/13 10:00 PM	15.2
3/14/13 11:00 PM	13.0
3/15/13 12:00 AM	11.8
3/15/13 1:00 AM	11.5
3/15/13 2:00 AM	11.5
3/15/13 3:00 AM	11.4
3/15/13 4:00 AM	11.6
3/15/13 5:00 AM	12.7
3/15/13 6:00 AM	14.4
3/15/13 7:00 AM	13.8
3/15/13 8:00 AM	12.5
3/15/13 9:00 AM	11.4
3/15/13 10:00 AM	10.7
3/15/13 11:00 AM	14.5
3/15/13 12:00 PM	14.5
3/15/13 1:00 PM	13.1

Day/Hour	Victoria Square (TJ/hr)
3/15/13 2:00 PM	12.9
3/15/13 3:00 PM	12.5
3/15/13 4:00 PM	13.3
3/15/13 5:00 PM	14.9
3/15/13 6:00 PM	16.4
3/15/13 7:00 PM	16.7
3/15/13 8:00 PM	17.8
3/15/13 9:00 PM	16.2
3/15/13 10:00 PM	13.8
3/15/13 11:00 PM	11.8
3/16/13 12:00 AM	11.4
3/16/13 1:00 AM	10.7
3/16/13 2:00 AM	10.5
3/16/13 3:00 AM	10.6
3/16/13 4:00 AM	13.1
3/16/13 5:00 AM	14.4
3/16/13 6:00 AM	16.5
3/16/13 7:00 AM	17.2
3/16/13 8:00 AM	8.7
3/16/13 9:00 AM	4.8
3/16/13 10:00 AM	4.1
3/16/13 11:00 AM	5.5
3/16/13 12:00 PM	5.0
3/16/13 1:00 PM	6.2
3/16/13 2:00 PM	6.8
3/16/13 3:00 PM	6.7
3/16/13 4:00 PM	6.6
3/16/13 5:00 PM	5.7
3/16/13 6:00 PM	5.2
3/16/13 7:00 PM	6.1
3/16/13 8:00 PM	6.9
3/16/13 9:00 PM	7.0
3/16/13 10:00 PM	6.9
3/16/13 11:00 PM	6.5
3/17/13 12:00 AM	7.1
3/17/13 1:00 AM	7.0
3/17/13 2:00 AM	7.1
3/17/13 3:00 AM	7.1
3/17/13 4:00 AM	6.4
3/17/13 5:00 AM	6.1
3/17/13 6:00 AM	7.3
3/17/13 7:00 AM	8.5
3/17/13 8:00 AM	9.7
3/17/13 9:00 AM	10.9
3/17/13 10:00 AM	11.9
3/17/13 11:00 AM	8.6

Day/Hour	Victoria Square (TJ/hr)
3/17/13 12:00 PM	10.7
3/17/13 1:00 PM	11.7
3/17/13 2:00 PM	10.2
3/17/13 3:00 PM	10.3
3/17/13 4:00 PM	10.8
3/17/13 5:00 PM	10.5
3/17/13 6:00 PM	10.8
3/17/13 7:00 PM	9.3
3/17/13 8:00 PM	10.1
3/17/13 9:00 PM	10.5
3/17/13 10:00 PM	9.2
3/17/13 11:00 PM	8.6
3/18/13 12:00 AM	12.0
3/18/13 1:00 AM	13.5
3/18/13 2:00 AM	13.8
3/18/13 3:00 AM	13.9
3/18/13 4:00 AM	14.1
3/18/13 5:00 AM	15.2
3/18/13 6:00 AM	17.5
3/18/13 7:00 AM	18.9
3/18/13 8:00 AM	18.0
3/18/13 9:00 AM	13.2
3/18/13 10:00 AM	11.9
3/18/13 11:00 AM	11.7
3/18/13 12:00 PM	12.6
3/18/13 1:00 PM	16.6
3/18/13 2:00 PM	16.6
3/18/13 3:00 PM	17.1
3/18/13 4:00 PM	17.5
3/18/13 5:00 PM	17.7
3/18/13 6:00 PM	17.7
3/18/13 7:00 PM	17.6
3/18/13 8:00 PM	17.3
3/18/13 9:00 PM	15.3
3/18/13 10:00 PM	12.1
3/18/13 11:00 PM	6.3
3/19/13 12:00 AM	6.0
3/19/13 1:00 AM	5.3
3/19/13 2:00 AM	3.3
3/19/13 3:00 AM	3.3
3/19/13 4:00 AM	3.3
3/19/13 5:00 AM	4.2
3/19/13 6:00 AM	7.1
3/19/13 7:00 AM	9.9
3/19/13 8:00 AM	9.1
3/19/13 9:00 AM	8.4

Day/Hour	Victoria Square (TJ/hr)
3/19/13 10:00 AM	8.3
3/19/13 11:00 AM	11.0
3/19/13 12:00 PM	14.1
3/19/13 1:00 PM	14.2
3/19/13 2:00 PM	14.1
3/19/13 3:00 PM	14.0
3/19/13 4:00 PM	12.5
3/19/13 5:00 PM	12.8
3/19/13 6:00 PM	13.1
3/19/13 7:00 PM	13.3
3/19/13 8:00 PM	13.1
3/19/13 9:00 PM	12.9
3/19/13 10:00 PM	12.3
3/19/13 11:00 PM	11.8
3/20/13 12:00 AM	10.6
3/20/13 1:00 AM	11.0
3/20/13 2:00 AM	11.4
3/20/13 3:00 AM	12.0
3/20/13 4:00 AM	12.4
3/20/13 5:00 AM	15.0
3/20/13 6:00 AM	15.3
3/20/13 7:00 AM	18.4
3/20/13 8:00 AM	17.8
3/20/13 9:00 AM	16.8
3/20/13 10:00 AM	16.1
3/20/13 11:00 AM	16.1
3/20/13 12:00 PM	14.0
3/20/13 1:00 PM	13.6
3/20/13 2:00 PM	13.0
3/20/13 3:00 PM	13.3
3/20/13 4:00 PM	14.1
3/20/13 5:00 PM	14.3
3/20/13 6:00 PM	14.2
3/20/13 7:00 PM	13.7
3/20/13 8:00 PM	14.3
3/20/13 9:00 PM	13.6
3/20/13 10:00 PM	13.0
3/20/13 11:00 PM	11.8
3/21/13 12:00 AM	11.0
3/21/13 1:00 AM	11.2
3/21/13 2:00 AM	11.5
3/21/13 3:00 AM	12.1
3/21/13 4:00 AM	12.4
3/21/13 5:00 AM	15.1
3/21/13 6:00 AM	19.8
3/21/13 7:00 AM	23.0

Day/Hour	Victoria Square (TJ/hr)
3/21/13 8:00 AM	20.1
3/21/13 9:00 AM	16.3
3/21/13 10:00 AM	15.3
3/21/13 11:00 AM	15.0
3/21/13 12:00 PM	14.7
3/21/13 1:00 PM	14.4
3/21/13 2:00 PM	13.6
3/21/13 3:00 PM	13.8
3/21/13 4:00 PM	14.4
3/21/13 5:00 PM	14.9
3/21/13 6:00 PM	18.8
3/21/13 7:00 PM	19.9
3/21/13 8:00 PM	20.4
3/21/13 9:00 PM	19.6
3/21/13 10:00 PM	18.8
3/21/13 11:00 PM	17.7
3/22/13 12:00 AM	17.2
3/22/13 1:00 AM	14.8
3/22/13 2:00 AM	14.1
3/22/13 3:00 AM	14.8
3/22/13 4:00 AM	15.1
3/22/13 5:00 AM	18.4
3/22/13 6:00 AM	21.6
3/22/13 7:00 AM	22.7
3/22/13 8:00 AM	22.3
3/22/13 9:00 AM	20.3
3/22/13 10:00 AM	20.7
3/22/13 11:00 AM	19.3
3/22/13 12:00 PM	18.1
3/22/13 1:00 PM	17.0
3/22/13 2:00 PM	16.5
3/22/13 3:00 PM	16.2
3/22/13 4:00 PM	16.4
3/22/13 5:00 PM	17.3
3/22/13 6:00 PM	17.6
3/22/13 7:00 PM	17.9
3/22/13 8:00 PM	17.6
3/22/13 9:00 PM	17.5
3/22/13 10:00 PM	16.4
3/22/13 11:00 PM	15.4
3/23/13 12:00 AM	15.4
3/23/13 1:00 AM	12.7
3/23/13 2:00 AM	12.1
3/23/13 3:00 AM	12.2
3/23/13 4:00 AM	12.7
3/23/13 5:00 AM	13.2

Day/Hour	Victoria Square (TJ/hr)
3/23/13 6:00 AM	15.6
3/23/13 7:00 AM	16.1
3/23/13 8:00 AM	12.1
3/23/13 9:00 AM	10.0
3/23/13 10:00 AM	9.7
3/23/13 11:00 AM	8.5
3/23/13 12:00 PM	12.7
3/23/13 1:00 PM	12.7
3/23/13 2:00 PM	12.2
3/23/13 3:00 PM	11.6
3/23/13 4:00 PM	11.8
3/23/13 5:00 PM	12.3
3/23/13 6:00 PM	12.7
3/23/13 7:00 PM	13.1
3/23/13 8:00 PM	13.5
3/23/13 9:00 PM	13.8
3/23/13 10:00 PM	13.7
3/23/13 11:00 PM	12.4
3/24/13 12:00 AM	12.2
3/24/13 1:00 AM	12.0
3/24/13 2:00 AM	12.2
3/24/13 3:00 AM	12.5
3/24/13 4:00 AM	13.0
3/24/13 5:00 AM	13.3
3/24/13 6:00 AM	14.3
3/24/13 7:00 AM	15.5
3/24/13 8:00 AM	15.0
3/24/13 9:00 AM	13.5
3/24/13 10:00 AM	12.1
3/24/13 11:00 AM	11.5
3/24/13 12:00 PM	10.6
3/24/13 1:00 PM	9.9
3/24/13 2:00 PM	9.3
3/24/13 3:00 PM	9.3
3/24/13 4:00 PM	10.0
3/24/13 5:00 PM	10.8
3/24/13 6:00 PM	11.3
3/24/13 7:00 PM	11.7
3/24/13 8:00 PM	11.8
3/24/13 9:00 PM	13.6
3/24/13 10:00 PM	13.1
3/24/13 11:00 PM	10.7
3/25/13 12:00 AM	10.0
3/25/13 1:00 AM	9.9
3/25/13 2:00 AM	10.3
3/25/13 3:00 AM	11.0

Day/Hour	Victoria Square (TJ/hr)
3/25/13 4:00 AM	13.6
3/25/13 5:00 AM	17.0
3/25/13 6:00 AM	21.0
3/25/13 7:00 AM	23.6
3/25/13 8:00 AM	18.7
3/25/13 9:00 AM	14.6
3/25/13 10:00 AM	14.3
3/25/13 11:00 AM	14.7
3/25/13 12:00 PM	14.2
3/25/13 1:00 PM	13.8
3/25/13 2:00 PM	13.3
3/25/13 3:00 PM	13.4
3/25/13 4:00 PM	13.6
3/25/13 5:00 PM	14.3
3/25/13 6:00 PM	14.2
3/25/13 7:00 PM	13.2
3/25/13 8:00 PM	13.6
3/25/13 9:00 PM	13.1
3/25/13 10:00 PM	12.2
3/25/13 11:00 PM	9.7
3/26/13 12:00 AM	8.6
3/26/13 1:00 AM	8.6
3/26/13 2:00 AM	8.7
3/26/13 3:00 AM	9.1
3/26/13 4:00 AM	9.6
3/26/13 5:00 AM	12.2
3/26/13 6:00 AM	15.8
3/26/13 7:00 AM	18.1
3/26/13 8:00 AM	16.4
3/26/13 9:00 AM	16.1
3/26/13 10:00 AM	14.5
3/26/13 11:00 AM	13.0
3/26/13 12:00 PM	11.2
3/26/13 1:00 PM	10.6
3/26/13 2:00 PM	10.2
3/26/13 3:00 PM	10.1
3/26/13 4:00 PM	10.3
3/26/13 5:00 PM	11.5
3/26/13 6:00 PM	12.3
3/26/13 7:00 PM	14.4
3/26/13 8:00 PM	14.8
3/26/13 9:00 PM	14.8
3/26/13 10:00 PM	13.0
3/26/13 11:00 PM	9.9
3/27/13 12:00 AM	8.6
3/27/13 1:00 AM	7.9

Day/Hour	Victoria Square (TJ/hr)
3/27/13 2:00 AM	8.3
3/27/13 3:00 AM	9.4
3/27/13 4:00 AM	10.4
3/27/13 5:00 AM	12.8
3/27/13 6:00 AM	16.3
3/27/13 7:00 AM	16.4
3/27/13 8:00 AM	15.7
3/27/13 9:00 AM	13.2
3/27/13 10:00 AM	11.8
3/27/13 11:00 AM	11.6
3/27/13 12:00 PM	12.3
3/27/13 1:00 PM	12.0
3/27/13 2:00 PM	12.4
3/27/13 3:00 PM	12.7
3/27/13 4:00 PM	13.1
3/27/13 5:00 PM	13.6
3/27/13 6:00 PM	14.1
3/27/13 7:00 PM	14.4
3/27/13 8:00 PM	14.5
3/27/13 9:00 PM	14.1
3/27/13 10:00 PM	12.7
3/27/13 11:00 PM	11.7
3/28/13 12:00 AM	11.0
3/28/13 1:00 AM	10.8
3/28/13 2:00 AM	10.8
3/28/13 3:00 AM	11.1
3/28/13 4:00 AM	11.9
3/28/13 5:00 AM	12.8
3/28/13 6:00 AM	15.9
3/28/13 7:00 AM	15.8
3/28/13 8:00 AM	14.5
3/28/13 9:00 AM	13.4
3/28/13 10:00 AM	12.3
3/28/13 11:00 AM	12.4
3/28/13 12:00 PM	13.3
3/28/13 1:00 PM	12.3
3/28/13 2:00 PM	11.8
3/28/13 3:00 PM	11.8
3/28/13 4:00 PM	12.2
3/28/13 5:00 PM	12.9
3/28/13 6:00 PM	13.1
3/28/13 7:00 PM	13.1
3/28/13 8:00 PM	12.5
3/28/13 9:00 PM	12.2
3/28/13 10:00 PM	10.8
3/28/13 11:00 PM	9.7

Day/Hour	Victoria Square (TJ/hr)
3/29/13 12:00 AM	9.4
3/29/13 1:00 AM	9.2
3/29/13 2:00 AM	9.3
3/29/13 3:00 AM	9.5
3/29/13 4:00 AM	9.8
3/29/13 5:00 AM	10.7
3/29/13 6:00 AM	11.8
3/29/13 7:00 AM	12.4
3/29/13 8:00 AM	12.3
3/29/13 9:00 AM	11.4
3/29/13 10:00 AM	10.2
3/29/13 11:00 AM	9.5
3/29/13 12:00 PM	9.4
3/29/13 1:00 PM	9.1
3/29/13 2:00 PM	8.5
3/29/13 3:00 PM	8.1
3/29/13 4:00 PM	8.1
3/29/13 5:00 PM	8.4
3/29/13 6:00 PM	8.8
3/29/13 7:00 PM	10.2
3/29/13 8:00 PM	10.5
3/29/13 9:00 PM	10.6
3/29/13 10:00 PM	10.5
3/29/13 11:00 PM	10.3
3/30/13 12:00 AM	10.2
3/30/13 1:00 AM	10.2
3/30/13 2:00 AM	10.5
3/30/13 3:00 AM	10.7
3/30/13 4:00 AM	11.0
3/30/13 5:00 AM	11.6
3/30/13 6:00 AM	12.8
3/30/13 7:00 AM	14.0
3/30/13 8:00 AM	13.6
3/30/13 9:00 AM	12.1
3/30/13 10:00 AM	10.8
3/30/13 11:00 AM	10.0
3/30/13 12:00 PM	9.9
3/30/13 1:00 PM	9.5
3/30/13 2:00 PM	9.0
3/30/13 3:00 PM	8.6
3/30/13 4:00 PM	8.8
3/30/13 5:00 PM	9.0
3/30/13 6:00 PM	9.3
3/30/13 7:00 PM	9.7
3/30/13 8:00 PM	10.0
3/30/13 9:00 PM	10.0

Day/Hour	Victoria Square (TJ/hr)
3/30/13 10:00 PM	9.7
3/30/13 11:00 PM	7.3
3/31/13 12:00 AM	7.4
3/31/13 1:00 AM	7.1
3/31/13 2:00 AM	7.0
3/31/13 3:00 AM	7.2
3/31/13 4:00 AM	7.6
3/31/13 5:00 AM	8.1
3/31/13 6:00 AM	9.1
3/31/13 7:00 AM	10.1
3/31/13 8:00 AM	10.5
3/31/13 9:00 AM	10.2
3/31/13 10:00 AM	7.0
3/31/13 11:00 AM	9.9
3/31/13 12:00 PM	8.8
3/31/13 1:00 PM	7.2
3/31/13 2:00 PM	6.9
3/31/13 3:00 PM	7.0
3/31/13 4:00 PM	7.6
3/31/13 5:00 PM	7.8
3/31/13 6:00 PM	7.8
3/31/13 7:00 PM	7.7
3/31/13 8:00 PM	7.7
3/31/13 9:00 PM	7.7
3/31/13 10:00 PM	7.5
3/31/13 11:00 PM	7.2
4/1/13 12:00 AM	6.9
4/1/13 1:00 AM	6.6
4/1/13 2:00 AM	6.9
4/1/13 3:00 AM	7.2
4/1/13 4:00 AM	8.3
4/1/13 5:00 AM	10.0
4/1/13 6:00 AM	15.6
4/1/13 7:00 AM	17.6
4/1/13 8:00 AM	15.4
4/1/13 9:00 AM	12.9
4/1/13 10:00 AM	8.3

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GEC INTERROGATORY #34

INTERROGATORY

Enbridge, Issue A.4.DSM Potential, Ref: Exh. A, T3, S7, pp. 1-3, ¶3.

a) Please provide the following actual results from Enbridge's DSM portfolio for every year from 2003 through 2012 (please provide by customer type – i.e. residential, apartments/multi-family, commercial and industrial – gate for the whole portfolio):

   i. Incremental annual gas saved

   ii. Incremental annual gas saved as a percentage of annual consumption by all of Enbridge's customers (please provide both the numerator and denominator used to compute the percentages, as well as their sources)

   iii. Lifetime gas savings

   iv. Average measure life of the gas savings.

   v. The portion of the incremental annual savings that were achieved in the GTA region.

   vi. Final portfolio DSM spending.

   vii. Final portfolio TRC net benefits.

b) Please provide the following forecast results for Enbridge's DSM portfolio for 2013 and for 2014 (please provide by customer type – i.e. residential, apartments/multi-family, commercial and industrial – and in aggregate for the whole portfolio):

   i. incremental annual gas saved

   ii. Incremental annual gas saved as a percentage of annual consumption by all of Enbridge's customers (please provide both the numerator and denominator used to compute the percentages, as well as their sources)

   iii. lifetime gas saved

   iv. average measure life of gas savings

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

v. The portion of incremental annual gas savings that will be in the GTA region.

c) Please explain what is meant by the statement that “currently planned DSM activities and conservation are already included in the forecast presented.” Specifically:

i. To what forecast in the evidence is Enbridge referring?

ii. Exactly what forecast DSM savings were assumed or included in the forecast?

iii. How much of the forecast savings for Enbridge’s entire service territory allocated to the GTA region? How was that allocation developed?

iv. Does the forecast include any assumption regarding additional DSM savings beyond 2014? If so, what was assumed and what was the basis for the assumption?

d) Did Enbridge attempt to quantify cost-effective efficiency potential for the purpose of determining its potential role in deferring the need for the GTA project? If so, please provide all available documentation of the inputs to and results from that assessment.

e) Please provide copies of all assessments of efficiency potential within the Company’s service territory conducted within the past ten years. Please include both comprehensive studies (i.e. those that examined all sectors) and studies focused on just parts of the Company’s customer base (e.g. just industrial, just residential, just from large boiler replacements, etc.).

RESPONSE

a) & b)

Please find below a detailed chart in response to GEC Interrogatory #34 at Exhibit A4-GEC-34 a) and b). Please note the following assumptions built into the data below:

- Due to the fact that the Company did not calculate cumulative cubic metres saved until the 2012 program year, lifetime gas savings provided are based on the assumed measure life of 12 years. For consistency, this method of calculation has been extended into 2012, 2013 and 2014. By way of reference,

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

the un-weighted 2012 average measure life was 17.7 years, demonstrating that the 12 year average is a conservative estimate.

GEC's has also requested in Interrogatory #34 at Exhibit A4-GEC-34 a) ii) and b) ii) the sources of the numerators and denominators used to determine incremental annual gas saved as a percentage of consumption by all of Enbridge's customers, both by customer segment and for the entire DSM portfolio from 2003 to 2014. The numerators used from 2003 to 2011 have been sourced from the Company's final TRC spreadsheets for each DSM program year as finalized during the drafting of the annual Audit Summary Report. The 2012 numerator was determined using the TRC spreadsheet submitted for audit with the Company's Draft Annual Report, while the 2013 and 2014 values were determined using the Company's budgeted TRC spreadsheet for those years. The denominators from 2003 to 2011 are Actual total volumes that have been publicly filed in a variety Rate Case and Account Clearance proceedings. The denominators for 2013 and 2014 are the total franchise volumes as filed on February 28, 2013 in EB-2012-0394 and can be found at Exhibit B, Tab 2, Schedule. 3.

10^3m^3		2003	2004	2005*	2006	2007	2008	2009	2010	2011	2012	2013	2014
Incremental Annual Gas Savings	Residential	28,320	23,633	35,150	26,553	29,329	17,152	12,737	9,997	9,763	4,273	1,614	1,658
	Apartment	14,572	12,683	16,509	17,477	22,519	17,915	15,095	14,688	21,725	14,205	17,996	18,427
	Commercial	8,284	13,256	16,111	19,840	12,882	21,372	19,694	22,393	27,802	25,326	32,084	32,852
	Industrial	26,844	21,338	23,647	25,651	27,191	23,847	22,331	18,547	17,962	18,059	22,659	23,112
	TOTAL PORTFOLIO	**78,020**	**70,910**	**91,418**	**89,520**	**91,921**	**80,285**	**69,857**	**65,625**	**77,252**	**61,863**	**74,353**	**76,049**
Total Franchise Consumption		12,646,200	12,256,800	12,166,000	11,487,000	12,073,300	11,907,500	11,334,800	10,940,600	11,503,300	11,300,100	11,473,251	11,473,251
Annual Savings as % of Total Consumption	Residential	0.22%	0.19%	0.29%	0.23%	0.24%	0.14%	0.11%	0.09%	0.08%	0.04%	0.01%	0.01%
	Apartment	0.12%	0.10%	0.14%	0.15%	0.19%	0.15%	0.13%	0.13%	0.19%	0.13%	0.16%	0.16%
	Commercial	0.07%	0.11%	0.13%	0.17%	0.11%	0.18%	0.17%	0.20%	0.24%	0.22%	0.28%	0.29%
	Industrial	0.21%	0.17%	0.19%	0.22%	0.23%	0.20%	0.20%	0.17%	0.16%	0.16%	0.20%	0.20%
	TOTAL PORTFOLIO	**0.62%**	**0.58%**	**0.75%**	**0.78%**	**0.76%**	**0.67%**	**0.62%**	**0.60%**	**0.67%**	**0.55%**	**0.65%**	**0.66%**
Incremental Annual Gas Savings in GTA Project Influence Area	Residential	13,593	11,344	16,872	12,745	14,078	8,233	6,114	4,798	4,686	2,051	775	796
	Apartment	6,994	6,088	7,924	8,389	10,809	8,599	7,245	7,050	10,428	6,819	8,638	8,845
	Commercial	3,977	6,363	7,733	9,523	6,184	10,258	9,453	10,749	13,345	12,157	15,400	15,769
	Industrial	12,885	10,242	11,351	12,312	13,051	11,446	10,719	8,903	8,622	8,668	10,876	11,094
	TOTAL PORTFOLIO	**37,450**	**34,037**	**43,881**	**42,970**	**44,122**	**38,537**	**33,531**	**31,500**	**37,081**	**29,694**	**35,689**	**36,504**
Average Measure Life of Gas Savings (Yrs)		12	12	12	12	12	12	12	12	12	12	12	12
Life Time Gas Savings	Residential	339,837	283,599	421,802	318,635	351,944	205,821	152,846	119,961	117,152	51,274	19,363	19,893
	Apartment	174,862	152,193	198,108	209,724	270,227	214,983	181,137	176,256	260,699	170,463	215,950	221,120
	Commercial	99,413	159,073	193,337	238,078	154,589	256,460	236,330	268,719	333,628	303,913	385,010	394,228
	Industrial	322,127	256,055	283,769	307,806	326,287	286,159	267,969	222,566	215,544	216,703	271,912	277,350
	TOTAL PORTFOLIO	**936,238**	**850,921**	**1,097,016**	**1,074,244**	**1,103,048**	**963,422**	**838,282**	**787,502**	**927,022**	**742,353**	**892,235**	**912,591**
Final Portfolio DSM Spending		$10,965,294	$13,059,174	$19,174,811	$18,785,159	$21,383,865	$23,026,660	$25,420,061	$24,000,645	$27,243,872	$30,606,510	$31,588,200	$32,158,764
Final Portfolio TRC Net Benefits		$125,900,000	$136,000,000	$196,000,000	$180,700,000	$199,800,000	$182,700,000	$215,800,000	$184,600,000	$171,800,000	$175,969,470	$134,705,568	$137,089,613

*2005 Program Year includes 3 month stub period c)

i. The reference is to the peak hour forecast used in Exhibit A, Tab 3, Schedule 4.

ii. to iv. Please refer to the response to Environmental Defence Interrogatories #12 and #13 found at Exhibit I.A4.EGD.ED.12 and I.A4.EGD.ED.14, respectively.

d) Please refer to the response to Environmental Defence Interrogatories #14 and #20 found at Exhibit I.A4.EGD.ED.14 and Exhibit I.A4.EGD.ED.20

e) Enbridge has conducted two DSM Potential studies over the past 10 years. These DSM Potential studies are comprehensive and look at potential in the residential, commercial and industrial sectors. These studies have been filed with the Board during previous case filings. Please refer to Exhibit JT1.12 filed in EB-2006-0021 (Filed 2006-05-26); and EB-2011-0295 Exhibit A, Tab 1, Schedule 1, Filed 2011-11-04

Witnesses: F. Oliver-Glasford
T. MacLean
J. Ramsay

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GEC INTERROGATORY #35

INTERROGATORY

Enbridge, Issue A.4.DSM Impacts on Peak, Ref: Exh. A, T3, S7, pp. 1-3, ¶3.

a) The Company states that "currently planned DSM activities and conservation are already included in the forecast presented."

i. Please specify what level of annual energy savings and peak demand savings are "already included in the forecast presented." Please indicate what portion of those savings are from the utility's DSM activities (as opposed to driven by natural market forces, government programs or other initiatives).

ii. Had the Company not been investing in DSM at the levels it has invested over the past 10 years, how many years earlier would the GTA project have been required? Please explain the basis for the answer, providing documentation of any analysis performed to produce the answer.

iii. If the Company had been acquiring twice as much energy and peak demand savings in each of the last ten years as it had actually acquired, how much farther into the future would the need for the GTA have been deferred? Please explain the basis for the answer, providing documentation of any analysis performed to produce the answer.

b) The Company states that some efficiency measures and programs reduce both energy and peak demand, whereas others – such as set-back thermostats and instantaneous water heating do not. Please provide the results (annual energy savings and, if available, peak demand savings) of the Company's 2012 DSM efforts by measure. Please provide the results in an Excel spreadsheet and indicate which measures fall into each of the two categories (i.e. measures which save both energy and peak and measures that do not).

c) The Company states that when system controls, such as setback thermostats, are employed on a large scale, can have significant impact on peak loads. Has the Company conducted any quantitative analysis of such impacts? If so, please summarize the results of that analysis and provide documentation of all inputs to and outputs from that analysis.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

d) Please explain how “nighttime set back control…increases peak loading.”

e) Are any of the Company’s current DSM programs promoting instantaneous water heaters?

   i. If so, in what sectors?

   ii. How many such water heaters did the company’s programs cause to have been installed in 2012?

   iii. What were the annual savings from those measures?

   iv. Does the Company have any “load shape” data for both standard water heater (i.e. with a tank) and/or tankless water heaters, for either residential or business applications. If so, please provide those load shapes. If not, please indicate which hours of the day the Company expects greatest consumption of gas for both standard and tankless water heaters, for both residential and business applications.

f) Please explain the statement that “conservation efforts…cannot be expected to replace capacity within the system due to the lowering of pressures on large diameter, high pressure lines…”

<u>RESPONSE</u>

a) i.

Please see the response to Environmental Defence Interrogatory #14 at Exhibit I.A4.EGD.ED.14 for annual energy savings and peak demand savings included in the forecast. Please also see the response to Environmental Defence Interrogatory #13 (b) at Exhibit I.A4.EGD.ED.13 for a description of the reduction factor.

ii.& iii. Enbridge has not conducted analysis regarding the impact of DSM over the past ten years on the timing of the GTA Project.

b) Information on the annual energy savings by measure is not available for the 2012 program year. For reference, the Appendices A from the 2010 and 2011 DSM Annual report are attached. These Appendices provide information on the annual energy savings by measure.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

In regards to GEC's request for each DSM measure's impact on peak hour demand, Enbridge does not actively track or calculate the impact on peak hour of specific DSM measures.

c) The Company has not conducted studies of the impacts of system controls such as setback thermostats on peak hourly loads. The Company did perform a desk top analysis utilizing hourly data that was from other studies conducted for other purposes. The data was specific to Residential usage and contains no other customer classifications. The directional result was that setback controls, while providing for annualized reduction in consumption, points to an increase in peak hour consumption.

d) A nighttime setback control can be expected to increase peak loading in the early morning when the daytime setting resumes and the heating system operates at a maximum for some time in order to return the heated space to the desired daytime temperature.

e)

i. Enbridge does not currently promote instantaneous water heaters in the residential sector; however, they are available as a prescriptive measure in the commercial sector.

ii. and iii.
The participation and natural gas savings information on instantaneous water heaters is not available for the 2012 program year (see item (b) above). The table below summarizes the instantaneous water heater installations and net natural gas savings in the commercial sector from 2007 to 2011 and in the residential sector for the 2009 program year.

Year	Sector	Measure	Participants	Net annual gas savings (m^3)
2007	Commercial	Tankless Water Heaters	67	54,170
2008	Commercial	Tankless Water Heaters	11	9075
2009	Commercial	Tankless Water Heaters	30	4,528
2010	Commercial	Tankless Water Heaters	116	17,507
2011	Commercial	Tankless Water Heaters	81	12,225
		Total	305	97,504
2009	Residential	Tankless Water Heating	7053	898,552

iv. Enbridge does not have hourly or daily "load shape" consumption data for either standard water heaters or tankless water heaters.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

For residential buildings, it would be expected that the greatest consumption of gas for this application would closely track hot water usage. Enbridge expects that there would be an increase for hot water usage in the early morning hours (6 to 8 am) and in the evening hours (6 to 9 pm). This would apply to storage tank water heaters, tankless water heaters, and, in multi-residential buildings, to boiler systems connected to large storage tanks (or indirect heated storage tanks). Because of the variety of hot water applications (beyond personal use) in the commercial sector, it would be expected that the consumption of gas related to water heating would exhibit a more constant load profile throughout the day.

Witnesses: T. MacLean
F. Oliver-Glasford
J. Ramsay

Appendix A: Summary Overviews of 2011 DSM Program

This section of the report provides a summary of the 2011 DSM Program results. This data is presented by program category and by technology. Separate tables are presented for custom programs and prescriptive programs.

Note: Tables 29 – 34 are based on pre-audit results and are suitable for illustrative purposes only.

Table 29: Summary Overview by Program Category: Prescriptive Programs

Program Category	Sum of Net TRC Benefits	Sum of Net annual gas savings	Sum of Net kWh	Sum of Net Water Savings m3	Sum of Participants / Units	Average of Measure Life	Sum of Total Net Incremental costs	Sum of Total incentive payments
Low Income	422,179	85,362	163,107	19,023	5,003	10	57,798	54,203
Multi-Residential Water Conservation	5,845,837	1,386,859	141,847	327,039	26,125	10	504,349	317,311
Residential New Construction	1,125,396	1,167,239	1,662,570	0	2,205	13	3,669,120	147,300
Schools	1,562,527	736,416	0	0	38	25	340,373	71,000
Small Commercial	12,666,641	6,357,308	3,542,058	242,758	4,571	16	5,258,260	936,063
Water Conservation	48,867,106	7,754,910	17,554,129	2,376,342	615,874	10	2,644,673	4,155,010

Table 30: Summary Overview by Program Category: Custom Programs

Program Category	Sum of Net TRC Benefits	Sum of Net annual gas savings	Sum of Net kWh	Sum of Net Water Savings m3	Sum of Participants / Units	Average of Measure Life	Sum of Total Net Incremental costs	Sum of Total incentive payments
Agriculture	652,597	520,228	-3,256	0	15	12	183,733	70,275
College/University	1,664,200	513,507	1,064,259	11,701	13	18	497,345	62,291
Government/Municipalities	1,469,874	731,511	1,553,673	5,954	31	13	471,620	82,382
Hospitals	4,400,043	2,715,999	1,259,265	1,026	31	12	1,676,444	305,363
Hotel/Motel	5,209,769	1,269,335	3,454,101	24,015	10	22	949,980	149,020
Industrial	28,008,352	16,962,619	3,194,674	68,614	112	14	5,793,109	1,773,771
Large New Construction	10,187,820	3,701,445	6,632,186	0	56	25	6,416,323	493,471
Long Term Health Care	230,153	75,810	111,380	0	3	18	47,811	12,258
Multi-Res Non-Profit	10,318,762	5,906,555	1,477,904	0	146	18	3,382,916	1,128,163
Multi-Res Private	27,058,067	14,626,758	4,405,754	8,218	320	18	7,915,120	2,609,422
Office	9,909,186	4,302,370	3,146,642	3,768	55	16	2,196,538	574,731
Other Commercial	7,124,476	4,844,643	1,368,825	24,340	32	22	4,812,707	555,293
Retail	351,302	185,658	244,999	0	11	16	278,353	26,542
Schools	2,151,585	1,447,562	1,104,495	0	149	11	914,827	180,044
Warehouses	1,472,423	1,109,136	-18,204	0	20	16	819,286	134,439

Table 31: Summary Overview by Technology: Prescriptive Programs

Technology	Sum of Net TRC Benefits	Sum of Net Annual Gas savings m³	Sum of Net kWh	Sum of Net Water savings m3	Sum of Participants/ Units	Average of Measure Life	Sum of Total Net Incremental costs	Sum of Total incentive payments
Aerator	10,346,138	1,811,801	0	612,462	315,778	10	217,892	0
Air Curtain	75,088	76,881	-27,181	0	7	15	58,473	0
Air Doors	61,619	63,912	42,761	0	44	15	104,500	12,200
Boiler - Hydronic High Efficiency	1,562,527	736,416	0	0	38	25	340,373	71,000
CFL	9,762,898	0	17,693,421	0	153,857	8	0	0
Condensing Boiler	237,269	169,578	0	0	59	25	198,226	25,000
Energy Star	1,138,093	1,167,239	1,662,570	0	2,205	25	3,669,120	147,300
Energy Star Broiler	1,385	1,342	10	0	1	12	1,016	0
Energy Star Dishwasher	152,080	24,030	112,620	3,384	50	10	-390	0
Energy Star Fryer	114,395	135,158	2,122	0	156	12	128,294	0
Energy Star Rack Conveyor	732,946	83,164	358,758	11,712	36	20	27,374	0
Energy Star Stationary Rack	869,413	139,986	256,926	19,703	221	15	-61,880	0
ERV	303,711	247,545	0	0	31	14	180,764	70,400
Front Load washer	236,379	41,909	141,847	20,819	398	11	214,920	32,250
HRV	824,361	707,134	0	0	46	14	559,584	-250
Infrared	2,442,018	1,346,155	330,329	0	1,028	20	1,053,394	48,650
Kitchen Ventilation	2,602,993	896,264	2,411,870	0	97	15	1,254,000	65,500
Ozone Laundry	1,417,262	806,880	53,845	42,223	65	15	831,892	0
Pre-Rinse Spray Nozzle	1,569,220	845,845	0	165,736	2,529	5	379,350	383,470
Showerhead	34,750,595	7,350,047	0	2,089,122	176,367	9	2,732,778	4,494,274
Small Commercial General	-277,426	0	0	0	0	0	0	327,843
Small Commercial High Eff Boiler	1,427,954	801,208	0	0	120	25	631,140	0
Tankless	112,355	12,225	0	0	81	18	-87,477	3,250
Thermostat - Programmable	26,416	23,374	23,815	0	602	15	41,230	0

CFL: Compact Fluorescent Light bulb

Table 32: Summary Overview by Technology: Custom Programs

Technology	Sum of Net TRC Benefits	Sum of Net Annual Gas savings m³	Sum of Net kWh	Sum of Net Water savings m3	Sum of Participants/ Units	Average of Measure Life	Sum of Total Net Incremental costs	Sum of Total incentive payments
Air Curtain	21,299	11,340	4,062	0	1	15	5,203	1,323
Air Handling Unit	2,310,195	688,521	1,369,292	0	6	15	136,228	109,126
Boiler - Hydronic Condensing - Advanceme	377,561	739,571	23,869	0	15	10	841,798	137,104
Boiler - Hydronic Condensing - Replaceme	8,778,939	4,949,255	0	0	94	25	3,808,495	1,109,616
Boiler - Hydronic High Efficiency	15,398,514	6,265,594	6,632,186	0	128	25	7,781,071	824,021
Boiler - Hydronic High Efficiency - Adva	1,438,538	1,879,535	0	0	17	11	1,682,330	245,455
Boiler - Hydronic High Efficiency - Repl	11,431,997	5,221,837	0	0	89	25	1,969,171	870,577
Boiler - Steam - Advancement	212,057	20,727	297,142	3,144	1	8	12,500	3,316
Boiler - Steam - Replacement	611,663	274,522	61,320	0	2	25	124,025	30,624
Building Envelope	150,671	69,622	0	0	1	25	14,574	11,218
Burner	161,351	121,852	0	0	2	15	78,172	19,110
Condensing Economizer	600,263	455,882	0	0	2	15	262,021	106,863
Controls	14,783,701	7,172,152	6,354,823	10,595	150	15	5,141,260	936,011
Destratification	862,047	799,480	-111,737	0	22	15	649,725	104,541
Direct Contact Water Heater - Advancemen	19,854	25,092	0	175	1	10	18,999	4,043
Drain Water Heat Recovery	1,149,269	556,488	-14,199	17,343	7	25	516,608	28,708
Economizer	5,232,397	4,630,324	733,117	24,340	5	15	5,043,303	556,264
ERV/HRV	114,085	197,809	21,072	0	4	14	290,100	25,493
Furnace	444,244	390,846	0	0	4	18	360,204	62,976
Greenhouse Curtains	218,797	384,349	0	0	9	10	341,611	52,002
Heat Recovery	4,782,940	2,439,455	58,058	20,610	14	16	989,135	297,137
Industrial Equipment	14,237,002	6,914,064	796,062	34,699	22	20	2,188,242	636,704
Infrared	120,139	92,466	3,178	0	4	20	95,290	12,159
Insulation	228,998	186,547	0	0	5	15	119,875	29,918
Insulation/Caulking/Sealing	84,049	157,047	0	0	70	15	235,580	20,423
Linkageless Control	266,812	171,028	33,451	0	4	15	81,233	27,557
Make Up Air Unit	128,402	74,887	0	0	1	15	24,012	13,658
Operational Improvements	3,448,413	3,223,923	1,885,907	7,603	111	5	205,260	402,631
Oven	21,769	23,224	0	0	1	15	21,663	3,742
Ozone Laundry	188,497	65,957	-8,749	10,127	1	15	96,800	0
Pipe Insulation	59,083	67,422	0	0	4	15	66,621	9,345
Reflective Panel	421,503	348,440	0	0	17	15	287,657	35,274
Roof Top Unit	24,274	21,397	0	0	2	15	15,742	3,448
Showerheads	146,335	36,760	0	8,218	3	10	13,356	4,510
Steam Trap	3,392,711	4,281,277	0	3,289	41	5	264,420	168,783
Thermostat - Programmable	10,056	4,984	0	0	1	15	88	582
VFD	17,075,390	5,019,394	11,098,126	963	135	15	2,510,735	1,036,825
Waste Water Reduction	251,656	77,037	0	6,530	1	15	2,500	0

ERV: Energy Recovery Ventilation
HRV: Heat Recovery Ventilation
VFD: Variable Frequency Drive

Table 33: Natural Gas Savings per $1 of Incremental Cost and $1 of Incentive Payments by Technology

Technology	Sum of Net annual gas savings	Sum of Total Net Incremental costs	Gas Savings/m³ per $1 of Incremental costs	Sum of Total incentive payments	Gas Savings/m³ per $1 of Incentive Payments
Aerator	1,811,801	217,892	8.32	0	N/A
Air Curtain	88,220	63,676	1.39	1,323	66.68
Air Doors	63,912	104,500	0.61	12,200	5.24
Air Handling Unit	688,521	136,228	5.05	109,126	6.31
Boiler - Hydronic Condensing - Advanceme	739,571	841,798	0.88	137,104	5.39
Boiler - Hydronic Condensing - Replaceme	4,949,255	3,808,495	1.30	1,109,616	4.46
Boiler - Hydronic High Efficiency	7,002,009	8,121,444	0.86	895,021	7.82
Boiler - Hydronic High Efficiency - Adva	1,879,535	1,682,330	1.12	245,455	7.66
Boiler - Hydronic High Efficiency - Repl	5,221,837	1,969,171	2.65	870,577	6.00
Boiler - Steam - Advancement	20,727	12,500	1.66	3,316	6.25
Boiler - Steam - Replacement	274,522	124,025	2.21	30,624	8.96
Building Envelope	69,622	14,574	4.78	11,218	6.21
Burner	121,852	78,172	1.56	19,110	6.38
Condensing Boiler	169,578	198,226	0.86	25,000	6.78
Condensing Economizer	455,882	262,021	1.74	106,863	4.27
Controls	7,172,152	5,141,260	1.40	936,011	7.66
Destratification	799,480	649,725	1.23	104,541	7.65
Direct Contact Water Heater - Advancemen	25,092	18,999	1.32	4,043	6.21
Drain Water Heat Recovery	556,488	516,608	1.08	28,708	19.38
Economizer	4,630,324	5,043,303	0.92	556,264	8.32
Energy Star	1,167,239	3,669,120	0.32	147,300	7.92
Energy Star Broiler	1,342	1,016	1.32	0	N/A
Energy Star Dishwasher	24,030	-390	-61.62	0	N/A
Energy Star Fryer	135,158	128,294	1.05	0	N/A
Energy Star Rack Conveyor	83,164	27,374	3.04	0	N/A
Energy Star Stationary Rack	139,986	-61,880	-2.26	0	N/A
ERV	247,545	180,764	1.37	70,400	3.52
ERV/HRV	197,809	290,100	0.68	25,493	7.76
Front Load washer	41,909	214,920	0.20	32,250	1.30
Furnace	390,846	360,204	1.09	62,976	6.21
Greenhouse Curtains	384,349	341,611	1.13	52,002	7.39
Heat Recovery	2,439,455	989,135	2.47	297,137	8.21
HRV	707,134	559,584	1.26	0	N/A
Industrial Equipment	7,767,094	2,248,748	3.45	704,059	11.03
Infrared	1,438,621	1,148,684	1.25	60,809	23.66
Insulation	186,547	119,875	1.56	29,918	6.24
Insulation/Caulking/Sealing	157,047	235,580	0.67	20,423	7.69
Kitchen Ventilation	896,264	1,254,000	0.71	65,500	13.68
Linkageless Control	171,028	81,233	2.11	27,557	6.21
Make Up Air Unit	74,887	24,012	3.12	13,658	5.48
Operational Improvements	3,223,923	205,260	15.71	402,631	8.01
Oven	23,224	21,663	1.07	3,742	6.21
Ozone Laundry	872,838	928,692	0.94	0	N/A
Pipe Insulation	67,422	66,621	1.01	9,345	7.21
Pre-Rinse Spray Nozzle	845,845	379,350	2.23	383,470	2.21
Reflective Panel	348,440	287,657	1.21	35,274	9.88
Roof Top Unit	21,397	15,742	1.36	3,448	6.21
Showerhead	7,350,047	2,732,778	2.69	4,494,274	1.64
Showerheads	36,760	13,356	2.75	4,510	8.15
Small Commercial General	0	0	0.00	327,843	N/A
Small Commercial High Eff Boiler	801,208	631,140	1.27	0	N/A
Steam Trap	4,281,277	264,420	16.19	168,783	25.37
Tankless	12,225	-87,477	-0.14	3,250	3.76
Thermostat - Programmable	28,358	41,318	0.69	582	48.73
VFD	5,019,394	2,510,735	2.00	1,036,825	4.84
Waste Water Reduction	77,037	2,500	30.81	0	N/A

Notes

1. Small Commercial costs for Energy star broiler, dishwasher, fryer, rack conveyor, stationary rack, HRV, ozone laundry, high efficiency boiler rolled into Small commercial general

Table 34: Natural Gas Savings per $1 of Incremental Cost and $1 of Incentive Payments by Program

Program Category	Sum of Net Gas savings	Sum of Total Net Incremental costs	Gas Savings/m³ per $1 of Incremental Cost	Sum of Total Incentive payments	Gas Savings/m³ per $1 of Incentive Payments
Agriculture	520,228	183,733	2.83	70,275	7.40
College/University	513,507	497,345	1.03	62,291	8.24
Government/Municipalities	731,511	471,620	1.55	82,382	8.88
Hospitals	2,715,999	1,676,444	1.62	305,363	8.89
Hotel/Motel	1,269,335	949,980	1.34	149,020	8.52
Industrial	16,962,619	5,793,109	2.93	1,773,771	9.56
Large New Construction	3,701,445	6,416,323	0.58	493,471	7.50
Long Term Health Care	75,810	47,811	1.59	12,258	6.18
Low Income	85,362	57,798	1.48	54,203	1.57
Multi-Res Non-Profit	5,906,555	3,382,916	1.75	1,128,163	5.24
Multi-Res Private	14,626,758	7,915,120	1.85	2,609,422	5.61
Multi-Residential Water Conservation	1,386,859	504,349	2.75	317,311	4.37
Office	4,302,370	2,196,538	1.96	574,731	7.49
Other Commercial	4,844,643	4,812,707	1.01	555,293	8.72
Residential New Construction	1,167,239	3,669,120	0.32	147,300	7.92
Retail	185,658	278,353	0.67	26,542	6.99
Schools	2,183,978	1,255,200	1.74	251,044	8.70
Small Commercial	6,357,308	5,258,260	1.21	936,063	6.79
Warehouses	1,109,136	819,286	1.35	134,439	8.25
Water Conservation	7,754,910	2,644,673	2.93	4,155,010	1.87

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GEC INTERROGATORY #36

INTERROGATORY

Enbridge, Issue A.4.Alternatives, Ref: Exh. A, T3, S7, pp. 5-6,8.

a) Please provide copies of all available documentation of the current constraint between Parkway and Maple, including evidence of the constraint from "recent open seasons and new builds by TransCanada along this path."

b) Please provide copies of all available documentation of the current XHP constraint at Parkway.

RESPONSE

a) Please see the response to CME Interrogatury #6 a) i and ii, as well as the response to CME Interrogatory #7, at Exhibits I.A1.EGD.CME.6 and 7, respectively.

b) Please see the response to BOMA Interrogatory #20 at Exhibit I.A4.EGD.BOMA.20 for discussion of system constraints.

A review and reproduction of all available documentation would require an inordinate amount of time and would not provide additional information of value in consideration of the issue.

Witnesses: C. Fernandes
M. Giridhar

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GEC INTERROGATORY #37

INTERROGATORY

Enbridge, Issue A.4.Alternatives, Ref: Exh. A, T3, S7, p. 9, ¶15.

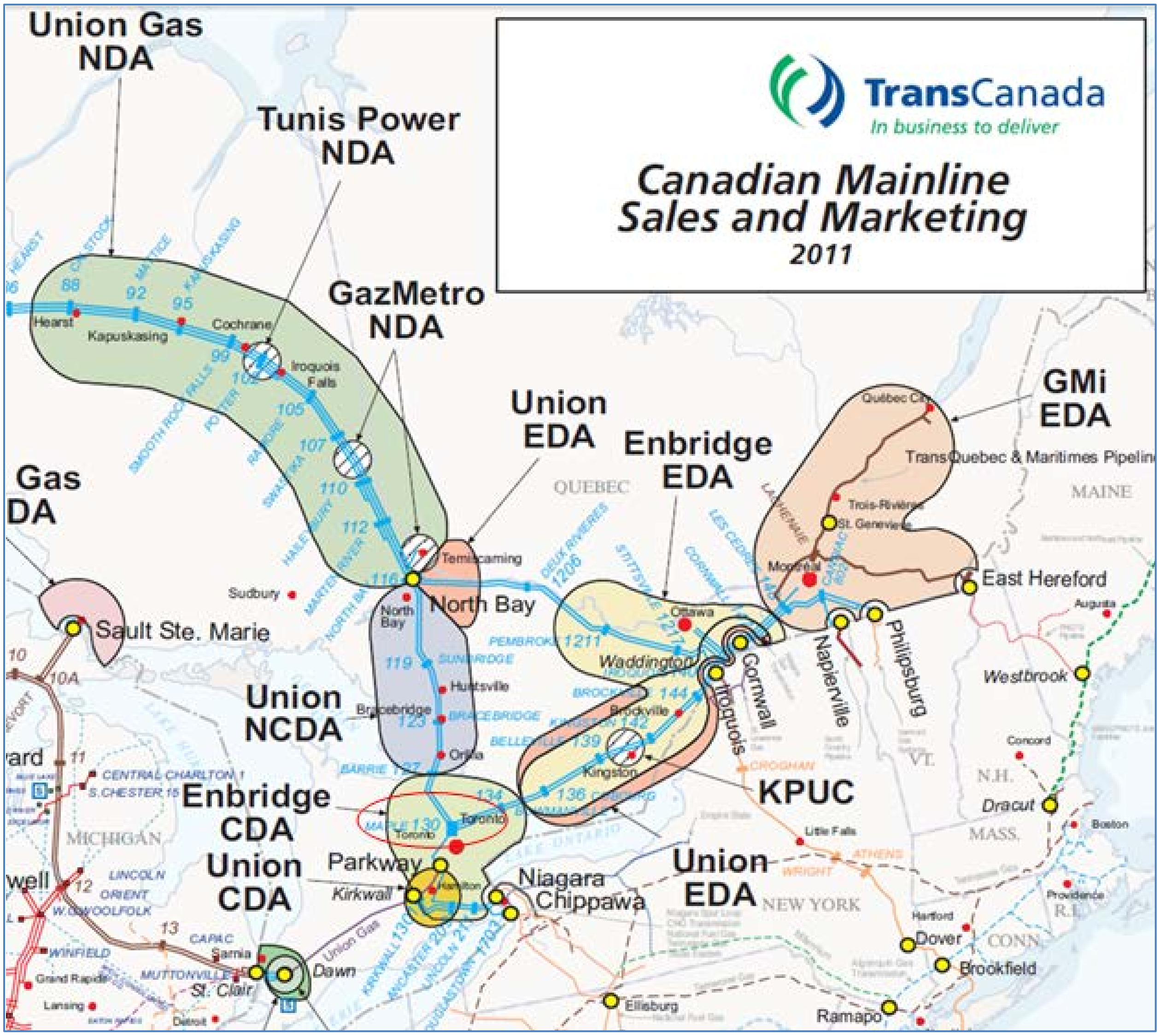
a) Please provide a description of the Maple facility and a map showing its location.

b) Please confirm that neither Enbridge nor Union Gas are currently planning to construct a pipeline between Albion and Maple.

RESPONSE

a) Enbridge does not own the Maple facility. Enbridge understands that the purpose of the Maple facility is to provide compression to volumes transported on the TransCanada system and it houses several compressors and that two segments of the TCPL Eastern Triangle (Barrie Line and the Montreal Line) interconnect at the Maple facility. Please also see attached map showing its location.

Witness: M. Giridhar



Source: http://www.transcanada.com/customerexpress/docs/ml_system_maps/delivery_export.pdf

b) Enbridge is able to confirm that it is not currently planning to construct a pipeline between Albion and Maple.

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
GEC INTERROGATORY #38

INTERROGATORY

Enbridge, Issue A.4.Alternatives, Ref: Exh. A, T3, S7, pp. 9-10, ¶16.

a) Did the Company evaluate the cost-effectiveness of replacing all or part of the proposed GTA Project with a combination of additional investment in DSM and alternative routes or alternative transport arrangements? If so, please provide all available documentation of this analysis.

b) If the load in the GTA or the GTA Project Influence Area were half of the forecast levels, which Project components would not be needed in 2015?

c) For each Project component that would not be needed at half of the forecast levels, please identify the load level at which the component would be needed.

d) For each Project component that would be needed at half of the forecast levels, please explain why it would be needed and identify the extent to which it could be downsized in capacity and cost.

e) If the Portlands Energy Centre were to switch to interruptible delivery service, would any of the Project components be unnecessary?

f) If an additional ten percent of peak load in the GTA Project Influence Area were on interruptible rates, which Project components would not be needed in 2015?

g) Please explain whether any component of the Project is required to maintain the pressure of gas delivered to Portlands Energy Centre, and if so, please describe the potential for added compression at Portlands Energy Centre to allow Enbridge to deliver gas at lower minimum pressure under peak load conditions.

Witnesses: C. Fernandes
E. Naczynski

RESPONSE

a) Please refer to Exhibit A, Tab 3, Schedule 7 for the alternatives considered.

b) We are assuming that this question is referring to halving of forecast load addition rather than halving of forecast load. Please refer to Environmental Defence Interrogatory #20 at Exhibit I.A4.EGD.ED.20. In order to meet all of the objectives, there would be no material change in the proposed facilities under this scenario

c) Not applicable, refer to b)

d) All of the remaining components are required to meet the supply chain reliability and gas transport benefits as described in Exhibit A, Tab 3, Schedule 1.

e) Portlands Energy Center has a firm contract for delivery. Please refer to EB-2006-0305 for publicly available details of the service requirements.

f) The Company does not believe this level of increase in interruptible load is feasible for the following reasons:

   i. This would require an almost 2 fold increase in the amount of interruptible load in the downtown core. Customers willing to accept the operational risks associated with Interruptible service are likely already on the rate, and the Company has seen a general decline in the volumes for this service as shown in Exhibit A, Tab 3, Schedule 7, Figure 1.

   ii. Customers on this service must have, and be able to demonstrate the ability to either shut down the contracted interruptible volume or switch to an alternate fuel source to qualify for an interruptible rate. Evidently, firm customers in Metro Toronto don't have this ability, or interest in acquiring and maintaining it. The vast majority of the peak load in Metro Toronto is for space heating purposes, which in cold winter conditions could be a life safety issue. The building must be heated or it will be uninhabitable.

   iii. Back up fuel systems would be costly, and storage of fuel would be difficult. A ten day supply of this level of load would require greater than 65 million litres of storage, assuming petro diesel and the same conversion efficiency as natural gas.

   Interruptible load would not address the other objectives of the project as discussed in Exhibit A, Tab 3, Schedule 7, paragraph 2, specifically improving

Witnesses: C. Fernandes
E. Naczynski

connectivity between the Western and Eastern portions of the system, mitigation of entry point concentrations and displacing less secure elements of the supply portfolio that generate significant savings for customers.

This level of additional interruptible load would address the forecast load growth, or a “growth only” scenario.

g) This project is required to maintain minimum pressures to Station B. Please see the response to BOMA Interrogatory #23 at Exhibit I.A1.EGD.BOMA.23 .

Witnesses: C. Fernandes
E. Naczynski

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
MARKHAM GATEWAY INTERROGATORY #1

INTERROGATORY

Issue: A.4

The Parkway Belt lands have been rejected by Enbridge as a route for the proposed pipeline for the section between Yonge Street and Bayview Avenue. Provide specifics and a detailed plan/profile drawing of all constraints that factored into the Parkway Belt route not being feasible.

RESPONSE

Please refer to the May 31, 2013 updated Correspondence Table which can be found in Exhibit B, Tab 2, Schedule 1, Attachment 5, page 64, Line 14 for information captured in the Comment Response - Municipalities and Regions section for the City of Markham and reference to the attachment with information for the GTA Project Route Constraints.

Witness: B. Madrid

GTA Project

Criteria used by Enbridge to evaluate pipeline routes include linear & continuous corridor, available working space, routes with least environmental impact, consultation feedback, location of existing utilities & planned infrastructures and potential for third party damages. Safety is a priority for Enbridge and as such, the route selection must allow for the safe and reliable operations and maintenance of our pipelines. The route must allow Enbridge the ability to conduct its regular maintenance and inspection programs.

Please find below a list of constructability constraints/factors for the route options mentioned at the April 5, 2013 meeting with representatives from the City of Markham and the Langstaff Development Land Owners (Condor Properties, Angus Glen Developers and their consultants).

In the designated Utility Corridor north of the 407 ETR:

The availability, accessibility and constructability within the designated Utility Corridor have been eliminated due to the existing development and structures located on the designated Utility Corridor.

Traveling from west of Yonge St. to east of Bayview Ave.

- HONI Tower Corridor crosses the Utility Corridor as it travels from south side of 407ETR to north side
- Protected Transit Way Corridor is aligned on the Utility Corridor as it crosses from south of 407ETR to north of 407ETR
- Bridge abutments for Yonge St to 407ETR are on the Utility Corridor alignment
- Pomona Creek conflict with Utility Corridor crossing alignment – west of Yonge St
- 407ETR ramp to Yonge St crosses under HWY 7 – the overpass bridge is on the Utility Corridor
- Yonge Subway extension plans conflict with Utility Corridor on north side of the 407ETR due to undetermined depth
- Metrolinx Bridge structure, for Hwy 7, on Utility Corridor alignment
- Petro Canada gas station is on the Utility Corridor
- Sales Office (east of Petro Canada gas station) is on the Utility Corridor
- PowerStream Substation is on top of the Utility Corridor
- PowerStream's Local Distribution line starting at the Substation and traveling east, is located on the Utility Corridor alignment
- West side of Bayview Ave – the Bayview Bridge Structure is on the Utility Corridor alignment East side of Bayview Ave – New VIVA Transfer Station projects within the Utility Corridor
- Bell Canada building east of Bayview Avenue sits within the Utility Corridor
- The HWY 7 & 407ETR bridge abutments, over German Mills Creek, conflict with the Utility Corridor
- Changes to Conservation Authority requirements makes Utility Corridor alignment adjacent to German Mills Creek no longer acceptable
- HONI Tower Corridor crosses the Utility Corridor as it travels from north side of 407ETR to south side

In the Transit Way Corridor:

- The Transit Way will not approve the construction of the pipeline within their Corridor (as per pre-consultation discussions held in early 2012)
- Transit Way has specific guidelines for offsets from their Corridor
- Not an Viable Option

Between HWY 7 Corridor and 407ETR Corridor:

- The Transit Way Corridor alignment is located within the above two Highway Corridors
- As mentioned above, Transit Way will not grant approvals to install plant in their Corridor
- Constructability and accessibility to this area between the Highway Corridors is not available due to bridge structures, change in grade elevations, and Metrolinx Rail Corridor

Within the existing Langstaff Road allowance:

- Currently proposed for a realignment as part of the Langstaff Gateway Development
- Proposed Subway extension design crossing 407ETR not finalized and will cross existing Langstaff Rd
- York Region proposed waste water main north side of 407ETR crossing to the south side, depth and grade unknown, has not been designed yet but will need to be considered
- Road/Bridge under the 407ETR to connect High Tech Rd to Langstaff development is a proposed future design that is not available yet
- Langstaff Gateway development design of building structures along existing Langstaff Rd. would interfere with the proposed GTA pipeline alignment
- Existing EGD 12" main pipeline will potentially need to be relocated
- Ramp from Yonge St, north bound, to 407ETR, east bound, may have change of grade and/or alignment
- Construction would be under the middle of existing Langstaff Rd and require road closure to avoid 407ETR wall
- Alignment may require relocation or closure of GO transit parking lot during construction
- Alignment and location of possible future extra railway tracks, at Metrolinx station, not confirmed at this time
- Bayview Avenue crossing from Langstaff Road to east side of Bayview Avenue, paralleling 407ETR, conflicts with bridge abutments

As a result of the high number of coincident constraints identified in all the above options along the relatively short stretch, possible mitigation for one constraint causes issues with adjacent or coincident constraints.

ENBRIDGE GAS DISTRIBUTION INC. RESPONSE TO
MARKHAM GATEWAY INTERROGATORY #2

INTERROGATORY

Issue: A.4

Provide details of the costs of Segment B for all alternatives examined in the Environmental Assessment by Dillon Consulting.

RESPONSE

A detailed cost analysis was not completed as part of the routing analysis undertaken for the ER. Cost was considered in the route selection process, as noted in Section 1.5 (page 17) and Section 2.1.2 (page 28), at a high level based on length.

Witnesses: L. Dumond