Exhibit L.EGD.GEC.2

Before the Ontario Energy Board

EB-2013-0451

DSM Potential in the GTA

Prepared by:

Chris Neme & Jim Grevatt
Energy Futures Group

For:
The Green Energy Coalition
David Suzuki Foundation
Greenpeace Canada
Sierra Club of Canada
WWF-Canada

June 28, 2012

I. INTRODUCTION

Enbridge Gas has proposed a complex and expensive new pipeline project to serve the Greater Toronto Area (GTA). A very brief part of the Company's filing addresses its consideration of alternatives to the proposed project,[1] including energy efficiency delivered through the utility's Demand Side Management (DSM) programs. This report critiques the Company's assessment of DSM as an alternative and puts forward an estimate of how much additional peak hour savings could be achieved in the geographic area of interest if Enbridge were to ramp up its DSM investments. In particular, we focus on the geographic area that is purported to be driving the need for Segments B1 and B2 of the pipeline.[2]

The development of this evidence was coordinated with the development of evidence filed on behalf of Environmental Defence by Ian Jarvis of EnerLife. Among other things, our evidence assesses how much additional efficiency savings is achievable in aggregate (i.e. a "top-down approach" looking across all sectors) based on the experience of leading jurisdictions. It also looks a little more closely at the savings potential in the residential sector. We do not perform a comparable "deeper dive" into savings potential in the commercial and/or apartment sectors because we understood that Mr. Jarvis would be doing so.

The development of our evidence was also coordinated with the development of evidence filed on behalf of the Green Energy Coalition (GEC) by Paul Chernick of Resource Insight. Our estimate of the magnitude of additional peak hour savings that Enbridge could realize from DSM was provided to Mr. Chernick to incorporate in his evidence on the mix of alternatives that could defer the need for the pipeline project to meet load growth.

Mr. Neme, one of the co-authors of this report, has more than 20 years experience with the design, implementation and evaluation of energy efficiency programs and policies. He previously filed testimony on DSM/CDM issues before the Ontario Energy Board on numerous occasions over the past two decades (EBRO 487, EBRO 493/494, EBRO 497, EBRO 499, RP-1999-0001, RP-1999-0017, RP-2001-0029, RP-2001-0032, RP-2002-0133, RP-2003-0063, RP-2003-0203, EB-2005-0211, EB-2005-0001, EB-2005-0523, EB-2006-0021, EB-2008-0346, EB-2010-0279; EB-2012-0337), as well as before similar regulatory bodies in Quebec, Connecticut, Illinois, Maine, Maryland, Michigan, New Jersey, Ohio and Vermont. Mr. Neme is also intimately familiar with Enbridge's current and past DSM efforts from serving on the current Ontario Technical Evaluation Committee (TEC), serving on all but one of Enbridge's annual DSM Audit Committees since they were first formed in 2000 (including the current audit committee charged with

[1] Exh. A, Tab 3, Schedule 7

[2] This should not be construed to imply an endorsement of any other segment of the pipeline project. We take no position on the relative merits of the other segments. Our testimony is simply focused on the portions of the pipeline project which GEC witness Chernick has identified as potentially deferrable through greater investment in demand-side resources.

reviewing the Company's 2012 DSM savings), and having played a lead role in negotiating the settlement agreement between Enbridge Gas and stakeholder groups on Enbridge's 2012-2014 DSM plan.[3] In addition to his work in Ontario for the GEC and OPA, Mr. Neme has consulted on DSM issues for clients in more than 20 different states, several Canadian provinces and several countries in Europe. That includes extensive experience with the integration of DSM into system planning which culminated last year in the publication of a report on North American experience with the use of energy efficiency to defer electric transmission and/or distribution system investments.[4]

Mr. Grevatt, the other co-author of this report, also has more than 20 years experience with the design, implementation and evaluation of efficiency programs. Prior to joining Energy Futures Group, Mr. Grevatt worked for the Vermont Energy Investment Corporation – both as a senior consultant to clients out of state (two years) and as the manager of Efficiency Vermont's statewide residential efficiency programs (five years). Mr. Grevatt also worked for Vermont Gas Systems (VGS) for 11 years, the last five of which he was responsible for managing all of VGS' DSM efforts (residential, commercial and industrial). Mr. Grevatt has filed regulatory testimony on gas and electric DSM issues in both Vermont and Illinois.

Curricula Vitae for both Mr Neme and Mr Grevatt are found at Exhibit L.EGD.GEC.4.

II. Enbridge's Consideration of DSM as a Potential Alternative to the GTA Pipeline

1. The Extent of Enbridge's Assessment of DSM

Enbridge has, by its own admission, done essentially no analysis of the role that more aggressive DSM could play in deferring or eliminating the need for any part of its pipeline project. Indeed, the Company's discussion of DSM as an alternative in its filing is less than 1½ pages long, and most of that discussion is focused on the fact that a very small minority of the efficiency measures that it currently promotes through its programs could exacerbate peak demands.[5] As discussed below, subsequent discovery makes clear that such measures are not representative of most DSM. When pressed on the question of what Enbridge did to assess the role DSM could play in deferring any part of the pipeline project, the Company's witnesses made clear that its quantitative assessment of DSM was limited to an extremely high level and very rough quantification of the level of savings that would be needed to fully address *all* aspects of the *entire* pipeline project:

[3] Mr. Neme was elected by the broader stakeholder Collaborative to serve on the audit committees and the TEC.
[4] Neme, Chris and Richard Sedano, *"U.S. Experience with Efficiency as a Transmission and Distribution System Resource"*, published by the Regulatory Assistance Project, February 2012.
[5] Exh. A, Tab 3, Schedule 7, pp. 1-3.

> "when we looked at DSM we looked at the rough order of magnitude (of) what we thought would potentially be achievable in terms of peak demand reduction…(and) When we talk about 600 terajoules a day, we felt that was so far away from anything that we could possibly hope to achieve that we screened that out as an alternative…Our level of detail is not any more than that."[6]

In short, the Company simply asked itself whether all of the "needs" driving all of the elements of a complex multi-component project could be deferred by DSM. The Company did not adequately assess whether different individual elements of the project could be cost-effectively deferred.

2. Enbridge's Planning Failure

That all-or-nothing approach to planning is highly problematic. For example, the 1600 terajoules (TJ) referenced above relates to the amount of gas that would be supplied from different sources, as a result of construction of new facilities around Parkway and Segment A of the GTA project. As GEC's witness Mr. Chernick explains, even if the shift in sourcing of gas justified some portions of the GTA project, that objective would not justify Segment B. The Company has also argued that it needs 160 TJ per day reduction to reduce the pressure in the existing Don Valley line to 30% SMYS. However, as Mr. Chernick also explains, the Company has operated the Don Valley line at pressures above 30% SMYS since 1971,[7] so it is unclear pressure reductions should now be sufficient justification for such an expensive capital investment. Thus, as Mr. Chernick explains, the only *potentially* compelling rationale for Segment B is that forecast load growth will create reliability problems if the segment is not built.

Enbridge has forecast that load growth in the GTA influence area is approximately 18 TJ per peak day (after accounting for the effects of currently planned DSM)[8] – far less than 600 TJ or 160 TJ. The Company did not assess whether DSM, alone or in combination with other strategies, could more cost-effectively address such growth.[9]

That represents a fundamental failure in Enbridge's planning. A number of different jurisdictions are now actively assessing whether system reliability needs can be met through geographically targeted DSM. Put another way, they are conducting integrated resource planning any time a significant system reliability concern that is related to load growth reaches the point where a future response is forecast to be needed. Capital investments on the supply-side are then compared to alternative investments on the demand-side.[10] These same principles should apply equally to electric and gas systems. Again, they have clearly not been followed by Enbridge in this case.

---

[6] June 13th Technical Conference transcript, p. 121, lines 2-9.
[7] June 12th Technical Conference transcript, p. 32, lines 1-3.
[8] June 13th Technical Conference transcript, p. 103, lines 9-10.
[9] Note that though we cite Enbridge's estimates of peak load growth, we are not endorsing them. The Company's approach to the development of its forecast raises some questions. However, we have not assessed their forecast in sufficient detail to pass judgment on its reasonableness.
[10] Combinations of demand and (smaller) supply-side investments are also considered.

3. Enbridge's Failure to Fully Value DSM Peak Benefits

It is bad enough that the Company has not really considered the role that more aggressive DSM could play in deferring any part of the pipeline project as part of its recent application to the Board. What's worse is that the Company has known of a potential need for additional pipeline capacity (or equivalent) for a decade or more[11] and never adapted its DSM plans – by proposing larger levels of investment and savings, by geographically targeting more of its investment and/or by focusing more of its investment on saving of loads that drive peak demand – to address the potential need.

Unlike some other gas utilities, the Company has never even quantified the peak hour or peak day benefits of its efficiency programs. Nor has it assigned economic value to peak day or peak hour savings. The avoided costs that Enbridge has used to conduct cost-effectiveness screening of its DSM measures and programs are expressed entirely in dollars per *annual* m^3 of gas energy saved. Moreover, those avoided costs appear to be comprised entirely of avoided commodity costs, avoided transportation charges and avoided storage.[12] There does not appear to have been any value assigned to deferring capital investments in pipelines that would otherwise be needed to address peak capacity constraints. The Company summed this up clearly in the Technical Conference:

> *"…we do everything within the DSM program on the basis of annual savings".*[13] (emphasis added)

This suggests that the Company has never really considered DSM as a potential peak capacity resource. As a result, they have probably understated the benefits of their historic DSM efforts and, more importantly, failed to adapt their DSM efforts to maximize benefits to rate-payers.

4. DSM's Role in Reducing Peak Demand

As noted above, most of the extremely brief discussion of DSM as an alternative in the Company's initial filing was focused on the point that some efficiency measures – such as setback thermostats and tankless water heaters – can exacerbate peak demands by shifting loads from off-peak hours to on-peak hours. However, that argument is, at best, a distraction. The amount of attention devoted to it in Enbridge's filing (relative to discussion of the peak benefits of the overwhelming majority of efficiency measures) is completely inappropriate.

When asked during the Technical Conference to identify which specific efficiency measures that the Company promoted in 2012 could exacerbate peak demands, the Company identified only one that would definitely have that effect (residential

[11] During the June 13th Technical Conference Enbridge stated that the capacity shortfall at Station B as foreseen at least as early as 2002 (Transcript p. 116, lines 19-26).
[12] EB-2012-0384, Exh. B, Tab 2, Schedule 2.
[13] June 13th Technical Conference Transcript, p. 129, lines 6-8.

programmable thermostats) and three others that might (commercial programmable thermostats, demand control ventilation that is occupancy based and other commercial "controls"). The Company stated that the other 54 measures it promotes would decrease both annual *and* peak loads.[14]

It is also worth noting that the one measure the Company identified in its Technical Conference undertaking response as definitely adding to peak loads, residential programmable thermostats, accounts for a negligible portion – on the order of 0.1% or less – of the Company's DSM savings.[15] Given available data, it is difficult to estimate exactly how much of the Company's DSM savings which are associated with the other measures that the Company identified as *possibly* adversely affecting peak (e.g. controls installed at commercial buildings or industrial facilities) would actually adversely affect peak loads. In aggregate, commercial and industrial controls appear to account for about 10-15% of the Company's total savings in 2010 and 2011.[16] However, a significant portion of those savings are likely to actually disproportionately *save* energy at the time of peak rather than exacerbate peak loads.[17]

Put simply, the vast majority of the Company's DSM savings are being produced by measures that save energy at peak hours. The same would be true of almost any imaginable expansion of the Company's DSM efforts – particularly if the expansion was specifically designed to defer pipeline investments.

III. Opportunities for Increasing DSM Savings in the GTA

1. Characteristics of GTA Loads

Table 1 summarizes the gas load forecast in the GTA for 2013. Several important points should be gleaned from these data. First, the industrial sector is responsible for a much smaller fraction of peak hour loads than of total annual energy usage. Indeed, the ratios of peak hour loads to annual consumption for the residential, apartment and commercial

[14] Exh. JT2.24

[15] It is not clear that the company acquired any energy savings in 2012 from residential programmable thermostats as they are not mentioned in its draft annual report, any of its related verification reports or the TRC spreadsheet in which it adds up all the savings achieved by measure. In 2011, all programmable thermostats, residential and non-residential (data on just the residential portion are not readily available), accounted for less than 30,000 annual m^3 savings out of a DSM portfolio total of more than 77 million m^3 (Exh. I.A4.EGD.GEC.35, Attachment p. 4). In 2010, residential thermostats accounted for roughly 60,000 annual m^3 savings out of a DSM portfolio total of more than 65 million m^3 (Enbridge Gas Distribution, Inc., *2010 Draft DSM Annual Report*, April 14, 2011.)

[16] Exh. I.A4.EGD.GEC.35, Attachment p. 4, and Enbridge Gas Distribution, Inc., *2010 Draft DSM Annual Report*, April 14, 2011, Appendix A, Table 32.

[17] Consider, for example, occupancy linked demand control ventilation. The amount of ventilation provided by such systems in office buildings and even retail stores will decline quickly after 5 pm (i.e. as evening peak hours approach) with declining occupancy levels and not reach significant levels until 9 or 10 am the following morning (as occupancy increases – after the peak hour). Thus, in buildings for which the baseline condition was ventilation that was continuously running, inconsistently turned off and on, and/or turned off later at night and/or turned on early in the morning by custodial staff or others, substantial savings will occur on peak.

sectors are roughly three to three and a half times greater than for the industrial sector. This should not be surprising as industrial loads tend to be much less climate driven than non-industrial loads. However, it underscores that DSM efforts designed to address pipeline capacity concerns should focus on residential, apartment and commercial sectors. Second, the residential sector accounts for both 40% of annual energy sales and 40% of peak hour demands. This is important because, as discussed further below, only a very small fraction of the Company's current DSM savings are forecast to come from the residential sector.

Table 1: 2013 GTA Sales and Contributions to Peak Demands by Sector[18]

Sector	No. of Customers	Annual Gas Use		Peak Hour Load		Ratio of Peak m3 to Annual m3
		1000s m3	%	m3	%	
Apartment	4,729	914,000	13%	428,717	15%	0.00047
Commercial	80,563	2,063,000	30%	1,119,742	38%	0.00054
Industrial	4,823	1,202,000	17%	184,791	6%	0.00015
Residential	904,728	2,730,000	40%	1,178,633	40%	0.00043
Total		6,909,000		2,911,883		0.00042

2. Enbridge's Currently Planned DSM for the GTA

Table 2 summarizes the impacts of Enbridge's currently planned DSM programs on the GTA portfolio. A couple of points are worth highlighting. First, as noted above, Enbridge is forecasting that it will get almost none of its savings from the residential sector (just 2%) in 2013, even though that sector accounts for both the largest portion of annual sales (40%) and the largest contribution to peak hour loads (also 40%) in the region. Also, Enbridge is forecasting that it will achieve nearly 30% of its savings from the industrial sector even though that sector accounts for just 17% of annual sales and just 6% of peak hour loads. These results are not surprising. Enbridge's DSM portfolio is optimized so as to maximize total lifetime savings per dollar of spending. Under a framework in which total savings are all that matters, such an approach might make sense. However, consideration of the benefits of deferring large capital projects like pipeline expansions suggests a different approach would be appropriate (at least for the geographically targeted area that would otherwise be served by the pipeline investment). Finally, it is worth noting that Enbridge appears to be forecasting that it will achieve annual savings of about 0.5% of sales in the GTA. That is both lower than what it is forecasting to achieve in its entire service territory (0.65%)[19] and, as discussed further below, much less than what leading North American gas utilities are achieving.

[18] Number of customers and annual gas consumption are from Exh JT2.36. Peak hour loads are from Exh. I.A4.EGD.ED.3.
[19] Exh. I.A4.EGD.GEC.34, p. 4 of 5.

Table 2: Impacts of Enbridge's Current DSM Programs on the GTA (2013)[20]

	Annual Savings			Peak Hour Savings	
Sector	1000s m3	%	% of Sales	m3	% of Peak
Apartment	8,638	24%	0.95%	4,052	0.95%
Commercial	15,400	43%	0.75%	8,359	0.75%
Industrial	10,876	30%	0.90%	1,672	0.90%
Residential	775	2%	0.03%	335	0.03%
Total	35,689		0.52%	14,417	0.50%

3. Potential for Additional DSM Savings in the GTA

One of the best indicators of how much additional savings could be acquired is the amount of savings other jurisdictions – particularly leading jurisdictions – are acquiring. There are numerous examples of Natural Gas utilities in North America that are achieving significantly greater savings through their DSM programs than Enbridge has demonstrated to date:

- Interstate Power and Light in Iowa achieved system wide annual savings of 1.50% of sales in 2009, with subsequent years at 1.29% and 1.42%. The average of these three years is over 300% of the savings that Enbridge achieved for the same period in the GTA.
- National Grid in Massachusetts increased annual savings from 0.54% of sales in 2010 to 1.29% in 2012, a 140% increase in three years starting at a level in 2010 that was already 23% more than what Enbridge achieved in the GTA in the same year.
- Questar Gas in Utah also demonstrated an impressively rapid ramp-up in their overall energy efficiency portfolio. Over a three-year span from 2007 to 2009 Questar increased portfolio-wide annual savings five-fold to nearly 1% of sales, more than double the level of savings that Enbridge is currently getting in the GTA.
- Vermont Gas Systems has averaged 1.0% annual savings over the past six years despite having few industrial customers within its service territory.'
- Xcel in Minnesota has similarly averaged approximately 1.0% annual savings over the past six years.

These examples and others clearly demonstrate that Enbridge could be capturing much greater savings through aggressive energy efficiency than it has been capturing to date. Moreover, these savings are occurring in the absence of imminent "necessary" capital expenditures such as those that Enbridge has put before the OEB. Despite Enbridge's

[20] Annual savings in the GTA are from Exh. I.A4.EGD.GEC.34, p. 4 of 5. Savings as % of sales calculated using sales values shown in Table 1 (from Exh. JT2.36). Peak hour savings calculated using ratios of peak hour loads to annual sales in Table 1 (derived in part from Exh. I.A4.EGD.ED.3).

failure to examine construction alternatives for over a decade, it is still not unreasonable to think that, approached with the real urgency at hand, Enbridge could drive greater near term results even than those currently being attained by industry leaders elsewhere, and that these results could mitigate at least a significant part of the need for the proposed Segment B.

In summary, as demonstrated in Table 3 below, leading natural gas efficiency programs have been able to demonstrate rapid ramp up and are achieving portfolio-wide annual savings on the order of 1.0% to 1.5% of annual sales, or more than two to three times the recent historical experience of only about 0.47% per year for Enbridge within the GTA.[21]

Table 3: Gas Savings as % of Sales – Enbridge vs. North American Leaders[22,23]

	Enbridge		Leading Jurisdictions				
Year	System-Wide	GTA	Questar (UT)	Interstate Power & Light (IA)	Vermont Gas Systems (VT)	Xcel (MN)	National Grid (MA)
2007	0.76%	0.55%	0.19%	n.a.	0.89%	1.12%	n.a.
2008	0.67%	0.49%	0.38%	0.71%	1.14%	0.80%	n.a.
2009	0.62%	0.45%	0.98%	1.50%	0.73%	0.87%	0.68%
2010	0.60%	0.44%	n.a.	1.29%	0.97%	0.99%	0.54%
2011	0.67%	0.49%	n.a.	1.42%	1.30%	n.a.	0.85%
2012	0.55%	0.43%	n.a.	n.a.	0.91%	1.09%	1.29%

[21] Enbridge's forecast GTA savings as a percent of sales for 2013 and 2014 are slightly higher than recent years (0.52% for both years), but still well below levels being achieved by North American leaders.
[22] Note that this is not necessarily a definitive list of leading gas DSM jurisdictions. We have not conducted the kind of comprehensive assessment necessary to identify all of the leading jurisdictions.
[23] Enbridge system-wide savings as % of sales and GTA savings from Exh.I.A4.EGD.GEC.34; GTA sales are from JT2.36. Questar savings data for 2007 – 2009 from Dan Dent, Questar program manager, "Regional Round Up: Southwest Region and Questar Gas," CEE, March 18, 2010. Questar sales data for 2007-2009 were obtained from annual 10-K filings. IPL savings and sales data were obtained from regulatory filings including annual reports filed with the Iowa Utilities Board. Vermont Gas Systems savings data were obtained from the VGS annual demand-side management reports, while sales data were obtained from the U.S. Energy Information Administration. Xcel Energy data were obtained from regulatory filings including CIP Status Reports and 2010-12 and 2013-15 Plans. National Grid savings data for Massachusetts were obtained from energy efficiency annual reports for 2009-2011 and from the fourth quarter Program Administrators quarterly report filed with the Massachusetts Energy Efficiency Advisory Council for 2012. Sales data were reported by the Program Administrators, including National Grid, during the most recent (2013-2015) Massachusetts energy efficiency planning process.

4. Achievable Residential Sector Savings

As discussed above, one of the reasons Enbridge's DSM savings levels are below those of leading gas DSM jurisdictions is that it is acquiring very little savings from the residential sector. There is an enormous untapped potential from retrofitting residential buildings.

There is no shortage of examples of effective, high-achieving efforts to capture such savings in other jurisdictions. In some cases, significant year after year savings have been achieved for more than a decade. In other cases, there has been a quick ramp up of participation and savings in recent years. Selected examples worth noting are as follows:

- The Canadian EcoENERGY program (with considerable complementary support from the province of Ontario) built a considerable business infrastructure for home retrofit services. In Ontario, the program ramped up from about 9500 completed home retrofits in the 2007-2008 year – about 0.25% of the eligible housing stock – to nearly 170,000 – about 4.4% of the eligible housing stock – in the 2010-2011 year.[24] To be sure, not all of those participants did whole house retrofits. Many simply installed a single measure, often just a new furnace.[25] However, roughly half of the measures installed were thermal envelope measures, including insulation upgrades, window and door replacements and draft sealing.[26]
- In the United Kingdom, the six major energy suppliers (competitive retailers supplying both electricity and gas) installed attic insulation in nearly 1.4 million homes over the two-year period ending March 2010 – about 3.5% of all single family homes in the country each year. They also installed wall insulation in 1.1 million homes (equivalent to roughly 2.8% of all single family homes per year) over the same time period.[27]
- Questar, referenced above for its rapid ramp-up of savings at the portfolio level reported that it provided natural gas service to 823,151 residential customers in 2008, roughly comparable to the 849,520 residential customers in the GTA in 2008 as reported by Enbridge.[28] In 2010, 65% of Questar's roughly 27 million m^3 annual DSM savings came from residential retrofits, clearly demonstrating that the potential for achieving high levels of savings is not limited to the commercial sector.

[24] EcoENERGY program Status Report June 2013 data, by province, provided in a spreadsheet by Office of Energy Efficiency, Natural Resources Canada
[25] From April 2007 to March 2010, 23.5% of Ontario participants installed just a single measure and nearly three quarters of those single measure participants installed new furnaces (Environmental Commissioner of Ontario, *Re-thinking Energy Conservation in Ontario – Result: Annual Energy Conservation Progress Report – 2009 (Volume 2)*, November 2010.
[26] Ibid.
[27] Neme, Chris, Meg Gottstein and Blair Hamilton, *Residential Efficiency Retrofits: A Roadmap for the Future*, published by the Regulatory Assistance Project, May 2011.
[28] Exh. I.A4.EGD.ED.4.

- As documented in the recently released *Leaders of the Pack: ACEEE's Third National Review of Exemplary Energy Efficiency Programs*[29], the Mass Save® Home Energy Services (HES) Program in Massachusetts is cost-effectively providing comprehensive services to thousands of residential customers annually. Nearly 11,000 Massachusetts customers received retrofits in 2012. That number does not include thousands of additional low income retrofits completed in the state. It has been estimated that the combined participation of both low income and non-low income retrofit programs in Massachusetts in 2009 represented approximately 1.25% of the single family housing stock in the state.[30]
- After an initial start-up/set-up of several months, Efficiency Maine's Home Energy Savings Program began completing whole house retrofits at a rate of nearly 3000 per year – or an annual market penetration rate of 0.6% of the eligible housing stock in the first year.[31] The program was also very successful in the following year until it ran out of money (it was funded with federal dollars). The average savings per participant was 31% of total baseline energy use.[32]
- It has been estimated that in the combined participation of both low income and non-low income retrofit programs in Vermont in 2009 represented approximately 1.2% of the single family housing stock in the state.[33]

In summary, experience from leading jurisdictions suggest it is possible to achieved market penetrations of residential thermal envelop retrofits of 1% to 2% per year – an order of magnitude more than Enbridge's planned market penetration rate of roughly 0.1% for its combined efforts to retrofit both low income and non low income homes in 2013.[34] Experience in leading jurisdictions also suggests that savings on the order of 20-35% per treated home are eminently achievable. Table 4 shows how much residential savings could be achieved in the GTA if Enbridge were to launch a much more aggressive effort to promote whole house retrofits.

[29] Nowak, Seth, et al. *Leaders of the Pack: ACEEE's Third National Review of Exemplary Energy Efficiency Programs*, published by the American Council for an Energy Efficient Economy, June 2013.
[30] Neme, Chris, Meg Gottstein and Blair Hamilton, *Residential Efficiency Retrofits: A Roadmap for the Future*, published by the Regulatory Assistance Project, May 2011.
[31] Based on participation data from Efficiency Maine, Draft HESP Final Report, December 21, 2012.
[32] The Cadmus Group, *Efficiency Maine Trust Home Energy Savings Program Final Evaluation Report*, November 30, 2011.
[33] Neme, Chris, Meg Gottstein and Blair Hamilton, *Residential Efficiency Retrofits: A Roadmap for the Future*, published by the Regulatory Assistance Project, May 2011.
[34] Enbridge has adopted a goal of retrofitting approximately 1700 single family homes in 2013 – 732 non-low income homes and approximately 1000 low income homes (EB-2012-0394, Exh. B, Tab 2, Schedule 9, pp. 12 and 16) out of a total 1.84 million Rate 1 customers (EB-2013-0046, Exh. B, Tab 3, Schedule 4).

Table 4: Achievable Residential Savings Potential in the GTA[35]

	Market Penetrations		Homes Treated		Annual m3 Savings				Peak Hour m3 Savings	
					Incremental Annual		Cumulative Annual			
Year	Incremental Annual	Cumulative	Incremental Annual	Cumulative	(1000s m3)	% of Res. Sales	(1000s m3)	% of Res. Sales	Incremental Annual	Cumulative
2014	0.50%	0.50%	4,524	4,524	5,397	0.20%	5,397	0.20%	2,330	2,330
2015	1.00%	1.50%	9,047	13,571	10,794	0.39%	16,191	0.58%	4,660	6,990
2016	1.50%	3.00%	13,571	27,142	16,191	0.58%	32,382	1.15%	6,990	13,980
2017	1.50%	4.50%	13,571	40,713	16,191	0.57%	48,573	1.71%	6,990	20,971
2018	1.50%	6.00%	13,571	54,284	16,191	0.56%	64,764	2.25%	6,990	27,961
2019	1.50%	7.50%	13,571	67,855	16,191	0.56%	80,955	2.78%	6,990	34,951
2020	1.50%	9.00%	13,571	81,426	16,191	0.55%	97,146	3.30%	6,990	41,941
2021	1.50%	10.50%	13,571	94,996	16,191	0.54%	113,337	3.81%	6,990	48,932
2022	1.50%	12.00%	13,571	108,567	16,191	0.54%	129,528	4.30%	6,990	55,922
2023	1.50%	13.50%	13,571	122,138	16,191	0.53%	145,719	4.78%	6,990	62,912
2024	1.50%	15.00%	13,571	135,709	16,191	0.53%	161,910	5.25%	6,990	69,902

Note that the home retrofit ramp up assumed in Table 4 leads to incremental savings as a percent of sales of about 0.55% from 2016 through 2024 and cumulative savings as a percent of sales of 5.25% over the 2014-2024 (i.e. 11 year) period.[36] For comparison purposes, in its 2008 Update of natural gas efficiency potential in the Enbridge service territory, Marbek projected that after 10 years Enbridge could cost-effectively save 5.0% of its residential load under a $20 million annual DSM budget scenario, 5.7% under a $40 million annual DSM budget scenario and 7.5% under a scenario in which budgets were constrained only by whether the savings targeted were cost-effective.[37]

5. Total Achievable Residential Sector Savings

As noted above, Enbridge should be able to ramp up – over several years – to the point where it is achieving annual energy savings in the GTA of 1.0% to 1.5% per year – roughly doubling to tripling its recent levels of DSM savings in the region. A significant portion of that increase should come from a substantial effort to promote residential whole house retrofits. Table 5 provides an estimate of how those savings might be achieved, by sector, as well as what the resulting peak hour savings would be.

As noted in Table 2 above, we estimate that Enbridge's current DSM programs will produce approximately 14,000 peak hour m^3 savings in 2013; absent any change in the Company's DSM efforts, similar incremental annual peak hour savings would be

[35] The number of homes treated is a function of forecast market penetration rates and a stock of existing 2013 residential customers of 904,728 (Exh. I.A4.EGD.ED.4). Annual savings per home is based on an assumed 30% savings per home multiplied by estimated baseline annual usage of 3977 for the 30% highest consuming homes which would be the most likely target market for a program (derived from Exh. JT2.36 and Exh. I.A1.EGD.GEC.16). Peak hour savings based on ratio for 2013 presented in Table 1. Savings as % of sales estimated using forecast residential sales from Exh. JT2.36.

[36] Note that it is likely possible to achieve additional savings from other measures targeted to the residential sector (e.g. more efficient appliances, more efficient heating and water heating equipment, more efficient new construction, etc.) which are not captured in our analysis.

[37] Exh. I.A4.EGD.ED 14, pp. 17 and 18 of Attachment.

achieved in 2014.[38] The ramp up that we are proposing would result in roughly 23,000 peak hour m^3 savings in 2014 (about a 9,000 peak hour m^3 – or 60% - increase over Enbridge's currently planned efforts), roughly 30,000 peak hour m^3 savings in 2015 (about a 15,000 peak hour m^3 increase, or about a doubling of Enbridge's current annual plans) and roughly 37,000 incremental annual peak hour m^3 savings per year thereafter (about a 23,000 peak hour m^3 increase, or roughly a 165% increase over Enbridge's current annual plans).

Table 5: Incremental Annual Achievable Savings Potential (All Sectors) in the GTA

	Annual Savings (000s m3)						Peak Hour Savings (m3)					
Year	Apart.	Com.	Ind.	Res.	Total	% of Sales	Apart.	Com.	Ind.	Res.	Total	% of Peak
2014	11,229	24,640	14,139	5,397	55,405	0.79%	5,267	13,374	2,174	2,330	23,145	0.79%
2015	14,253	29,260	17,945	10,794	72,252	1.03%	6,685	15,882	2,759	4,660	29,986	1.01%
2016	14,253	37,730	17,945	16,191	86,119	1.22%	6,685	20,479	2,759	6,990	36,913	1.24%
2017	14,253	37,730	17,945	16,191	86,119	1.20%	6,685	20,479	2,759	6,990	36,913	1.23%
2018	14,253	37,730	17,945	16,191	86,119	1.19%	6,685	20,479	2,759	6,990	36,913	1.22%
2019	14,253	37,730	17,945	16,191	86,119	1.18%	6,685	20,479	2,759	6,990	36,913	1.21%
2020	14,253	37,730	17,945	16,191	86,119	1.17%	6,685	20,479	2,759	6,990	36,913	1.20%
2021	14,253	37,730	17,945	16,191	86,119	1.16%	6,685	20,479	2,759	6,990	36,913	1.19%
2022	14,253	37,730	17,945	16,191	86,119	1.15%	6,685	20,479	2,759	6,990	36,913	1.18%
2023	14,253	37,730	17,945	16,191	86,119	1.14%	6,685	20,479	2,759	6,990	36,913	1.18%
2024	14,253	37,730	17,945	16,191	86,119	1.13%	6,685	20,479	2,759	6,990	36,913	1.17%

It should be emphasized that the two key conclusions presented in Table 5 are that it should be possible to ramp up to approximately 1.2% incremental annual energy savings[39] per year and that a significant portion of that ramp up should be associated with the residential sector. The allocation of savings by sector is illustrative only.[40] We use the term illustrative to underscore that we have not developed a detailed DSM plan, from the bottom up, to achieve these savings. Nor have we developed a new detailed efficiency potential study. Rather, we have taken a "top down" approach, extrapolating from other leading jurisdictions, some past experiences in Ontario and Enbridge's own experience. That approach is more than sufficient to demonstrate that there is sufficient additional achievable potential in the GTA (including the significant portion of GTA load that lies in the corridor served by the Don Valley NPS 30 line) to have warranted consideration by Enbridge in developing its pipeline project proposal.

[38] Exh. I.A4.EGD.GEC.34.

[39] Note that though baseline sales are projected by Enbridge to grow over time, we have held our absolute savings levels constant after a three year ramp up. As a result, savings as a percent of sales decline gradually to closer to 1.1% by 2024. This is a conservatism in our approach because the addition of new loads should offer the opportunity for additional savings.

[40] Our illustrative example assumes residential savings equal to those we estimated as possible from just an aggressive whole house retrofit program in the section above; industrial savings on the order of 1.5% of sales per year, consistent with the efficiency potential study conducted for Enbridge by Marbek (Exh. I.A4.EGD.ED 14, p. 57 of Attachment); apartment savings ramping up to between 1.4% and 1.5% of sales; and commercial savings ramping up to between 1.6% and 1.8% of sales.

It should also be emphasized that though we have not conducted a detailed assessment of the cost-effectiveness of such an expanded portfolio, there is every reason to believe that such an expansion would be cost-effective, adding significantly to the net benefits of Enbridge's current DSM efforts. We would expect that most, if not all of the savings achieved under an expanded portfolio to come from the same efficiency measures that Enbridge is currently promoting (including, as we understand Environmental Defence witness Jarvis will be suggesting, significant low cost savings from operational improvements to commercial and multi-family buildings which Enbridge's programs are only this year beginning to capture) – and Enbridge is currently estimating that its 2013 and 2014 DSM plans will produce approximately $4 in societal economic benefits (under the Total Resource Cost test) for every $1 in societal costs.[41]

The principal difference between the expanded portfolio and the Company's current portfolio is that the Company would need to achieve much greater market penetrations of the measures it is currently promoting. That could be accomplished by greater financial incentives to encourage more consumers to invest in the measures; by moving some incentive offerings upstream (i.e. to retailers, vendors, distributors, and possibly even manufacturers rather than just to consumers) which can achieve broader market penetrations, sometimes at lower program costs per unit of savings; and/or by increasing marketing efforts.

In general, that combination of strategies would lead to greater levels of DSM spending. However, it is important to note that higher levels of spending do not mean lower societal net benefits. If the efficiency measures themselves are cost-effective, and higher incentives lead to more of the measures being installed, then net benefits will increase.[42] Sometimes higher spending levels will produce not only greater absolute net benefits (the most important metric of DSM performance), but also greater benefit-cost ratios. This can occur both because greater customer participation means relatively fixed program and overhead costs can be spread across a greater depth of savings and because free ridership typically declines as incentive levels increase.

In response to an undertaking request, Enbridge suggested that the net economic (TRC) benefits of expanding its DSM portfolio to eliminate load growth in the GTA would be approximately $140 million per year – or nearly $1.7 billion over the 2014-2025 timeframe – if the cost-effectiveness of the expanded DSM effort was the same, per unit of savings, as the current DSM portfolio.[43] However, the Company also suggests that it would expect the expanded levels of DSM to be less cost-effective.[44]

In assessing the reasonableness of that conclusion, one must consider a variety of different factors. First, we would expect an increased relative reliance on some less cost-

[41] EB-2012-0394 Exh. B, Tab 2, Schedule 3.
[42] From the societal/TRC perspective, financial incentives are a transfer payment. Put another way, an efficiency measure costs what it costs. The only question is how much of the cost will be borne by the consumer and how much will be borne by the utility program.
[43] Exh. JT2.20.
[44] Ibid.

effective measures in Enbridge's current DSM portfolio – particularly residential retrofit measures – to cause some reduction in overall portfolio cost-effectiveness. However, some of the other factors noted above – e.g. increased focus on low cost operational efficiency improvements in non-residential buildings, spreading relatively fixed costs (including overhead and administration) over a larger volume of savings and reducing free ridership rates – would push in the opposite direction. Of course, as GEC witness Chernick shows in his evidence, deferral of pipeline investment would also add significant economic value. Without conducting a thorough planning exercise, it is difficult to say with any precision what the net result of these countervailing forces would be. However, given the cost-effectiveness of Enbridge's current DSM portfolio, we would be surprised if the net economic benefits of the significant DSM expansion we have suggested were not at least $1 billion over the next 12 years.

IV. Conclusions

To the extent that any portion of its pipeline project is driven principally by load growth, which GEC witness Chernick has indicated is the case for Segment B, Enbridge has clearly failed to adequately assess the role that expanded DSM could play as an alternative to its proposed pipeline investment.

Our analysis clearly demonstrates that Enbridge could significantly expand its current DSM efforts in the GTA region, generating substantial additional annual gas savings, substantial peak reductions – nearly offsetting all forecast load growth – and substantial economic benefits to Enbridge's customers even absent any impact on the Company's proposed pipeline project. We defer to GEC witness Chernick on the extent to which GTA-wide efficiency savings would, alone or in combination with other measures, provide additional economic benefits by deferring the need for elements of that project. To the extent that savings from just a portion of the GTA region are relevant to certain elements of the pipeline project, our GTA-wide savings estimates can be linearly scaled for any such smaller area of concern.

As discussed above, any significant expansion of DSM efforts in the GTA to defer pipeline project investment would require additional DSM spending (just as the pipeline project would). Enbridge's current DSM spending is in line with the Board's 2012-2014 DSM guidelines. However, it is should be noted that the Board's guidelines were established without consideration of the role that DSM could play in addressing some of the pending need for this extremely large capital investment by the Company. Also, to the extent that the guidelines were established in part to address concerns about cross-subsidies from non-DSM participants to DSM participants, it is worth noting that the economic benefit of any deferral of capital investments in new pipelines that would result from an expanded DSM effort would accrue to all customers, not just DSM participants. Of course, an expanded DSM effort would also mean that more customers would have the opportunity to become DSM participants. Further, it is worth noting that concerns about cross-subsidies apply at least as much to the pipeline investment as to DSM, as all

customers would pay for the investment, not just the new customers that would be causing the increases in peak demand and, therefore, creating the need for the pipeline.