500 Consumers Road
North York, Ontario M2J 1P8
PO Box 650
Scarborough ON M1K 5E3

Norm Ryckman
Director Regulatory Affairs
phone: (416) 753-6280
fax: (416) 495-6072
Email: norm.ryckman@enbridge.com

May 28, 2010

VIA RESS, EMAIL and COURIER

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

Dear Ms Walli:

Re: Enbridge Gas Distribution Inc. ("Enbridge")
2011 DSM Plan Application
Ontario Energy Board ("Board") File Number EB-2010-0175

On January 7, 2010, the Board issued a letter to parties involved in the DSM Guidelines for Natural Gas Distributors proceeding, EB-2008-0346, requesting distributors to file DSM Plans for 2011, by April 30, 2010. The Board subsequently extended the deadline for the filing of Enbridge's 2011 DSM Plan to May 28, 2010. In accordance with the Board's request, enclosed please find the application and evidence for Enbridge's 2011 DSM Plan.

The attached plan is the result of extensive discussion and review with the Enbridge DSM Consultative. A meeting was held with the Consultative on April 9, 2010, which resulted in the formation of a working group of four Consultative members plus Enbridge to consider proposals relating to the 2011 Plan. On April 23, 2010 a second Consultative meeting was held to review proposals developed by the working group. From that meeting, there was general agreement on revisions to the budget and SSM calculations and to scorecard based programs.

Enbridge also agreed to circulate the complete 2011 DSM Plan submission to the Consultative, prior to filing the plan with the Board. The circulated document included the adjustments as agreed with the Consultative, together with the other components of a complete DSM Plan submission. The other components of the 2011 Plan reflect a continuation of 2010 DSM activities and measures as described in the 2010 Plan and 2010 Update.

Through this process Enbridge has gained general consensus support for this submission, subject to one outstanding concern. Enbridge followed the Board's direction in using Board approved assumptions to develop the 2011 Plan and followed accepted process in filing the 2010 Update to address new measures and updates to measure assumptions based on changes in program delivery. As a member of the 2010 EAC, GEC has supported the 2010 Update submission. Regarding the 2011 Plan, we understand that GEC has concerns about some of the Board approved assumptions and may raise those concerns at the appropriate time.

This submission has been filed through the Board's RESS, with two copies being delivered to the Board by courier. Enbridge's 2011 DSM Plan will be available on the Enbridge website at www.enbridge.com/ratecase, under Other Regulatory Proceeding, as of May 31, 2010.

Sincerely,

for Norm Ryckman

EXHIBIT LIST AND DESCRIPTIONS

A - ADMINISTRATIVE

Exhibit	Tab	Schedule	Title	Description	Witness(es)
A	1	1	Exhibit List and Description		A. Mandyam
	1	2	Application		N. Ryckman

B - EVIDENCE

B	1	1	2011 Demand Side Management Plan – Introduction	Provides an introduction to the 2011 DSM Plan and orientation for the layout of evidence.	A. Mandyam P. Squires
		2	2011 DSM Plan Regulatory Framework	Provides an overview of the Plan and context for how the Plan relates to the Board Decision in EB-2006-0021 on the DSM Framework for the 2007-2009 Multi-year Plan.	A. Mandyam P. Squires
		3	Summary of 2011 Budget	Provides a budget estimate of DSM costs for 2011 and comparative 2010 Budget. The budget estimate was prepared in compliance with the Board's Framework Decision.	A. Mandyam P. Squires
	2	1	Programs / Activities	Provides program strategies and initiatives proposed as part of the 2011 Plan.	A. Mandyam P. Squires
		2	Residential Market		A. Mandyam P. Squires
		3	Small Commercial		A. Mandyam P. Squires
		4	Commercial Market		A. Mandyam P. Squires

EXHIBIT LIST AND DESCRIPTIONS

B- EVIDENCE

Exhibit	Tab	Schedule	Title	Description	Witness(es)
B	2	5	Multi-family		A. Mandyam P. Squires
		6	New Construction		A. Mandyam P. Squires
		7	Industrial Market		A. Mandyam P. Squires
		8	Market Transformation		A. Mandyam P. Squires
		9	DSM Evaluation Plan for 2011	This section outlines planned verification and evaluation research activities for 2011.	A. Mandyam P. Squires
	3	1	Program Assumptions and New Programs	This section includes assumption information and substantiation for programs that are supplemental to the Board Decision regarding the approval of programs for the 2010 DSM Plan – EB-2009-0154.	A. Mandyam P. Squires
		2	EGD DSM Input Assumptions for 2011 Program Year	Table of Program Assumptions	A. Mandyam P. Squires
		3	Substantiation Sheets for 2011 Input Assumptions for new Measures and Updated Programs	Substantiation Sheets	A. Mandyam P. Squires

EXHIBIT LIST AND DESCRIPTIONS

B- EVIDENCE

Exhibit	Tab	Schedule	Title	Description	Witness(es)
B	3	4	Custom Resource Acquisitions Technologies	Table of Measure Lives	A. Mandyam P. Squires

C – SUPPORTING MATERIAL

C	1	1	Consultative Agreement		

ONTARIO ENERGY BOARD

IN THE MATTER OF the *Ontario Energy Board Act, 1998,* S.O. 1998, c. 15, Sched. B., as amended;

AND IN THE MATTER OF an Application by Enbridge Gas Distribution Inc. for an Order or Orders approving its 2011 Demand Side Management Plan

APPLICATION

1. Enbridge Gas Distribution Inc. ("Enbridge" or the "Company") is an Ontario corporation with its head office in the City of Toronto. It carries on the business of selling, distributing, transmitting and storing natural gas within Ontario. The Company also undertakes Demand Side Management ("DSM") activities.

2. By Notice dated January 7, 2010, the Ontario Energy Board ("OEB" or the "Board") directed that Enbridge file its DSM plan (inclusive of low-income DSM programs) for 2011, by April 30, 2010 ("2011 DSM Plan"). By letter dated April 30, 2010, the Board extended the deadline for the filing of Enbridge's 2011 DSM Plan to May 28, 2010. Accordingly, Enbridge hereby applies to the Board pursuant to Section 36 of the *Ontario Energy Board Act, 1998,* as amended (the "Act") for an Order or Orders approving the 2011 DSM Plan.

3. The Company further applies to the Board pursuant to the provisions of the Act and the Board's *Rules of Practice and Procedure* for such final and interim Orders and Directions as may be necessary in relation to this Application and the proper conduct of this proceeding.

4. The persons affected by this Application are the customers of Enbridge. It is impractical to set out the names and address of the customers because they are too numerous.

5. Enbridge requests that a copy of all documents filed with the Board by each party to this proceeding be served on the Applicant and the Applicant's counsel, as follows:

Mr. Norm Ryckman
Director, Regulatory Affairs
Enbridge Gas Distribution Inc.

Address for personal service:	500 Consumers Road North York, ON M2J 1P8
Mailing Address:	P.O. Box 650 Scarborough, ON M1K 5E3
Telephone:	(416) 495-5499
Facsimile:	(416) 495-6072
Email:	EGDRegulatoryProceedings@enbridge.com

Please quote the name or docket number of the proceeding in all communications.

The Applicant's counsel:

Mr. Dennis M. O'Leary
Aird & Berlis LLP

Address for personal service:	Brookfield Place, Box 754 Suite 1800, 181 Bay Street Toronto, ON M4J 2T9
Telephone:	(416) 865-4711
Facsimile:	(416) 863-1515
Email:	doleary@airdberlis.com

6. Copies of this Application and supporting materials are being contemporaneously served on all parties to the Company's 2010 Low Income DSM Plan Proceeding (EB-2009-0154) and participants in the DSM Consultation Processes (EB-2008-0346 and EB-2008 0150).

Dated: May 28, 2010, at Toronto, Ontario.

ENBRIDGE GAS DISTRIBUTION INC.

Per: for Norm Ryckman
Director, Regulatory Affairs

2011 DEMAND-SIDE MANAGEMENT PLAN – INTRODUCTION

1. In August of 2006 the Ontario Energy Board (the "Board" or "OEB") issued a Decision in the Generic DSM proceeding (EB-2006-0021) setting the Framework for a multi-year DSM plan (2007-2009) for Enbridge Gas Distribution Inc. and Union Gas Limited (the "Utilities"). In a subsequent Decision, the Board approved input assumptions for the Utilities to use in their plan submissions. Enbridge Gas Distribution Inc.'s ("Enbridge") DSM Plan for 2007-2009 was approved by the Board in January 2007. Late in 2008, the Board began consultation with the Utilities and other interested parties on the DSM Framework and program assumptions to be used in the next multi-year plan period beginning in 2010. The Draft Guidelines were issued for comment in January of 2009. In April of 2009, the Board issued program assumptions to be used in 2010 and beyond.

2. Also, in April 2009, the Board deferred further consideration of the Draft Guidelines and instructed all rate-regulated gas utilities in Ontario to file a one year plan for 2010, extending by one year the framework and budget escalators established for the 2007-2009 three-year plan approved in EB-2006-0021 and applying the Board approved 2010 assumptions. Enbridge subsequently filed the DSM Plan for 2010 on May 29th, 2009 and the plan was approved by the Board in September of 2009.

3. In January of 2010 the Board issued a letter reporting on its intent to proceed with a review of the existing DSM Framework and that it had commissioned reports on the subject by Concentric Energy Advisors and Pacific Economics Group. The Board also directed the Utilities to file one year plans for 2011, extending by an additional year the framework and budget escalators established for the 2007-2009 three-year plan approved in EB-2006-0021.

Witnesses: A. Mandyam
P. Squires

4. The Board directed the Utilities to file their 2011 plans by April 30, 2010. Following consultation with the DSM Consultative, Enbridge later requested and the Board approved an extension of the filing date to May 28, 2010. In accordance with the Board's direction, this document presents Enbridge's 2011 DSM Plan.

5. As described in Exhibit B, Tab 1, Schedule 2, the DSM Plan for 2011 follows the framework established in EB-2006-0021 in almost every respect. Without changing the overall DSM budget formula as approved in EB-2006-0021, the plan adjusts the budget allocation between Resource Acquisition and Market Transformation programs. It also adjusts the TRC target and SSM calculation accordingly while retaining the maximum SSM allowable as developed through the EB-2006-0021 formulas. Details of these changes are provided in Exhibit B, Tab 1, Schedule 2.

6. In preparing the DSM Plan for 2011, Enbridge has consulted extensively with the members of the DSM Consultative. A document with details on the agreement achieved on matters of budget, TRC target and SSM calculation is appended as Exhibit C, Tab 1, Schedule 1.

7. As outlined in Exhibit B, Tab 1, Schedule 3, the 2011 plan provides a DSM budget of $26.7 million. This amount represents an escalation of 5% from the 2010 budget in accordance with the EB-2006-0021 formula. Details of the budget are outlined in Exhibit B, Tab 1, Schedule 3. Within the budget envelope, the 2011 DSM Plan will be adjusted over time as may be required to respond to changes in the marketplace, new barriers, new opportunities, and to optimize the DSM portfolio. This principle is in accordance with page 10 of the Board's Decision with Reasons Phase I (EB-2006-0021):

Witnesses: A. Mandyam
P. Squires

> **Program Design and Implementation.** The Utilities agree to the principle that their DSM programs should be managed with regard to the best available information known to them from time to time. Normal commercial practice requires that a Company should react through changes to program design, implementation and/or mix, to material changes in base data as soon as is feasible given relevant operational considerations.

8. Exhibit B, Tab 2 describes the program strategies and activities planned for 2011. This section includes a description of Resource Acquisition programs in the Residential, Small Commercial, Commercial, New Construction, and Industrial sectors. It also includes a description of the Enbridge's Market Transformation programs and discusses planned Verification and Evaluation Research activities for 2011.

9. Exhibit B, Tab 3 provides information on program assumptions. Schedule 2 is a Table of all Program Assumptions which apply to the Enbridge's 2011 DSM Plan. Measure Substantiation Sheets in Schedule 3 provide detailed information on assumptions for new prescriptive programs. In addition, a Table of Measure Lives for Custom Resource Acquisition programs as approved in EB-2009-0154 is included for reference in Schedule 4. Based on the information available at this time all proposed programs meet the benefit to cost ratio of 1.0 as outlined in the Board's Decision with Reasons Phase I (EB-2006-0021).

10. In conclusion, Enbridge's DSM Plan for 2011 meets the budget and framework criteria established in the Board's EB-2006-0021 Phase 1 Decision, with the very limited changes noted above and as mentioned. Enbridge respectfully requests approval of the Plan as filed.

Witnesses: A. Mandyam
P. Squires

2011 DEMAND-SIDE MANAGEMENT PLAN – REGULATORY FRAMEWORK

1. In the Ontario Energy Board's (the "Board") letter dated January 7, 2010, to all rate-regulated natural gas distributors and all participants in consultation processes EB-2008-0046 and EB-2008-0150, the Board directed the natural gas utilities to file their 2011 DSM Plans "under the current DSM framework, including increases based on the established budget escalators".

2. Enbridge Gas Distribution Inc. ("Enbridge") has prepared a 2011 Plan DSM based on this direction; however in two key areas Enbridge is proposing a departure from the established framework, to respond to evolving program and market issues that were not foreseen in 2006 when the original three-year plan (2007-2009) was designed and approved. Enbridge is respectful of the Board's specific direction to maintain overall budget escalators, and therefore the changes proposed do not impact the overall budget proposal. The two points of departure from the established framework are:
    a) a shift in budget from resource acquisition programs to market transformation/scorecard programs, and
    b) a shift in potential SSM incentive from the TRC-based SSM to the Market Transformation/Scorecard SSM, and the resulting re-casting of the SSM curve.

3. The conservation context in Ontario has been rapidly evolving since 2006. Electric CDM has emerged as a priority in the province and the Ontario Power Authority ("OPA") and some electric LDCs have been promoting electricity conservation with significantly higher financial incentives per unit of savings than the gas utilities have been able to provide within their prescribed budget parameters. The recently announced OPA province-wide programs propose to continue these substantial incentives, plus other market support elements such as account executives for

electric LDC's, into 2011 and beyond. This will put gas conservation measures lower on the list of priorities for consumers and businesses in 2011. Opportunities to collaborate between gas and electric LDC's to maximize savings for customers will be limited as long as the gas utilities are driven to maximize TRC through gas and electricity savings. Gas utilities will be perceived as competitors to electric LDC programs, as we target the same customers and the same capital dollars for conservation projects.

4. At the same time, many traditional gas utility DSM programs have reached, or are close to reaching maturity (e.g. high efficiency furnaces, programmable thermostats, low-flow showerheads), and the pressure to maximize TRC with a limited budget does not leave room for many new or emerging measures which are typically low in TRC value. The original budget escalators established in EB-2006-0021 did not contemplate this convergence of circumstances five years out, and therefore are insufficient to properly address market needs.

5. It is hoped that the new DSM framework being developed in EB-2008-0346 will consider and address these (and other) important market and program issues, resulting in an operating environment for gas DSM in 2012 that will remove barriers to collaboration with electric LDC's and encourage creativity and innovation in program design. And currently, Enbridge and Union Gas are participating actively in ongoing discussions with electric LDCs, the MEI, and the OPA to develop proposals to facilitate collaboration between gas utilities and electric LDCs.

6. In the meantime, in 2010 and 2011, Enbridge will be challenged to meet market needs and meet its targets within the current framework, and hence the rationale for this proposal to modify two elements of the framework for 2011.

Witnesses: A. Mandyam
P. Squires

Budget Shift from Resource Acquisition to Market Transformation/Scorecard

7. The 2007-2009 DSM Framework proposed a Market Transformation budget of $1 million per utility per year for the multi-year period, including $140,000 for Market Transformation activities targeted at low income consumers. Enbridge is proposing to increase the Market Transformation/Scorecard budget for 2011 to $3.766 million. This represents a $2.766 million increase over the *status quo* framework requirement for Market Transformation budget. The resource acquisition program budget is proposed to decrease by the same amount, thereby preserving the total budget amount.

8. The proposed 2011 Market Transformation/Scorecard budget of $3.766 million is to be allocated to two programs: Drain Water Heat Recovery and Low Income Weatherization. (Note that the Low Income Enhanced TAPS program will continue to be offered in the resource acquisition portfolio.) The following table summarizes these amounts, in comparison to amounts budgeted for Market Transformation activities in 2010:

2010 Vs. 2011 Market Transformation/Scorecard Budgets

	2010 Market Transformation Budget ($ millions)	2011 Market Transformation Budget ($ millions)
Drain Water Heat Recovery	$0.946	$2.230
Low Income Weatherization	$0 (program included in resource acquisition portfolio in 2010)	$1.396
Low Income information/education based activities	$0.140	$0.140
Other MT support activities	$0.050	$0
Total MT/Scorecard budget	$1.136	$3.766

Witnesses: A. Mandyam
P. Squires

8. The proposed shift towards Market Transformation/Scorecard initiatives accomplishes two objectives. First, expansion of the Drain Water Heat Recovery program provides the market with significant coverage across the province. Although both Enbridge and Union Gas are delivering this program in 2010, Enbridge's current budget limitations prevent us from offering this program to all builders. This increase in budget will almost triple Enbridge's participation rate from 2010 to 2011, thereby accelerating transformation of this market. This proposal also allows Enbridge to increase its conservation offering to a market segment (i.e. residential new construction) that has been historically under-represented in our portfolio due to lack of cost effective measures in the traditional resource acquisition category.

9. The second objective met by this proposal is that the Low Income Weatherization program – traditionally not highly cost effective in TRC terms – is moved to a more appropriate scorecard based evaluation framework. The multi-stakeholder Low Income Conservation Working Group that met at the OEB over the summer months in 2009 reached consensus that TRC was not an appropriate metric for evaluation of low income program results. TRC does not include such benefits as improvements in health and safety and improved comfort, and therefore understates the benefits that arise from low income programs. In a TRC framework, the utilities are not motivated to maximize results in this program as it takes limited budget dollars away from higher-TRC offerings. A scorecard model eliminates this disincentive, and designed properly with sufficient shareholder incentive, can motivate utilities to over-achieve its targets for this important customer segment.

10. The proposed increase in Low Income Weatherization budget will enable Enbridge to increase its participant target for this program from 389 in 2010 to 425 in 2011.

Witnesses: A. Mandyam
P. Squires

11. Detailed summaries of these Market Transformation/Scorecard programs and their proposed performance metrics can be found at Exhibit B, Tab 2, Schedule 7.

SSM Incentive Impacts

12. As a result of the budget shift from resource acquisition to market transformation programs and following consultations with Intervenor groups, Enbridge proposes to modify its financial incentive payments to reflect the shift in spending. This modification is necessary given that with a shift of about 10% of the budget towards market transformation programs, it would not be possible for Enbridge to achieve the same level of TRC results as contemplated under the framework approved in EB-2006-0021 with the smaller resource acquisition budget. In short, it is necessary to reduce the total amount of the incentive available for resource acquisition programs by the amount by which the market transformation incentive was increased. Whereas under the framework the 2010 SSM cap for resource acquisition programs would have been $8.5 million (before applying Ontario CPI increase factor applicable for 2011) and the incentive for market transformation programs would have been $0.5 million, by increasing the market transformation budget by $2.166 million as proposed in 2011, the cap for resource acquisition programs should decrease by at least the amount of the proposed increase to the incentive for market transformation (i.e., $400,000). The result is a resource acquisition cap of $8.1 million and a market transformation incentive of up to $900,000.

In addition, it is necessary to adjust downwards the resource acquisition payout at each of the target levels along the SSM curve. The Company is proposing the following resulting payouts for resource acquisition programs. It should be noted

that the curve retains the same percentage thresholds as prescribed in the generic framework.

Up to 25% of the annual target, a total payout of $200,000
Up to 50% of the annual target, a total payout of $600,000
Up to 75% of the annual target, a total payout of $2,000,000
Up to 100% of the annual target, a total payout of $4,000,000
Up to 125% of the annual target, a total payout of $6,000,000
In excess of 125% of the annual target, a total that is capped at no more than $8,100,000, and adjusted for annual CPI increase as written below.

The cap of $8,100,000 will be increased annually (from 2007 as base year) by the Ontario CPI as determined in October of the preceding year, i.e., the 2011 cap will increase based on CPI as determined at October of 2010.

It should be noted that Enbridge and Intervenors negotiated a lower set of target payments.

13. In addition, Enbridge will be eligible to earn an incentive payment of up to $900,000 based on the measured success of its Drain Water Heat Recovery and Low Income Weatherization market transformation programs. The proposed performance metrics and incentive payments can be found at Exhibit B, Tab 2, Schedule 7.

SUMMARY OF 2011 BUDGET

Table 1
Summary of 2011 Budget

Item No.	Program Name	Total O&M Costs
1	***Mass Markets***	
2	Residential Existing Homes	$ 4,096,936
3	Residential New Construction	$ 1,107,280
4	Small Commercial	$ 1,660,920
5	**Total Mass Markets**	**$ 6,865,137**
6	***Business Markets***	
7	Commercial	$ 3,292,667
8	Multi-Residential	$ 1,780,733
9	Industrial	$ 4,925,339
10	**Total Business Markets**	**$ 9,998,739**
11	***Market Transformation***	
12	Residential New Construction	$ 2,230,000
13	Low Income	$ 1,536,125
14	**Total Market Transformation**	**$ 3,766,125**
15	**Total All Programs**	**$ 20,630,001**
16	**Portfolio Administration**	**$ 6,078,067**
17	**TOTAL**	**$ 26,708,068**

Witnesses: A. Mandyam
P. Squires

PROGRAM ACTIVITIES

1. This section provides an overview of program strategies and initiatives proposed as part of the 2011 DSM Plan. Program Descriptions are grouped under the following headings:
   - Residential Market
   - Small Commercial
   - Large Commercial
   - Multi-family
   - New Construction
   - Industrial Market
   - Market Transformation

   The final section outlines planned verification and evaluation research activities for 2011.

Witnesses: A. Mandyam
P. Squires

RESIDENTIAL MARKET

Prescriptive Resource Acquisition Program

Program Name: Residential Tankless Water Heating Program – New/Existing

Goal: To capture energy savings through higher efficiency water heating technology.

Target market: Owners/Builders of existing/new homes within the Enbridge franchise territory

End-use addressed: Water heating

Measure: Tankless Water Heaters

Program elements: The program offers an incentive on the purchase/rental of an installed tankless water heater.

Delivery Channel: HVAC Contractors, Channel Consultants, Rental Service Providers

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Residential TAPS Program

Goal: To capture energy savings through the reduction of hot water use and through efficient lighting.

Target market: Owners of existing homes in the Enbridge franchise territory

End-use addressed: Water heating and electricity

Measure: Low-flow showerheads, bathroom and kitchen faucet aerators, and compact fluorescent light bulbs

Program elements: The program offers no charge installation of up to two low-flow showerheads, plus provision of a bathroom and a kitchen faucet aerator and four compact fluorescent light bulbs.

Delivery Channel: TAPS Partners Program contractors

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Fireplace Efficiency for existing/new homes

Goal: To promote the installation of efficient gas fireplaces utilizing the fireplace spark ignition for existing and residential new construction market.

Target market: Owners of existing homes and builders of residential low rise new construction homes within the Enbridge franchise territory

End-use addressed: Space heating and cooling

Measure: Gas Fireplace

Program elements: The program offers an incentive/rebate to the homeowner or builder to install an efficient gas fireplace.

Delivery Channel: Promotion through Enbridge New Housing Market Consultants, Contractors, retail stores

Pre-Approved Measure: No

Reference: As per EB 2009-0154 Update

New Measure: Yes

Prescriptive Resource Acquisition Program

Program Name: Programmable Thermostat – Existing Homes

Goal: To capture energy savings by upgrading from a manual thermostat to a programmable thermostat.

Target market: Owners of existing homes in the Enbridge franchise territory

End-use addressed: Space Heating (furnaces and boilers)

Measure: Installation of a programmable thermostat

Program elements: The program offers an incentive of $15.00 to home owners who upgrade to a programmable thermostat in their home.

Delivery Channel: Bill Inserts, direct mail, trade shows, community events, newspaper and magazine advertising

Measure: Installation of a programmable thermostat

Pre-approved measure: Yes

Reference: EB-2009-0154.

New Measure: No

Witnesses: A. Mandyam
P. Squires

Prescriptive Resource Acquisition Program

Program Name: ENERGY STAR™ for New Homes V#3

Goal: To capture energy savings and promote excellence in building practices in residential new construction by encouraging participation in the ENERGY STAR™ for New Homes initiative. For new homes built in Ontario, compliant to Ontario Building Code 2006, with permits issued prior to March 31, 2009.

Target market: Builders of new, residential, low rise homes in the Enbridge franchise territory

End-use addressed: Space heating and electricity savings

Measure: Improvements to the energy efficiency of the building envelope, mechanical systems, and appliances through adherence to ENERGY STAR™ technical requirements as outlined by Natural Resources Canada

Program elements: The program offers an incentive of $100.00 to builders for each labelled home and supports participating builders through tradeshows, workshops and advertising campaigns, through delivery of the service provider EnerQuality Corporation.

Delivery Channel: Promotion through Enbridge New Housing Market Consultants, sponsorship of EnerQuality Corporation, and marketing communications

Pre-Approved Measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: ENERGY STAR™ for New Homes V#4

Goal: To capture energy savings by promoting excellence in building practices in residential new construction by encouraging participation in the ENERGY STAR™ for New Homes initiative. For new homes built in Ontario, compliant to Ontario Building Code 2006, with permits issued after March 31, 2009.

Target market: Builders of new, residential, low rise homes in the Enbridge franchise territory

End-use addressed: Space heating and electricity savings

Measure: Improvements to the energy efficiency of the building envelope, mechanical systems, and appliances through adherence to ENERGY STAR™ technical requirements as outlined by Natural Resources Canada

Program elements: The program offers an incentive of $100.00 to builders for each labelled home and supports participating builders through tradeshows, workshops and advertising campaigns through delivery of the service provider EnerQuality Corporation.

Delivery Channel: Promotion through Enbridge New Housing Market Consultants, sponsorship of EnerQuality Corporation and marketing communications

Pre-Approved Measure: Yes

Reference: EB 2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Solar Pool Heating

Program Goal: To reduce energy use through more efficient pool heating.

Target market: Residential Sector – replacement of existing natural gas pool heater

End-use addressed: Pool heating

Measure: Installation of a solar pool heater

Program elements: Incentive paid to customer, incentive amount to be determined.

Delivery Channel: External business partners, Enbridge Channel Consultants, pool supply retailers and direct to customers.

Reference: EB-2009-0154-Update

Prescriptive Resource Acquisition Program

Program Name: Novitherm Panels

Goal: To capture energy savings by installing Novitherm reflector panels behind radiators of hydronically heated homes.

Target market: Owners of existing homes in the Enbridge franchise territory

End-use addressed: Space heating (boilers)

Measure: Installation of reflective panels behind radiators located on exterior walls of the home

Program elements: The program offers the Novitherm reflector panels free of charge to customers. The customer must apply for the program, pay for shipping and self install the panels.

Delivery Channel: Direct mail, Contractors/Distributors

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Residential Low Income TAPS Partners Program

Goal: To capture energy savings through the reduction of hot water use.

Target market: Home owners and tenants within the Enbridge franchise territory that pay their gas bill and are in need of assistance with their energy costs. Eligibility criteria: 135% of Statistics Canada Low-Income Cut-off (LICO)

End-use addressed: Water heating, space heating, and electricity

Measure: Low-flow showerhead, programmable thermostat, bathroom and kitchen faucet aerators, and compact fluorescent light bulbs

Program elements: The program offers no charge installation of up to two low-flow showerheads and programmable thermostat, plus a bathroom and a kitchen faucet aerator and four compact fluorescent light bulbs.

Delivery Channel: TAPS Partners Program contractors

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Witnesses: A. Mandyam
P. Squires

SMALL COMMERCIAL

Prescriptive Resource Acquisition Program

Program Name: Air Doors

Goal: To improve energy efficiency of the facility by installing an air barrier on exterior doors to maintain indoor air temperature.

Target market: Retail, commercial and institutional entrance ways

End-use addressed: Space conditioning

Measure: Installation of Air Door equipment on facility entrances.

Program elements: Rebate incentives are for a Single Door (3 to 4 feet) - $100.00 and for a Double Door (6 to 8 feet) - 2 doors - $300.00

Delivery Channel: External business partners, Enbridge Channel Consultants and manufacturers

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Commercial Kitchen Ventilation (Demand Control)

Goal: To improve the energy efficiency of kitchen ventilation thereby reducing the amount of energy needed to condition the restaurant space.

Target market: Commercial kitchens

End-use addressed: Space heating, cooling, and ventilation

Measure: Installation of demand control kitchen ventilation exhaust hood together with system rebalancing

Program elements: Incentive rebates are paid in three tiers based on the ventilation CFM rating of the system - Tier 1: 0-5000 CFM $1000. Tier 2: 5001-10000 CFM $1500. Tier 3: >10000 CFM $2000

Delivery Channel: External business partners, Enbridge Channel Consultants and manufacturers

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Energy Recovery Ventilator

Program Goal: To reduce energy use through more efficient space heating.

Target market: Commercial sector – New & Existing in the following sectors: Hotel, School, Restaurant, Retail, Health Care, Warehouse and Office

End-use addressed: Space conditioning

Measure: Installation of Energy Recovery Ventilator

Program elements: Incentive paid to contractor
$250 per unit up to 1,000 CFM
$750 per unit over 1,001 CFM – retrofit only
$750 per unit 1,001 to 4,999 CFM – new build only

Delivery Channel: External business partners, Enbridge Channel Consultants and manufacturers.

Pre-approved measure: Yes

Reference: EB-2004-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Heat Recovery Ventilator

Program Goal: To reduce energy use through more efficient space heating.

Target market: Commercial sector – New & Existing in the following sectors: Hotel, School, Restaurant, Retail, Health Care, Warehouse and Office

End-use addressed: Space conditioning

Measure: Installation of Heat Recovery Ventilator

Program elements: Incentive paid to contractor
$250 per unit – retrofit
$250 per unit up to 4,999 CFM – new build only

Delivery Channel: External business partners, Enbridge Channel Consultants and manufacturers

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Infrared Heater

Goal: To reduce energy use through more efficient space heating.

Target market: Commercial sector – New & Existing Facilities

End-use addressed: Space conditioning

Measure: Installation of Infrared Heater

Program elements: Rebate incentive paid to contractor of $150 per infrared heater installed to a maximum installed capacity of 300,000 BTU per gas unit.

Delivery Channel: External business partners, Enbridge Channel Consultants and manufacturers.

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Programmable Thermostats Program

Goal: To reduce space heating energy consumption.

Target market: Small commercial

End-use addressed: Space conditioning

Measure: Installation of a programmable thermostat

Program elements: Customer rebate incentive of $40 per thermostat when used with a natural gas space heating system to replace a standard thermostat. New construction is not eligible.

Delivery Channel: External business partners and Enbridge Channel Consultants.

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Rooftop Units

Goal: To space heat more efficiently.

Target market: Commercial sector

End-use addressed: Space conditioning

Measure: Installation of efficient 2-stage, 5-ton or under Roof Top Units

Program elements: Incentive paid is $100 per unit

Delivery Channel: External business partners, Enbridge Channel Consultants and manufacturers

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

Prescriptive Resource Acquisition Program

Program Name: Tankless Water Heater Program

Goal: To heat domestic hot water more efficiently.

Target market: Commercial sector

End-use addressed: Domestic hot water heating

Measure: Installation of a tankless water heater to replace a storage water heater

Program elements: Incentive paid is $200 per unit on tankless water heaters with minimum Energy Factor of 0.84 and daily water use of 100 gallons (378 litres) or less water usage per day

Delivery Channel: External business partners, Enbridge Channel Consultants and manufacturers

Pre-approved measure: Yes

Reference: EB-2009-0154

New Measure: No

COMMERCIAL MARKET

Custom Resource Acquisition Program

Program Name: Large Commercial

Program Goal: To capture energy savings in existing office buildings through retrofit of building components

Target market: Institutional, Hotel, Large Retail, Warehouses, Offices

End-uses addressed: Space heating, water heating and ventilation

Measures: A customized energy savings plan for the building may include:

- Higher efficiency boilers (may include mid-efficiency)
- Reflective panels for radiators
- Controls, including Building Energy Management Systems
- Building envelope upgrades including air sealing measures
- Ventilation upgrades including makeup air
- Electricity and water conservation

Program elements:

- Enbridge offers free technical advice and financial rebates for completing energy efficiency improvements in these market sectors. Enbridge can also introduce customers to independent businesses that can help customers with their specific energy needs.
- Targeted energy review of facilities by an Enbridge Energy Solutions Consultant including benchmarking.
- Support for Operational Improvements (Monitoring & Targeting) through on site qualification, providing billing history & billing review, meter exchanges where warranted (for real time monitoring) or additional meter readings (for monthly monitoring).
- Audit incentives for independent third parties to conduct building audits and implementation; audit based on building annual consumption up to $5,000 per study.
- Implementation Incentives at a rate of $\$0.10/m^3$ - up to a maximum of $100,000 per building for capital and operational improvements.
- Menu of prescriptive offerings for HVAC related measures which could include boilers, Heat Recovery/Energy Recovery Ventilation, Demand Control Kitchen Ventilation, Air Doors, Roof Top Units, Destratification Fans, Ozone Laundry

Witnesses: A. Mandyam
P. Squires

systems, Commercial Dishwashers and Unit Heaters subject to approved assumptions.

- Promotion: Trade shows, trade magazines & seminars, industry associations with ties into industry lead benchmarking initiatives.
- Short term promotions around specific technologies.

Delivery Channels:

- Property Managers
- HVAC contractors
- Consulting engineers and designers
- Energy management firms
- Industry associations

MULTI-FAMILY

Custom Resource Acquisition Program

Program Name: Multi-family Sector

Program Goal: To capture energy savings in existing office buildings through retrofit of building components.

Target market: Multi-family buildings – Private, Rental and Condominiums

End-uses addressed: Space heating, water heating and ventilation

Measures: A customized energy savings plan for the building may include:

- Higher efficiency boilers (may include mid-efficiency)
- Reflective panels for radiators
- Controls, including Building Energy Management Systems
- Building envelope upgrades including air sealing measures
- Ventilation upgrades including makeup air
- Electricity and water conservation

Program elements:

- Enbridge offers free technical advice and financial rebates for completing energy efficiency improvements in these market sectors. Enbridge can also introduce customers to independent businesses that can help customers with their specific energy needs.
- Enbridge provides in-house and third party support in the areas of benchmarking and energy planning. Portfolio benchmarking is available for a limited number of property management companies and customers.
- Support for Operational Improvements (Monitoring & Targeting) through on site qualification, providing billing history & billing review, meter exchanges where warranted (for real time monitoring) or additional meter readings (for monthly monitoring).
- Implementation Incentives - at a rate of $\$0.10/m^3$ of gas saved up to a maximum of $100,000 per building for capital and operational improvements.
- Menu of prescriptive offerings for HVAC related measures which include/could include showerheads, boilers, Heat Recovery/Energy Recovery Ventilation, etc. based on approved assumptions.
- Promotion: Trade shows, trade magazines & seminars, industry associations with ties into industry lead benchmarking initiatives and short term promotions.

Witnesses: A. Mandyam
P. Squires

Delivery Channels:

- Property Managers
- HVAC contractors
- Consulting engineers and designers
- Energy management firms
- Industry associations

NEW CONSTRUCTION

Custom Resource Acquisition Program

Program Name: Large Commercial New Construction

Program Goal: To capture energy savings in the design and construction of new commercial buildings.

Target market Owner, developer or designer of Industrial Commercial, Institutional, and Multi-family buildings. Eligible Sectors are – Industrial, Commercial, Institutional and Multi-family buildings.

End-uses addressed: Complete building systems including space heating, water heating, ventilation and building envelope.

Measures: All energy efficient commercial applications that provide demonstrable energy savings in new building construction.

Program elements:

- Energy Solution Consultants promote the program and track results.
- The Design Assistance Program (DAP) is directed towards the design phase of a building which offers a fixed payment of $3,000.
- The New Building Construction (NBC) Program targets actual implementation of more efficient options with the energy savings being defined by an energy model. The incentive is $0.10/$m^3$ of gas saved savings up to a maximum of $30,000 per building. Maximum limits are under review.
- Business Partner Implementation Support designed to help support design decision-makers in encouraging building owners to implement energy efficient design. This is a $2,000 fixed incentive.
- The New Construction (NC) Program provides an incentive for energy savings that result from adding energy efficient natural gas equipment to a new building design where efficiency savings are defined by engineering calculations. The incentive is $0.10/$m^3$ of gas saved savings up to a maximum of $30,000 per building. Maximum limits are under review.
- Promotion: Trade shows, trade magazines & seminars, industry associations.

Witnesses: A. Mandyam
P. Squires

Delivery Channels:

- Design advisors
- Consulting engineers and designers
- Energy management firms
- Industry associations

INDUSTRIAL MARKET

Custom Resource Acquisition Program

Program Name: Industrial & Agricultural

Goal: To capture energy savings in existing facilities through retrofit of process and building components.

Target market: Large Industrial & Agricultural customers

End-uses addressed: All uses

Measures:

- Customized energy savings plan for facility
- All energy efficient industrial applications which provide demonstrable energy savings
- All end uses within the Industrial and Agricultural sectors ie. process related, ventilation, space conditioning, water heating

Program elements:
Enbridge delivers the industrial programs under the sub-program designations: Steam Saver, Heating & Ventilation (HV), Monitoring & Targeting (M&T), and Process Efficiency.

Specific elements include:

- Energy Solutions Consultants (ESCs) work closely with the customers to assist customers in identifying energy efficiency opportunities executing and completing projects. ESCs provide the following services at no cost to customers: help develop energy conservation plans, on-site assessments and surveys, assistance with benchmarking activities, on-site combustion testing for most types of equipment, conduct thermal imaging and statistical analysis and help build business cases for energy efficient projects.
- Enbridge retains the services of certain experts to provide site specific analysis.
- Subsidies for a specified number of energy managers for key large accounts.
- Incentives toward the cost of various assessments and surveys to identify and assess opportunities and set priorities which include Boiler Plant Performance Testing, Process Heating Equipment and Industrial Heating and Ventilation up to $10,000. Incentives for Process Integration Studies up to $30,000.

Witnesses: A. Mandyam
P. Squires

- Implementation incentives at a rate of $0.08/$m^3$ up to a maximum of $100,000 per project for energy efficiency measures implemented.
- For eligible customers: Incentives for sub-meter calibration, billing meter connection, meter and communication infrastructure acquisition, installation and commissioning.
- Incentives for customer training.
- Sponsorship of educational initiatives designed to provide training and field experience for student energy auditors.
- Capacity building through energy workshops aimed at increasing the knowledge of customers and service providers to facilitate increased implementation of energy efficient projects and adoption of energy conservation measures.
- For smaller industrial customers, Enbridge is developing a series of prescriptive offerings, at various stages of regulatory approval for destratification fans, air curtains, HVAC Control Set back thermostats, condensing unit heaters, forklift ventilation and direct fired space heating. Enbridge may provide assistance for on-site assessments for small industrial customers.

Delivery Channels:

- Industrial Energy Solutions Consultants
- Industry associations
- Network of industry experts and business associates including consulting engineers, manufacturers etc
- Farm organizations, co-operatives

MARKET TRANSFORMATION

Market Transformation/Scorecard Program

Program Name: Drain Water Heat Recovery System

Goal: Reduce energy consumption through water heating conservation technology.

Target market: Builders of new, residential, low rise (towns, semis and detached homes) homes in the Enbridge franchise territory. Enbridge will be targeting its promotional activity to the key water heater rental service providers who will, in turn, promote the technology to the builder market.

End-use addressed: Water heating

Efficiency Technology or Behaviour addressed: Effective capture of heat from drain water for use in pre-heating inlet water to the residential water heater.

Barriers to the Technology or Behaviour: Lack of awareness that water heating accounts for 20-30% of a home's energy use, and that there is significant heat recovery potential from household drain water.

Program Objectives: To increase the penetration of drain water heat recovery technology in residential new construction low rise homes in the Enbridge franchise territory.

Program Elements:

- Enbridge covers the cost ($400 per unit) for each Drain Water Heat Recovery unit installed by enrolled builders
- Promotional activity by Enbridge and rental service providers to increase awareness of the Drain Water Heat Recovery technology amongst builders and potential home buyers

SSM incentive structure:

- Shareholder incentive of $650,000 for achievement of 100 percent of scorecard metrics. Incentive amount to be pro-rated for achievement levels between 50 and 100 percent, and 100 and 150 percent on individual metrics, to a maximum allowable incentive for the program of $650,000.

Witnesses: A. Mandyam
P. Squires

Drain Water Heat Recovery		2011 Metric Value Levels			
Element	**Metrics (weighting)**	**50%**	**100%**	**150%**	**Weight**
ULTIMATE OUTCOMES	a) Builders Enrolled	20	25	30	20%
	b) Units Installed	20%	22%	25%	80%

a) Builders Enrolled:
1st time new Builders Enrolled: The number of builders enrolled in the program will be tracked through the rental service providers, RenewAbility, and/or Enbridge. A builder enrolled means they are installing the technology in at least one home. It is also an indicator of how widespread the awareness of the technology may be, and how many builders may be talking about the technology with potential homebuyers. This metric is based on new incremental builders enrolled in 2011, not a cumulative result.

b) Units Installed:
Units installed as percentage of 2010 housing starts. Enbridge's current forecast of housing starts in the franchise (singles, towns, semis) for 2011 is 22,396. Based on this forecast, the 100% performance target of 22% would translate to 4,927 installations. However, the proposal for this metric is that it will be calculated on the basis of actual, not forecast, housing starts at the end of 2011.

This metric will be measured across all builder installations so that all units installed by any participant in the program will be counted. This is the key "ultimate outcome" metric for the program, indicating the penetration of this technology in the residential new construction market, and therefore has the largest weighting of all the two metrics.

Market Transformation/Scorecard Program

Program Name: Low Income Weatherization Program

Goal: Reduce energy consumption through an improved building envelope.

Target market: Low income home owners and tenants living in low rise homes (up to six units) that pay their own gas bills. Eligibility criteria: 35 percent of Statistics Canada Low Income Cut-Off (LICO) or beneficiary of selected social assistance programs.

End-use addressed: Space heating

Efficiency Technology or Behaviour addressed: Technologies may include attic insulation, wall insulation, basement insulation, door and window weather-stripping, caulking, and switch and outlet gaskets and covers.

Barriers to the Technology or Behaviour: Low awareness, lack of trust, hesitance to self identify, language barriers, disruption of household, follow up painting/restoration.

Program Objectives: To decrease energy costs to low income customers living in low rise homes in the Enbridge franchise territory.

Program Elements:

- Enbridge will be offering an initial energy assessment, with insulation and draft proofing measures to qualified homes and a follow-up energy assessment at no cost to the customer.
- Delivery service providers experienced in energy efficiency audits and retrofits are contracted by Enbridge to provide the program to customers.

SSM incentive structure:

- Shareholder incentive of $250,000 for achievement of100 percent of scorecard metrics. Incentive amount to be pro-rated for achievement levels between 50 and 100 percent, and 100 and 150 percent on individual metrics, to a maximum allowable incentive for the program of $250,000.

Low Income Weatherization and Education		2011 Metric Value Levels			
Element	**Metrics (weighting)**	**50%**	**100%**	**150%**	**Weight**
ULTIMATE OUTCOMES	Retrofit Participants	300	425	450	50%
	Total Annual Natural Gas Savings (m3)	340,200	481,950	510,300	50%

Retrofit Participants:
The number of qualified customers' homes that receive insulation and/or draft-proofing measures. A retrofit participant also receives an initial audit with blower door test and a follow-up audit with blower door test.

Total Annual Natural Gas Savings:
Fully effective annual cubic meters of gas saved across the number of retrofitted homes. Hot 2000 software program is used to measure actual natural gas savings for tracking purposes. Gas savings assumptions are based on the Board approved assumption of 1134 m^3 per home (reference EB 2009-0154).

Market Transformation/Scorecard Program

Program Name: Low Income Education Program

Goal: To improve energy efficiency knowledge and basic efficiency practices among low income home owners and tenants through provision of information and simple energy savings tools.

Target market: Home owners and tenants paying their gas bill who need assistance with their energy costs and low income segment stakeholders such as social service agencies.

End-use addressed: Space heating, water heating

Efficiency Technology or Behaviour addressed: Basic heating and water heating conservation practices and weatherization activities

Barriers to the Technology or Behaviour: Lack of customer knowledge or access to factual information regarding simple and easy to implement energy saving measures and the cost of these measures. Customer lack of trust and hesitance to self-identify for programs. Lack of market awareness of available programs.

Program Objectives: To provide education promoting energy management and simple measures that can be customer implemented such as reducing air leakage around windows, doors, switch plates and outlet gaskets and saving electricity with compact fluorescent lights. Raise awareness amongst front line social service personnel of energy efficiency and programs available.

Program Elements: Information workshops, exhibits, distribution of simple measures and educational materials to those in need and amongst front line social agency personnel to enhance delivery of programs. Target and support various initiatives promoting energy conservation to the low income sector.

SSM incentive structure: None

Witnesses: A. Mandyam
P. Squires

FISCAL 2011 DSM VERIFICATION AND EVALUATION PLAN

1. Development of the Company's Monitoring and Evaluation Plan for the period 2011 is in alignment with the framework outlined in the Board's Decision with Reasons Phase I (EB-2006-0021).

2. Objectives and Priorities of the 2011 Evaluation Plan

   The Company identified six overall objectives for the 2007 - 2009 Evaluation Plan and will continue with these objectives for the 2011 year:

   - maintain and enhance ongoing program tracking and documentation procedures;
   - fulfill commitments from the Generic Hearing including research items listed in Appendix A, updating the DSM Potential Study and reviewing all prescriptive program assumptions (completed);
   - undertake third party evaluation of custom project savings;
   - provide evaluation research necessary to measure the impacts of new market transformation programs;
   - support development and evaluation of new DSM programs during the plan period; and
   - undertake other evaluation research on a priority basis.

3. In practice, Enbridge has been reviewing research priorities with the EAC at the beginning of the year and again in mid year or early fall, following the completion of the DSM audit of the previous year's results. As well, the Company has been engaged in ongoing discussions with the EAC regarding research and requirements for individual programs.

Witnesses: A. Mandyam
P. Squires

4. Planned activities for 2011.

Study type	Purpose	Plans for 2011
Verification studies	Validate annual program results	Continue with verification studies for ▪ TAPS and Enhanced TAPS ▪ Custom Projects engineering review ▪ Multi-residential showerhead program ▪ Other programs as needed
Research studies	Update measure or program assumptions	▪ As needed
Research studies	Determine assumptions for new measures	▪ As needed
Research studies	Respond to recommendations from DSM audit	▪ Complete any outstanding research recommended through the 2009 DSM audit ▪ Initiate new research recommendations from the 2010 DSM audit.

5. Evaluation plans for 2011 will be developed in more detail through a review of evaluation priorities with the EAC following completion of the 2009 DSM Audit later in 2010.

6. Enbridge and Union Gas have collaborated extensively on DSM research through the period of the Multi-year plan, most recently in the Assumption Update for 2010. In 2011, the Company, in consultation with the Evaluation Audit Committee, will continue to look for appropriate opportunities to partner with Union Gas and other parties when executing the Evaluation Plan. Alignment of evaluation activities with Union Gas may be affected by differences in customer base, program portfolio, evaluation priorities and other factors.

Witnesses: A. Mandyam
P. Squires

NEW PROGRAMS AND PROGRAM ASSUMPTIONS

1. Introduction

In the Ontario Energy Board's (the "Board") letter of January 7th, 2010 directing the utilities to file their 2011 DSM plans, the Board stated:

> The measures and input assumptions that should be used for the development of the DSM plans for 2011 are those contained in "Measures and Assumptions for Demand Side Management (DSM) Planning" prepared by Navigant Consulting Inc. (issued by the Board April 29, 2009) and selectively updated by the utilities based on the evaluation results of their 2008 and 2009 DSM programs.

2. The Navigant Report acknowledged three circumstances in which the utilities may wish to propose alternative or additional assumption values in their DSM plans. They are to provide:

    1. free ridership values,
    2. incremental cost information which reflects the utility's program costs, and
    3. information on "additional promising measures" not covered in the Navigant Report.

4. In September of 2009, the Board Decision in EB-2009-0154 approved the Enbridge DSM plan for 2010 including all measure assumptions.

5. The program assumptions for the 2011 plan are based on the assumptions approved in EB-2009-0154 for the 2010 plan with some changes and additions. In a few programs, changes in program delivery necessitated a change in incremental costs. As well, the plan includes new measures resulting from program development research.

6. Exhibit B, Tab 3, Schedule 2 includes an Assumption Table showing all proposed assumptions for the Company's 2011 DSM Plan. Detailed Substantiation Sheets for new measures or measures with updated assumptions based on changes to program delivery are included in Exhibit B, Tab 3, Schedule 3.

7. Measure life assumptions for technologies used in custom projects are used to calculate TRC net benefits and cost effectiveness of the custom projects. The Measure Life Assumptions Table was last approved as part of the 2010 DSM Plan (EB-2009-0154). The Table is included for reference at Exhibit B, Tab 3, Schedule 5.

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

as per EB 2009-0154

indicates new program as filed in 2010 Update

indicates update based on change in program as filed in 2010 Update

Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas (m3)	Electricity (kWh)	Water (L)	Equipment Life (Years)	Incremental Cost ($)	Free Ridership (%)	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
	RESIDENTIAL NEW CONSTRUCTION									
1	Tankless Water Heater	Storage Tank Water Heater	base	130	-	-	18	$750.00	2%	
2	Faucet Aerator (Kitchen, installed, 1.0 GPM)	Ontario Building Code 2006 (2.2 gpm)	base	32	0	10,631	10	$1.00	31%	New Measure
3	Faucet Aerator (Bathroom, installed, 1.0 GPM)	Ontario Building Code 2006 (2.2 gpm)	base	10	0	3,435	10	$0.55	31%	New Measure
4	Faucet Aerator (kitchen, installed, 1.5 GPM)	Average existing stock, 2.5 GPM	base	23	0	7,797	10	$1.65	31%	Incremental cost change based on supplier's cost of product, inventory, packaging etc.
5	Faucet Aerator (bathroom, installed, 1.5 GPM) (3 aerators)	Average existing stock, 2.2 GPM	base	18	0	6,012	10	$2.72	31%	Incremental cost change based on supplier's cost of product, inventory, packaging etc.
6	Low-Flow Showerhead (Per unit, installed, 1.5 GPM)	Average existing stock, 2.2 GPM	base	46	0	6,334	10	$12.50	10%	Incremental cost change based on supplier's cost of product, inventory, packaging etc.
7	Low-Flow Showerhead (Per household, installed, 1.25 GPM replacing 2.0-2.5 GPM)	2.0 -2.5 GPM showerhead (2.25 GPM)	base	66	0	10,886	10	$4.26	10%	Incremental cost change based on supplier's cost of product, inventory, packaging etc.
8	CFL (13W) (8 bulbs)	60W Incandescent	n/a	0	360	0	8	$0.00	24%	Program delivery changed increasing the number of CFL bulbs from 6 to 8.
9	High Efficiency Fireplace with Pilotless Ignition - Freestanding = Minimum 70% EnerGuide Rating	Freestanding fireplace = 65% median efficiency	base	110	(31)	0	20	$135.00	17%	New Measure
10	High Efficiency Fireplace with Pilotless Ignition - Insert = Minimum 60% EnerGuide Rating	Insert = 55% median efficiency	base	109	(31)	0	20	$135.00	17%	New Measure
11	High Efficiency Fireplace with Pilotless Ignition - Zero Clearance >= 40 kBtu.h =Minimum 60% EnerGuide Rating	Zero Clearance >= 40kBtu/h median efficiency	base	122	(31)	0	20	$135.00	17%	New Measure
12	High Efficiency Fireplace with Pilotless Ignition - Zero Clearance < 40 kBtu.h =Minimum 70% EnerGuide Rating	Zero Clearance <40kBtu/h median efficiency	base	108	(31)	0	20	$135.00	17%	New Measure
13	Programmable Thermostat	Standard Thermostat	weather	53	54	0	15	$53.22	10%	Incremental cost change based on supplier's cost of product, inventory, packaging etc.
14	Energy Star Home (version 3)	Home built to OBC 2006	weather	1,018	1,450	0	25	$4,701.00	5%	
15	Energy Star Home (version 4)	Home built to OBC 2006 as of Mar 31, 2009	weather	881	734	0	25	$4,275.00	5%	

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

as per EB 2009-0154

indicates new program as filed in 2010 Update

indicates update based on change in program as filed in 2010 Update

Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas m3	Electricity kWh	Water L	Equipment Life Years	Incremental Cost $	Free Ridership %	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
	RESIDENTIAL EXISTING HOMES									
16	High Efficiency Condensing Furnace AFUE 96	High-Efficiency Furnace AFUE 90	weather	129	0	-	18	$1,767.00		
17	Solar Pool Heater	Natural Gas Pool Heater	base	1,116	(57)	0	20	$1,450.00	10%	New Measure
18	High Efficiency Fireplace with Pilotless Ignition - Freestanding = Minimum 70% EnerGuide Rating	Freestanding fireplace = 65% median efficiency	base	110	(31)	0	20	$135.00	17%	New Measure
19	High Efficiency Fireplace with Pilotless Ignition - Insert = Minimum 60% EnerGuide Rating	Insert = 55% median efficiency	base	109	(31)	0	20	$135.00	17%	New Measure
20	High Efficiency Fireplace with Pilotless Ignition - Zero Clearance >= 40 kBtu.h =Minimum 60% EnerGuide Rating	Zero Clearance >= 40kBtu/h median efficiency	base	122	(31)	0	20	$135.00	17%	New Measure
21	High Efficiency Fireplace with Pilotless Ignition - Zero Clearance < 40 kBtu.h =Minimum 70% EnerGuide Rating	Zero Clearance <40kBtu/h median efficiency	base	108	(31)	0	20	$135.00	17%	New Measure
22	Faucet Aerator (Kitchen, installed, 1.0 GPM)	Average Existing Stock (2.5 gpm)	base	35	0	11,694	10	1.00	31%	New Measure
23	Faucet Aerator (Bathroom, installed, 1.0 GPM)	Average Existing Stock (2.2 gpm)	base	10	0	3,435	10	.55	31%	New Measure
24	Faucet Aerator (kitchen, distributed, 1.5 GPM)	Average existing stock, 2.5 GPM	base	23	0	7,797	10	$1	31%	
25	Faucet Aerator (bathroom, distributed, 1.5 GPM)	Average existing stock, 2.2 GPM	base	6	0	2,004	10	$1	31%	
26	Low-Flow Showerhead (Per unit, distributed, 1.5 GPM)	Average existing stock, 2.2 GPM	base	46	0	6,334	10	$4	10%	
27	Low-Flow Showerhead (Per unit, distributed, 1.25 GPM)	Average existing stock, 2.2 GPM	base	63	0	10,570	10	$4	10%	
28	Low-Flow Showerhead (Per household, installed, 1.25 GPM replacing 2.0-2.5 GPM)	2.0 -2.5 GPM showerhead (2.25 GPM)	base	66	0	10,886	10	$19.00	10%	
29	Low-Flow Showerhead (Per household, installed, 1.25 GPM replacing 2.6 + GPM)	2.6 + GPM showerhead (3.0 GPM)	base	116	0	17,168	10	$19.00	10%	
30	Pipe Insulation	Water Heater w/o pipe insulation	base	18	-	-	10	$2/$4	4%	

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

as per EB 2009-0154

indicates new program as filed in 2010 Update

indicates update based on change in program as filed in 2010 Update

Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas (m3)	Electricity (kWh)	Water (L)	Equipment Life (Years)	Incremental Cost ($)	Free Ridership (%)	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
31	Programmable Thermostat	Standard Thermostat	weather	53	54	0	15	$50	43%	
32	Tankless Water Heater	Storage Tank Water Heater	base	130	-	-	18	$750.00	2%	
33	Reflector Panels	Radiant heat w/o reflector panels	weather	143.0	-	-	18	$238.00	0%	
	RESIDENTIAL LOW INCOME									
34	Faucet Aerator (Kitchen, installed, 1.0 GPM)	Average Existing Stock (2.5 gpm)	base	35	0	11,694	10	1.00	1%	New Measure
35	Faucet Aerator (Bathroom, installed, 1.0 GPM)	Average Existing Stock (2.2 gpm)	base	10	0	3,435	10	.55	1%	New Measure
36	Faucet Aerator (kitchen, distributed, 1.5 GPM)	Average existing stock, 2.5 GPM	base	23	0	7,797	10	$0.94	1%	
37	Faucet Aerator (bathroom, distributed, 1.5 GPM)	Average existing stock, 2.2 GPM	base	6	0	2,004	10	$0.46	1%	
38	Low-Flow Showerhead (Per household, installed, 1.25 GPM replacing 2.0-2.5 GPM)	2.0 -2.5 GPM showerhead (2.25 GPM)	base	66	0	10,886	10	$18.71	5%	
39	Low-Flow Showerhead (Per household, installed, 1.25 GPM replacing 2.6 + GPM)	2.6 + GPM showerhead (3.0 GPM)	base	116	0	17,168	10	$18.71	5%	
40	CFL (13W) (2 bulbs)	60 W Incandescent	n/a	0	90	0	8	$0.00	5%	
41	CFL (23W) (2 bulbs)	75 W Incandescent	n/a	0	100	0	8	$0.00	5%	
42	Programmable Thermostat	Standard Thermostat	weather	53	54	0	15	$69.18	1%	
	COMMERCIAL NEW BUILDING CONSTRUCTION									
43	Condensing Unit Heater	% Sales Weighted Average model - Equivalent in efficiency to a power-vented or separated combustion unit heater (78% Annually Efficient)		.00631 m3 / (BTU/H)	(.00186) kWh / (BTU/H)	0	18	$.0129 / (BTU/H)	0%	New Measure
44	Energy Star Dishwasher - Undercounter - High Temperature	Non- Energy Star Dishwasher		801	3,754	112,795	10	($13.00)	40%	New Measure
45	Energy Star Dishwasher - Undercounter - Low Temperature	Non- Energy Star Dishwasher		326	559	45,891	10	($13.00)	40%	New Measure

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

as per EB 2009-0154

indicates new program as filed in 2010 Update

indicates update based on change in program as filed in 2010 Update

Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas (m3)	Electricity (kWh)	Water (L)	Equipment Life (Years)	Incremental Cost ($)	Free Ridership (%)	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
46	Energy Star Dishwasher - Stationary Rack (Door type or single rack) - High Temperature	Non- Energy Star Dishwasher		619	3,553	87,119	15	($350.00)	20%	New Measure
47	Energy Star Dishwasher - Stationary Rack (Door type or single rack) - Low Temperature	Non- Energy Star Dishwasher		841	855	118,369	15	($350.00)	20%	New Measure
48	Energy Star Dishwasher - Rack conveyor, single (tank) - High Temperature	Non- Energy Star Dishwasher		2,203	9,811	310,271	20	$2,375.00	27%	New Measure
49	Energy Star Dishwasher - Rack conveyor, multi (tank) - High Temperature	Non- Energy Star Dishwasher		3,708	15,822	522,192	20	$288.00	27%	New Measure
50	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Washer	base	.0328 m3 / (lbs/yr)	.00219 kWh / (lbs/yr)	2.01 L / (lbs/yr)	15	$10,970.00	8%	New Measure
51	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Washer	base	.0328 m3 / (lbs/yr)	.00219 kWh / (lbs/yr)	2.01 L / (lbs/yr)	15	$30,270.00	8%	New Measure
52	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Tunnel Washer - 120 lbs	base	.0240 m3 / (lbs/yr)	.00152 kWh / (lbs/yr)	1.22 L / (lbs/yr)	15	$49,667.00	8%	New Measure
53	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Tunnel Washer - 500 lbs	base	.0240 m3 / (lbs/yr)	.00152 kWh / (lbs/yr)	1.22 L / (lbs/yr)	15	$160,065.00	8%	New Measure
54	Condensing Gas Water Heater 100 gals	Storage Tank Water Heater	base	332			13	$2,230.00	5%	
55	Condensing Gas Water Heater 500 gals	Storage Tank Water Heater	base	873			13	$2,230.00	5%	
56	Condensing Gas Water Heater 1000 gals	Storage Tank Water Heater	base	1,551			13	$2,230.00	5%	
57	Rooftop Unit (2 stage roof top unit)	Single stage rooftop unit	weather	255	-	-	15	$375.00	5%	
58	Tankless Water Heater 50 - 150 USG/day, 84% thermal efficiency	Storage Tank Water Heater 91 gal tank, 80% efficiency	base	154	-	-	18	-$1,102.00	2%	
59	Infrared Heaters (0 - 75,000BTUH)	Regular Unit Heater	weather	0.015 m3/BTUH	245	-	20	$0.0122 BTUH/hr	33%	
60	Infrared Heaters (76,000 - 150,000 BTUH)	Regular Unit Heater	weather	0.015 m3/BTUH	559	-	20	$0.0122 BTUH/hr	33%	

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

as per EB 2009-0154

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Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas (m3)	Electricity (kWh)	Water (L)	Equipment Life (Years)	Incremental Cost ($)	Free Ridership (%)	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
61	Infrared Heaters (151,000 0 - 300,000 BTUH)	Regular Unit Heater	weather	0.015 m3/BTUH	870	-	20	$0.0122 BTUH/hr	33%	
62	Demand Control Kitchen Ventilation (0 - 4999 CFM)	Ventilation without DCKV	weather	4,801	13,521	-	15	$10,000.00	5%	
63	Demand Control Kitchen Ventilation (5000 - 9999 CFM)	Ventilation without DCKV	weather	11,486	30,901	-	15	$15,000.00	5%	
64	Demand Control Kitchen Ventilation (10000 - 15000 CFM)	Ventilation without DCKV	weather	18,924	49,102	-	15	$20,000.00	5%	
65	Energy Recovery Ventilators (ERV) savings vary by sector	Ventilation without ERV	weather	1.75-4.89 / CFM	-	-	20	$3.00/CFM	5%	
66	Heat Recovery Ventilator (HRV) - savings vary by sector	Ventilation without HRV	weather	1.62-4.55 / CFM	-	-	20	$3.40/CFM	5%	
67	Condensing Boilers (90% estimated seasonal efficiency)	Non-condensing Boiler (76% estimated seasonal efficiency)	base	0.014 m^3/BTUH	-		25	$12.00/$10^3$ / BTUH	5%	
68	Destratification Fans	No destratification fans	weather	0.56/ft^2	(-)0.0034/ft^2	-	15	$7,021.00	10%	
69	Pre-Rinse Spray Nozzle (1.24 GPM) (Full Service)	standard pre-rinse spray nozzle (3.0 GPM)	base	886	-	170,326	5	$60	12.4%	
70	Pre-Rinse Spray Nozzle (1.24 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	190	-	36,484	5	$60	12.4%	
71	Pre-Rinse Spray Nozzle (1.24 GPM) (Other)	standard pre-rinse spray nozzle (3.0 GPM)	base	200	-	38,383	5	$60	12.4%	
72	Pre-Rinse Spray Nozzle (0.64 GPM) (Full Service)	standard pre-rinse spray nozzle (3.0 GPM)	base	1,286	-	252,000	5	$88	0%	
73	Pre-Rinse Spray Nozzle (0.64 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	339	-	66,400	5	$88	0%	
74	Pre-Rinse Spray Nozzle 0.64 GPM) (Other)	standard pre-rinse spray nozzle (3.0 GPM)	base	318	-	62,200	5	$88	0%	
	COMMERCIAL EXISTING BUILDINGS									
75	Condensing Unit Heater	% Sales Weighted Average model - Equivalent in efficiency to a power-vented or separated combustion unit heater (78% Annually Efficient)		.00631 m3 / (BTU/H)	(.00186) kWh / (BTU/H)	0	18	$.0129 / (BTU/H)	0%	New Measure
76	Energy Star Dishwasher - Undercounter - High Temperature	Non- Energy Star Dishwasher		801	3,754	112,795	10	($13.00)	40%	New Measure

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

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indicates update based on change in program as filed in 2010 Update

Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions						Reference
				Natural Gas	Electricity	Water	Equipment Life	Incremental Cost	Free Ridership	
				m3	kWh	L	Years	$	%	
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
77	Energy Star Dishwasher - Undercounter - Low Temperature	Non- Energy Star Dishwasher		326	559	45,891	10	($13.00)	40%	New Measure
78	Energy Star Dishwasher - Stationary Rack (Door type or single rack) - High Temperature	Non- Energy Star Dishwasher		619	3,553	87,119	15	($350.00)	20%	New Measure
79	Energy Star Dishwasher - Stationary Rack (Door type or single rack) - Low Temperature	Non- Energy Star Dishwasher		841	855	118,369	15	($350.00)	20%	New Measure
80	Energy Star Dishwasher - Rack conveyor, single (tank) - High Temperature	Non- Energy Star Dishwasher		2,203	9,811	310,271	20	$2,375.00	27%	New Measure
81	Energy Star Dishwasher - Rack conveyor, multi (tank) - High Temperature	Non- Energy Star Dishwasher		3,708	15,822	522,192	20	$288.00	27%	New Measure
82	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Washer extractor - 60 lbs	base	.0328 m3 / (lbs/yr)	.00219 kWh / (lbs/yr)	2.01 L / (lbs/yr)	15	$10,970.00	8%	New Measure
83	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Washer extractor - 500 lbs	base	.0328 m3 / (lbs/yr)	.00219 kWh / (lbs/yr)	2.01 L / (lbs/yr)	15	$30,270.00	8%	New Measure
84	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Tunnel Washer - 120 lbs	base	.0240 m3 / (lbs/yr)	.00152 kWh / (lbs/yr)	1.22 L / (lbs/yr)	15	$49,667.00	8%	New Measure
85	Ozone Laundry - Commercial Laundry Washing Equipment with Ozone	Commercial Laundry Washing Equipment without Ozone - Tunnel Washer - 500 lbs	base	.0240 m3 / (lbs/yr)	.00152 kWh / (lbs/yr)	1.22 L / (lbs/yr)	15	$160,065.00	8%	New Measure
86	Pre-Rinse Spray Nozzle (0.64 GPM) (Full Service)	standard pre-rinse spray nozzle (1.6 GPM)	base	457	-	97,292	5	$150	0%	New Measure
87	Pre-Rinse Spray Nozzle (0.64 GPM) (Limited)	standard pre-rinse spray nozzle (1.6 GPM)	base	90	-	19,197	5	$150	0%	New Measure
88	Pre-Rinse Spray Nozzle 0.64 GPM) (Other)	standard pre-rinse spray nozzle (1.6 GPM)	base	109	-	23,166	5	$150	0%	New Measure
89	Condensing Gas Water Heater 100 gals 95% thermal efficiency	Storage Tank Water Heater 80% eff, 91 Gal tank	base	332	-	-	13	$2,230.00	5%	
90	Condensing Gas Water Heater 500 gals 95% thermal efficiency	Storage Tank Water Heater 80% eff, 91 Gal tank	base	873			13	$2,230.00	5%	

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

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Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas (m3)	Electricity (kWh)	Water (L)	Equipment Life (Years)	Incremental Cost ($)	Free Ridership (%)	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
91	Condensing Gas Water Heater 1000 gals 95% thermal efficiency	Storage Tank Water Heater 80% eff, 91 Gal tank	base	1,551			13	$2,230.00	5%	
92	Faucet Aerator (kitchen, installed, 1.5 GPM)	Average existing stock	base	16	-	5,377	10	$2	10%	
93	Faucet Aerator (kitchen, installed, 1.0 GPM)	Average existing stock	base	24	-	8,072	10	$2	10%	
94	Faucet Aerator (bathroom, installed, 1.5 GPM)	Average existing stock	base	4	-	1,382	10	$2	10%	
95	Faucet Aerator (bathroom, installed, 1.0 GPM)	Average existing stock	base	7	-	2,371	10	$1.50	10%	
96	High Efficiency Condensing Furnace (AFUE 96)	High Efficiency Furnace (AFUE 90)		1.7/kBtu/hr			18	8.4/kBtu/hr	17.5%	
97	Low-Flow Showerhead (Per unit, distributed, 1.5 GPM)	Average existing stock	base	33	-	5,228	10	$4	10%	
98	Low-Flow Showerhead (Per unit, distributed, 1.25 GPM)	Average existing stock	base	45	-	8,824	10	$4	10%	
99	Low-Flow Showerhead (Per household, Installed, 1.25 GPM)	2.0 -2.5 GPM showerhead (2.25 GPM)	base	48	-	9,088	10	$17	10%	
100	Low-Flow Showerhead (Per household, Installed, 1.25 GPM)	2.6 + GPM showerhead and above (3.0GPM)	base	84	-	14,333	10	$12.50	10%	Change in incremental cost due to program delivery change.
101	Low-Flow Showerhead (Per household, Installed, 1.5 GPM)	2.0 -2.5 GPM showerhead (2.25 GPM)	base	28	-	5,197	10	$17	10%	
102	Low-Flow Showerhead (Per household, Installed, 1.5 GPM)	2.6 -3.0 GPM GPM showerhead (2.75 GPM)	base	55	-	9,490	10	$17	10%	
103	Low-Flow Showerhead (Per household, Installed, 1.5 GPM)	3.1 - 3.5 GPM showerhead (3.25 GPM)	base	79	-	13,250	10	$17	10%	
104	Low-Flow Showerhead (Per household, Installed, 1.5 GPM)	3.6 GPM and above (3.6 GPM)	base	91	-	15,114	10	$12.50	10%	Change in incremental cost due to program delivery change.
105	Low-Flow Showerhead (Per household, Installed, 2.0 GPM)	2.6 -3.0 GPM GPM showerhead (2.75 GPM)	base	4	-	1,727	10	$17	10%	
106	Low-Flow Showerhead (Per household, Installed, 2.0 GPM)	3.1 o 3.5 GPM (3.25 GPM)	base	28	-	5,487	10	$17	10%	
107	Low-Flow Showerhead (Per household, Installed, 2.0 GPM)	3.6 GPM and above (3.6 GPM)	base	40	-	7,351	10	$12.50	10%	Change in incremental cost due to program delivery change.
108	Pre-Rinse Spray Nozzle (1.24 GPM) (Full Service)	standard pre-rinse spray nozzle (3.0 GPM)	base	886	-	170,326	5	$60	12.4%	
109	Pre-Rinse Spray Nozzle (1.24 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	190	-	36,484	5	$60	12.2%	
110	Pre-Rinse Spray Nozzle (1.24 GPM) (Other)	standard pre-rinse spray nozzle (3.0 GPM)	base	200	-	38,383	5	$60	12.4%	

Enbridge Gas Distribution

DSM Input Assumptions for 2011 Program Year

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Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas (m3)	Electricity (kWh)	Water (L)	Equipment Life (Years)	Incremental Cost ($)	Free Ridership (%)	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
111	Pre-Rinse Spray Nozzle (0.64 GPM) (Full Service)	standard pre-rinse spray nozzle (3.0 GPM)	base	1,286	-	252,000	5	$88	0%	
112	Pre-Rinse Spray Nozzle (0.64 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	339	-	66,400	5	$88	0%	
113	Pre-Rinse Spray Nozzle (0.64 GPM) (Other)	standard pre-rinse spray nozzle (3.0 GPM)	base	318	-	62,200	5	$88	0%	
114	Programmable Thermostats (Warehouse, Recreation, Agriculture, Industrial)	Standard thermostat	weather	538	266	-	15	$110	20%	
115	Programmable Thermostats (Multi family, food service)	Standard thermostat	weather	223	156	-	15	$110	20%	
116	Programmable Thermostats (Office, Information & Culture, Educational services)	Standard thermostat	weather	211	112		15	$110	20%	
117	Programmable Thermostats (Retail, hotel/motel)	Standard thermostat	weather	82	63		15	$110	20%	
118	Rooftop Unit	Standard Rooftop Unit	weather	255	-	-	15	$375.00	5%	
119	Tankless Water Heater 100 USG/day	84% Thermal Efficiency	base	154	-	-	18	-$1,102.00	2%	
120	Enhanced Furnace (continuous)	Standard PSC motor	weather	-2.7 kBtu/hr	22.7kBtu/hr	-	15	$960.00	10%	
121	Enhanced Furnace (Non-continuous)	Standard PSC motor	weather	-0.4 kBtu/hr	4.8kBtu/hr		15	$960.00	10%	
122	Heat Recovery Ventilator (HRV)-savings vary by sector	Ventilation without HRV	weather	1.75-4.90 / CFM	-	-	20	$3.40/CFM	5%	
123	Energy Recovery Ventilators (ERV)-savings vary by sector	Ventilation without ERV	weather	1.84-5.14 m3/CFM	-	-	20	$3.00/CFM	5%	
124	Condensing Boilers	Non-condensing Boiler (76% estimated seasonal efficiency)	base	0.0104 m3/BTUH	-	-	25	$12.00/$10^3$ BTUH	5%	
125	Infrared Heaters (0 - 75,000 BTUH)	Unit Heater	weather	0.015 m3/BTUH	245	-	20	$0.0122/$10^3$ BTUH/hr	33%	
126	Infrared Heaters (76,000 - 150,000 BTUH)	Unit Heater	weather	0.015 m3/BTUH	559	-	20	$0.0122/$10^3$ BTUH/hr	33%	
127	Infrared Heaters (151,000 - 300,000 BTUH)	Unit Heater	weather	0.015 m3/BTUH	870	-	20	$0.0122/$10^3$ BTUH/hr	33%	
128	Demand Control Kitchen Ventilation (0 - 49,999 CFM)	Ventilation without DCKV	weather	4,801	13,521	-	15	$10,000.00	5%	
129	Demand Control Kitchen Ventilation (5000 - 9999 CFM)	Ventilation without DCKV	weather	11,486	30,901	-	15	$15,000.00	5%	
130	Demand Control Kitchen Ventilation (10000 - 15000 CFM)	Ventilation without DCKV	weather	18,924	49,102	-	15	$20,000.00	5%	

Enbridge Gas Distribution

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Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas (m3)	Electricity (kWh)	Water (L)	Equipment Life (Years)	Incremental Cost ($)	Free Ridership (%)	Reference
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
131	Air Curtains (Single Door)		weather	667	172	-	15	$1,650.00	5%	
132	Air Curtains (Double Door)		weather	1,529	1,023	-	15	$2,500.00	5%	
133	Destratification Fans	No destratification fans	weather	0.56 / ft^2	(-)0.0034 / ft^2	-	15	$7,021.00	10%	
134	CEE Qualified Energy Efficient Washers	Conventional top loading washers.	base	117	396	58,121	11	$600.00	10%	
135	Prescriptive School Boilers (Elementary)	Space Heating, Hydronic Boiler with Comb. Eff. Of 80%-82%.	base	10,830	-	-	25	$8,646.00	12%	
136	Prescriptive School Boilers (Secondary)	Space Heating, Hydronic Boiler with Comb. Eff. Of 80%-82%.	base	43,859	-	-	25	$14,470.00	12%	
137	Energy Efficient Fryers	Standard fryer	base	913	0	-	12	$2,648.00		
138	High Efficiency Boilers (DHW) Small Commercial, Large Commercial and Multi-residential	higher efficiency boilers 300-1500 MBH 83-84% efficient	base	1,075-4,317	-	-	25	$3900 -$5900	10/12/20%	
139	High Efficiency Boilers (DHW) Small Commercial, Large Commercial and Multi-residential	higher efficiency boilers 600 MBH 85-88% efficient	base	1,766-7,095	-	-	25	$4500-$7400	10/12/20%	
140	High Efficiency Boilers (Space) Small Commercial, Large Commercial and Multi-residential	higher efficiency boilers 1000 MBH 83-84% efficient	base	2,105-16,452	-	-	25	$3900-$4950	10/12/20%	
141	High Efficiency Boilers (Space) Small Commercial, Large Commercial and Multi-residential	higher efficiency boilers 1500 MBH 85-88% efficient	base	3,125-24,431	-	-	25	$4500-$7050	10/12/20%	
	COMMERCIAL/INDUSTRIAL CUSTOM PROJECTS									
142	Custom Projects			Actual	Actual	Actual	Actual	Actual		
	Agriculture								40%	
	Industrial								50%	
	Commercial								12%	
	Multi-Residential								20%	
	New construction								26%	
	OTHER MEASURES									
143	CFL (13W)	60W Incandescent	n/a	0	45	0	8	$0.00	24%	
144	CFL (23W)	75W Incandescent	n/a	0	49.7	0	8	$0.00	24%	

Substantiation Sheets for 2011 Plan

Witnesses: A. Mandyam
P. Squires

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Witnesses: A. Mandyam
P. Squires

RESIDENTIAL NEW CONSTRUCTION

Witnesses: A. Mandyam
P. Squires

1.0 GAL/MIN FAUCET AERATOR (Kitchen)

Residential New Construction

Efficient Technology & Equipment Description
Faucet Aerator (Kitchen) (1.0 GPM)
Base Technology & Equipment Description
Ontario Building Code 2006 (2.2 GPM)

Resource Savings Assumptions

Natural Gas	32 m^3
Savings based on Navigant's[1], except using 2.2 USGPM base case (opposed to 2.5) and 1.0 GPM efficient technology case	
Electricity	n/a kWh
Water	10,631 L
Savings based on Navigant's[1], except using 2.2 USGPM base case (opposed to 2.5) and 1.0 GPM efficient technology case	

Other Input Assumptions

Equipment Life	10 years
Faucet aerators have an estimated service life of 10 years.[2] As approved in EB 2008-0384 & 0385.	
Incremental Cost	$1.00
As per utility program costs, bulk purchase of aerators.	
Free Ridership	31 %
Free Ridership rate recommended by Summit Blue Consulting.[3] As approved in EB 2008-0384 & 0385.	

[1] Final Report "Measures and Assumptions for Demand Side Management (DSM) Planning", Navigant Consulting Inc., Ontario Energy Board, Appendix C: Substantiation Sheets, pg. C60-63, April 16, 2009.

[2] U.S. DOE – FEMP, Energy Cost Calculator for Faucets and Showerheads, http://www.eere.energy.gov/femp

[3] "Residential Measure Free Ridership And Inside Spillover Study - Final Report", Summit Blue Consulting, June 2008.

1.0 GAL/MIN FAUCET AERATOR (Bathroom)

Residential New Construction

Efficient Technology & Equipment Description
Faucet Aerator (Bathroom) (1.0 GPM)
Base Technology & Equipment Description
Average existing stock & Ontario Building Code 2006 maximum allowed (2.2 GPM)

Resource Savings Assumptions

Natural Gas (Updated)	10	m^3
Savings recommended by Navigant Consulting. [1] adjusted for 1.0 GPM		
Electricity	n/a	kWh
Water (Updated)	3,435	L
Savings recommended by Navigant Consulting[1] adjusted for 1.0 GPM		

Other Input Assumptions

Equipment Life	10	Years
Faucet aerators have an estimated service life of 10 years.[1, 2] As approved in EB 2008-0384 & 0385.		
Incremental Cost	$0.55	
As per utility program costs, bulk purchase of aerators.		
Free Ridership	31	%
Free Ridership rate recommended by Summit Blue Consulting.[3] As approved in EB 2008-0384 & 0385.		

[1] Final Report "Measures and Assumptions for Demand Side Management (DSM) Planning", Navigant Consulting Inc., Ontario Energy Board, April 16, 2009

[2] U.S. DOE – FEMP, Energy Cost Calculator for Faucets and Showerheads, http://www.eere.energy.gov/femp

[3] "Residential Measure Free Ridership And Inside Spillover Study - Final Report", Summit Blue Consulting, June 2008.

1.5 GAL/MIN FAUCET AERATOR (KITCHEN)

Residential New Construction – ESK kit

Efficient Technology & Equipment Description
Faucet Aerator (Kitchen) (1.5 GPM)
Base Technology & Equipment Description
Average existing stock (2.5 GPM)

Resource Savings Assumptions

Natural Gas	**23 m^3**
EB 2009-0154	
Electricity	**n/a kWh**
Water	**7,797 L**
EB 2009-0154	

Other Input Assumptions

Equipment Life	**10 Years**
EB 2009-0154	
Incremental Cost (Installed)	**$1.65**
Bulk purchase of kitchen aerators for new construction ESK + Packaging	
Free Ridership	**31 %**
EB 2009-0154	

1.5 GAL/MIN FAUCET AERATOR (BATHROOM)

Residential New Construction – ESK kit

Efficient Technology & Equipment Description
Faucet Aerator (Bathroom) (1.5 GPM)
Base Technology & Equipment Description
Average existing stock (2.2 GPM)

Resource Savings Assumptions

Natural Gas	**18**	**m^3**
6 m3 x 3 aerators being installed as approved in EB 2009-0154.		
Electricity	**n/a**	**kWh**
Water	**6012**	**L**
2004 L x 3 aerators being installed as approved in EB 2009-0154.		

Other Input Assumptions

Equipment Life	**10**	**Years**
EB 2009-0154		
Incremental Cost (Installed)	**$2.72**	
Bulk purchase for bathroom aerators for new construction ESK + Packaging x 3 aerators being installed.		
Free Ridership	**31**	**%**
EB 2009-0154		

1.5 GAL/MIN LOW-FLOW SHOWERHEAD

Residential New Construction – ESK kit

Efficient Technology & Equipment Description
Low-flow showerhead (1.5 gal/min)
Base Technology & Equipment Description
Average existing builder stock as per Enbridge survey (2.2 GPM)

Resource Savings Assumptions

Natural Gas	**46 m^3**
EB 2009-0154	
Electricity	**n/a kWh**
Water	**6,334 L**
EB 2009-0154	

Other Input Assumptions

Equipment Life	**10 Years**
EB 2009-0154	
Incremental Cost (Installed)	**$12.50**
Bulk purchase of showerheads for new construction ESK + Packaging.	
Free Ridership	**10 %**
EB 2009-0154	

1.25 GAL/MIN LOW-FLOW SHOWERHEAD

Residential New Construction – ESK kit

Efficient Technology & Equipment Description
Low-flow showerhead (1.25 gal/min)
Base Technology & Equipment Description
Average existing builders stock as per Enbridge builder survey. (2.25 gpm)

Resource Savings Assumptions

Natural Gas	**66**	**m^3**
EB 2009-0154		
Electricity	**n/a**	**kWh**
Water	**10,886**	**L**
EB 2009-0154		

Other Input Assumptions

Equipment Life	**10**	**Years**
EB 2009-0154		
Incremental Cost (Installed)	**$4.26**	
Bulk purchase of showerhead for new construction ESK + Packaging.		
Free Ridership	**10**	**%**
EB 2009-0154.		

CFL (13W)

Residential New Construction – ESK kit

Efficient Technology & Equipment Description
CFL screw-in 13W
Base Technology & Equipment Description
60W Incandescent

Resource Savings Assumptions

Natural Gas (Updated)	**0 m^3**
Electricity	**360 kWh**
EB 2009-0154 = 45 kwh 8 x 45 = 360	
Water (Updated)	**0 L**

Other Input Assumptions

Equipment Life	**8 years**
EB 2009-0154	
Incremental Cost Contractor/Customer Install	**0.00 $**
EB 2009-0154	
Free Ridership	**24 %**
A pre-qualifying survey will be used to screen out builders who currently install CFL's as part of their standard package. After discussion with the Evaluation Audit Committee (EAC) it was agreed to set an assigned free ridership of 24% in recognition of those new home buyers who would install CFL's if the builder had not done so.	

HIGH EFFICIENCY FIREPLACE WITH PILOTLESS IGNITION

Residential – New Homes

Efficient Technology & Equipment Description	
A new high efficiency fireplace with intermittent (pilotless) ignition	
Type	EnerGuide Rating *(Minimum)*
Freestanding fireplace	70%
Insert	60%
Zero Clearance >= 40 kBtu/h	60%
Zero Clearance < 40 kBtu/h	70%
Base Technology & Equipment Description	
A typical natural gas fireplace based on the median fireplace model	
Type	Median Efficiency
Freestanding fireplace	65%
Insert	55%
Zero Clearance >= 40 kBtu/h	55%
Zero Clearance < 40 kBtu/h	65%

Resource Savings Assumptions

Natural Gas	**See Below**
Type	**Gas Savings (m3/yr)**
Freestanding fireplace	**110**
Insert	**109**
Zero Clearance >= 40 kBtu/h[1]	**122**
Zero Clearance < 40 kBtu/h[2]	**108**

The savings above is based on

1. A 5-percentage point efficiency increase above the median model efficiency according to the EnerGuide Rating
2. Pilotless (intermittent) ignition (i.e. gas saved from the standing pilot burner)

The table below shows gas use from the main burner (not including the standing pilot) and the EnerGuide ratings mentioned above.

Type	Input (BTU/H)[3]	Oper. Hours[4]	Base (m3/yr)	Heat Load (BTU/yr)	Upgrade (m3/yr)	Savings (m3/yr)
Freestanding	32,000	178	161	3,702,400	150	12
Insert	25,000	178	126	2,447,500	116	11

[1] Calculated at 55 kBtu/h

[2] Calculated at 25 kBtu/h

[3] Median fireplace input capacity, from LeapFrog Consulting, Market Assessment for Potential Natural Gas Fireplace DSM Initiatives by Union Gas in Ontario, Union Gas Fireplace Consolodated Presentation 071221.ppt slide 24

[4] 178 hrs/yr = 8.9 hrs/week for 20 weeks (~5 months) of use, according to Leapfrog Energy Technologies' conversations with retailers and fireplace owners and weighted average use behavior per week from NRCAN 2003 Survey of Household Energy Use results(as per slide 19 of Leapfrog's presentation, Market Assessment for Potential Natural Gas Fireplace DSM Initiatives by Union Gas in Ontario, 2007

Zero Clearance	55,000	178	277	5,384,500	254	23
Zero Clearance	25,000	178	126	2,892,500	117	9

The EnerGuide rating uses the CSA P.4.1-02 Efficiency Standard, which is supposed to include the pilot light. However the average efficiency point improvement between an intermittent ignition and a standing pilot light ignition according to this rating is only about 2 percentage points. This was based on looking at the average difference between Vermont Casting fireplace models with & without intermittent ignition.[5] The efficiency values include only a small portion of the gas consumption from the pilot (5.5 m3/yr). This portion is subtracted off in the gas savings calculation so as to not double count the intermittent ignition savings.

The intermittent ignition gas savings value is based on the gas normally consumed by a pilot flame during the winter and the non-heating season discounted by the fraction of households who shut off their gas pilot in the non-heating season according to the NRCAN SHEU study[6]. The pilot flame is estimated to consume 700 Btu/hr (which is at the lower end of the published values).[7],[8] The table below[9] shows approximately how much gas is consumed by a pilot flame in the heating and non-heating seasons.

Operation Mode	Btu/hr	~m3/hr	Annual hours	m3 Gas Per Year
Pilot Light- Heating Season	700	0.02	4,932[10]	96.6
Pilot Light - Non-Heating Season	700	0.02	3,650[11]	71.5

The table below shows the effects on the gas savings estimates from fireplace owners who shut off their pilot lights during the non-heating season.

[5] from slide 17, LeapFrog Consulting, Union Gas Fireplace Consolodated Presentation 071221.ppt
[6] Table 3.4 "NRCan - 2003 Survey of Household Energy Use" – 38% of households in Ontario do not extinguish pilot lights in non-heating season
[7] Leapfrog Energy Technologies, Market Assessment for Potential Natural Gas Fireplace DSM Initiatives, 2007, Union Gas Fireplace Consolodated Presentation 071221.ppt, slide 18.
[8] "A pilot light…can consume from 600 to 1500 Btu of gas per hour and, if left to run continuously, can significantly increase your annual energy costs." – "All About Gas Fireplaces", Office of Energy Efficiency, Natural Resources Canada – March 2004
[9] From Fireplace Backup Calculations for Pete 071221.xls
[10] The heating season was estimated to last for 7 months. This value is also used in the CSA Fireplace Efficiency standard. The time that the pilot light runs during the heating season is 7 months/12 months X 365 days X 24 hours MINUS the number of hours when the fireplace is actually running.
[11] The non-heating hours per year are equivalent to 8760 minus the time that the fireplace is running and minus the time when the pilot flame is running during the heating season.
[12] Table 3.4 "NRCan - 2003 Survey of Household Energy Use" – 38% of households in Ontario do not extinguish pilot lights in non-heating season.
[13] Agreed upon at UG-EAC meeting April 15, 2010.
[14] 5.5 m3/yr = 1.98% * 280 m3/yr. "The average efficiency point improvement between an intermittent ignition and a standing pilot light ignition is approximately 2 percentage points." This was based on looking at the average difference between Vermont Casting fireplace models with the same fireboxes with & without intermittent ignition from slide 17, LeapFrog Consulting, *Union Gas Fireplace Consolodated Presentation 071221.ppt.* The UG fireplace NAC is 280 m3/yr, (Paul Gardiner UG forecasting, Oct 3, 2007 email to Pete Koepfgen).
[15] Calculated at 25 kBtu/h
[16] Calculated at 55 kBtu/h

	Annual m3	Percent of Fireplace Owners	Weighted Average (m3/yr)
Standing Pilot Use in Heating Season	96.6	100%	96.6
Standing Pilot Use in Non-Heating Season	71.5	38%[12]	27.2

A small portion of the wintertime pilot gas heat is assumed to contribute to space heating during the heating season; however, the actual value is unknown. A nominal value of 20% was estimated by Skip Hayden of NRCAN to be the highest likely value[13].

104 m3/yr = 27.2 m3/yr + (96.6 m3/yr * 80%)

Gas savings =
Savings from EnerGuide Rating improvement (*5 percentage points above median*)
+ (plus) intermittent (pilotless) ignition
– (minus) intermittent ignition savings already accounted for in the EnerGuide Rating[14]

Freestanding	110 m3/yr = 12 m3/yr + 104 m3/yr – 5.5 m3/yr
Insert	109 m3/yr = 11 m3/yr + 104 m3/yr – 5.5 m3/yr
Zero Clearance >= 40 kBtu/h[15]	122 m3/yr = 23 m3/yr + 104 m3/yr – 5.5 m3/yr
Zero Clearance < 40 kBtu/h[16]	109 m3/yr = 11 m3/yr + 104 m3/yr – 5.5 m3/yr

Electricity	**(-) 31 kWh/yr**

Intermittent ignition systems actually increase electricity consumption. The power supply for the electronic fireplace ignition consumes standby power anywhere from 2 Watts[17] to 5 Watts[18]. Power is drawn continuously through the year (8760 hours). The corresponding annual power consumption ranges from 17.5 to 43.8 kWh.

31 kWh/yr represents the average between 17.5 and 43.8 kWh

Water	**NA**

Other Input Assumptions

Equipment Life	**20 yrs**

Equipment life was estimated from manufacturer technical service reps.[19]

Incremental Cost	**$135**

The incremental cost for higher efficiency model fireplaces is 0 (Zero). Higher efficiency fireplaces don't cost more than lower efficiency fireplaces. Correlations were drawn and the R^2 values were around 0.3-0.4. The incremental cost for new fireplace models that include an intermittent control are $120-150[20] above models with just a pilot light. The simple average of these values was used ($135).

[17] LeapFrog Energy Technology's phone conversations with Jatin at Majestic Fireplace technical services on 30/01/08.
[18] LeapFrog Energy Technology's phone conversations with Stan at ESA Heating Products technical services 30/01/08.
[19] LeapFrog Energy Technology's phone conversations with Jatin at Majestic Fireplace technical services on 30/01/08 and to Stan at ESA Heating Products technical services 30/01/08
[20] Fireplace Retailer survey within Union Gas franchise territory by LeapFrog Energy in Oct-Nov 2007

Free Ridership	**17 %**
Free ridership based on Enbridge research with builders regarding percentage of fireplaces with intermittent ignition installed in new homes and HPBAC (Hearth, Patio, Barbeque Association of Canada) information that 2009 sales of electronic spark fireplaces in Ontario is between 10-20%.	

PROGRAMMABLE THERMOSTAT

Residential New Construction - ESK kit

Efficient Technology & Equipment Description
Programmable thermostat
Base Technology & Equipment Description
Standard thermostat

Resource Savings Assumptions

Natural Gas	**53 m^3**
EB 2009-0154	
Electricity	**54 kWh**
EB 2009-0154	
Water	**n/a L**

Other Input Assumptions

Equipment Life	**15 Years**
EB 2009-0154	
Incremental Cost	**$53.22**
Bulk purchase of programmable thermostats for new construction ESK + Packaging etc.	
Free Ridership	**10 %**
Pre-screening will be conducted to ensure builders who install a programmable thermostat as standard are not targeted. Measure will not be delivered to Energy Star Labeled Homes. A builder survey will be conducted immediately prior to launch of the program in order to capture the majority of builders in the franchise area.	

RESIDENTIAL EXISTING HOMES

Witnesses: A. Mandyam
P. Squires

Program: Solar Pool Heater

***Sector**: Residential Existing Homes*

Efficient Technology & Equipment Description
Solar Panels for pool heating
Qualifier/Restriction
Old gas pool heaters must be removed to qualify
Base Technology & Equipment Description
Natural Gas Heater

Resource Savings Assumptions

Natural Gas (Updated)	**1116**	**m^3**
Based on Enbridge Territory Load Research results: 2007 – 14 directly metered natural gas pools = 1330 m3 2008 – 6 directly metered natural gas pools = 901m3 Average natural gas savings from a customer choosing a solar pool heater alternative = 1116 m3 (100% of natural gas pool heater use)		
Electricity	**-57**	**kWh**
2009 Board Approved assumption filed by Navigant April 16, 2009 page c 83		
Water		**L**

Other Input Assumptions

Equipment Life	**20**	**Years**
2009 Board Approved assumption filed by Navigant April 16, 2009 page c 81-84		
Incremental Cost (Contractor Installed)	**1450**	**$**
2009 Board Approved assumption filed by Navigant April 16, 2009 page c 83		
Free Ridership	**10**	**%**
NRCAN, Renewable Energy, Residential Solar Pool Heating Systems; A Buyer Guide page 3, 6		

HIGH EFFICIENCY FIREPLACE WITH PILOTLESS IGNITION

Residential –Existing Homes

Efficient Technology & Equipment Description	
A new high efficiency fireplace with intermittent (pilotless) ignition	
Type	EnerGuide Rating *(Minimum)*
Freestanding fireplace	70%
Insert	60%
Zero Clearance >= 40 kBtu/h	60%
Zero Clearance < 40 kBtu/h	70%
Base Technology & Equipment Description	
A typical natural gas fireplace based on the median fireplace model	
Type	Median Efficiency
Freestanding fireplace	65%
Insert	55%
Zero Clearance >= 40 kBtu/h	55%
Zero Clearance < 40 kBtu/h	65%

Resource Savings Assumptions

Natural Gas	**See Below**
Type	**Gas Savings (m3/yr)**
Freestanding fireplace	**110**
Insert	**109**
Zero Clearance >= 40 kBtu/h[21]	**122**
Zero Clearance < 40 kBtu/h[22]	**108**

The savings above is based on

3. A 5-percentage point efficiency increase above the median model efficiency according to the EnerGuide Rating
4. Pilotless (intermittent) ignition (i.e. gas saved from the standing pilot burner)

The table below shows gas use from the main burner (not including the standing pilot) and the EnerGuide ratings mentioned above.

Type	Input (BTU/H)[23]	Oper. Hours[24]	Base (m3/yr)	Heat Load (BTU/yr)	Upgrade (m3/yr)	Savings (m3/yr)
Freestanding	32,000	178	161	3,702,400	150	12
Insert	25,000	178	126	2,447,500	116	11
Zero Clearance	55,000	178	277	5,384,500	254	23
Zero Clearance	25,000	178	126	2,892,500	117	9

The EnerGuide rating uses the CSA P.4.1-02 Efficiency Standard, which is supposed to include the pilot light. However the average efficiency point improvement between an intermittent ignition and a standing pilot light ignition according to this rating is only about 2 percentage points. This was based on looking at the average difference between Vermont Casting fireplace models with & without intermittent ignition.[25] The efficiency values include only a small portion of the gas consumption from the pilot (5.5 m3/yr). This portion is subtracted off in the gas savings calculation so as to not double count the intermittent ignition savings.

The intermittent ignition gas savings value is based on the gas normally consumed by a pilot flame during the winter

and the non-heating season discounted by the fraction of households who shut off their gas pilot in the non-heating season according to the NRCAN SHEU study[26]. The pilot flame is estimated to consume 700 Btu/hr (which is at the lower end of the published values).[27],[28] The table below[29] shows approximately how much gas is consumed by a pilot flame in the heating and non-heating seasons.

Operation Mode	Btu/hr	~m3/hr	Annual hours	m3 Gas Per Year
Pilot Light- Heating Season	700	0.02	4,932[30]	96.6
Pilot Light - Non-Heating Season	700	0.02	3,650[31]	71.5

The table below shows the effects on the gas savings estimates from fireplace owners who shut off their pilot lights

	Annual m3	Percent of Fireplace Owners	Weighted Average (m3/yr)
Standing Pilot Use in Heating Season	96.6	100%	96.6
Standing Pilot Use in Non-Heating Season	71.5	38%[32]	27.2

during the non-heating season.

A small portion of the wintertime pilot gas heat is assumed to contribute to space heating during the heating season; however, the actual value is unknown. A nominal value of 20% was estimated by Skip Hayden of NRCAN to be the highest likely value[33].

104 m3/yr = 27.2 m3/yr + (96.6 m3/yr * 80%)

Gas savings =
Savings from EnerGuide Rating improvement (*5 percentage points above median*)
+ (plus) intermittent (pilotless) ignition
– (minus) intermittent ignition savings already accounted for in the EnerGuide Rating[34]

Freestanding	110 m3/yr = 12 m3/yr + 104 m3/yr – 5.5 m3/yr
Insert	109 m3/yr = 11 m3/yr + 104 m3/yr – 5.5 m3/yr
Zero Clearance >= 40 kBtu/h[35]	122 m3/yr = 23 m3/yr + 104 m3/yr – 5.5 m3/yr
Zero Clearance < 40 kBtu/h[36]	109 m3/yr = 11 m3/yr + 104 m3/yr – 5.5 m3/yr

Electricity	**(-) 31 kWh/yr**

Intermittent ignition systems actually increase electricity consumption. The power supply for the electronic fireplace ignition consumes standby power anywhere from 2 Watts[37] to 5 Watts[38]. Power is drawn continuously through the year (8760 hours). The corresponding annual power consumption ranges from 17.5 to 43.8 kWh.

31 kWh/yr represents the average between 17.5 and 43.8 kWh

Water	**NA**

Other Input Assumptions

Equipment Life	**20 yrs**
Equipment life was estimated from manufacturer technical service reps.[39]	
Incremental Cost	**$135**
The incremental cost for higher efficiency model fireplaces is 0 (Zero). Higher efficiency fireplaces don't cost more than lower efficiency fireplaces. Correlations were drawn and the R^2 values were around 0.3-0.4. The incremental cost for new fireplace models that include an intermittent control are $120-150[40] above models with just a pilot light. The simple average of these values was used ($135).	
Free Ridership	**17 %**
Free ridership based on Enbridge research with builders regarding percentage of fireplaces with intermittent ignition installed in new homes and HPBAC (Hearth, Patio, Barbeque Association of Canada) information that 2009 sales of electronic spark fireplaces in Ontario is between 10-20%.	

[21] Calculated at 55 kBtu/h
[22] Calculated at 25 kBtu/h
[23] Median fireplace input capacity, from LeapFrog Consulting, Market Assessment for Potential Natural Gas Fireplace DSM Initiatives by Union Gas in Ontario, Union Gas Fireplace Consolodated Presentation 071221.ppt slide 24
[24]178 hrs/yr = 8.9 hrs/week for 20 weeks (~5 months) of use, according to Leapfrog Energy Technologies' conversations with retailers and fireplace owners and weighted average use behavior per week from NRCAN 2003 Survey of Household Energy Use results(as per slide 19 of Leapfrog's presentation, Market Assessment for Potential Natural Gas Fireplace DSM Initiatives by Union Gas in Ontario, 2007
[25] from slide 17, LeapFrog Consulting, Union Gas Fireplace Consolodated Presentation 071221.ppt
[26] Table 3.4 "NRCan - 2003 Survey of Household Energy Use" – 38% of households in Ontario do not extinguish pilot lights in non-heating season
[27] Leapfrog Energy Technologies, Market Assessment for Potential Natural Gas Fireplace DSM Initiatives, 2007, Union Gas Fireplace Consolodated Presentation 071221.ppt, slide 18.
[28] "A pilot light…can consume from 600 to 1500 Btu of gas per hour and, if left to run continuously, can significantly increase your annual energy costs." – "All About Gas Fireplaces", Office of Energy Efficiency, Natural Resources Canada – March 2004
[29] From Fireplace Backup Calculations for Pete 071221.xls
[30] The heating season was estimated to last for 7 months. This value is also used in the CSA Fireplace Efficiency standard. The time that the pilot light runs during the heating season is 7 months/12 months X 365 days X 24 hours MINUS the number of hours when the fireplace is actually running.
[31]The non-heating hours per year are equivalent to 8760 minus the time that the fireplace is running and minus the time when the pilot flame is running during the heating season.
[32]Table 3.4 "NRCan - 2003 Survey of Household Energy Use" – 38% of households in Ontario do not extinguish pilot lights in non-heating season.
[33] Agreed upon at UG-EAC meeting April 15, 2010.
[34]5.5 m3/yr = 1.98% * 280 m3/yr. "The average efficiency point improvement between an intermittent ignition and a standing pilot light ignition is approximately 2 percentage points." This was based on looking at the average difference between Vermont Casting fireplace models with the same fireboxes with & without intermittent ignition from slide 17, LeapFrog Consulting, *Union Gas Fireplace Consolodated Presentation 071221.ppt.* The UG fireplace NAC is 280 m3/yr, (Paul Gardiner UG forecasting, Oct 3, 2007 email to Pete Koepfgen).
[35] Calculated at 25 kBtu/h

[36] Calculated at 55 kBtu/h
[37] LeapFrog Energy Technology's phone conversations with Jatin at Majestic Fireplace technical services on 30/01/08.
[38] LeapFrog Energy Technology's phone conversations with Stan at ESA Heating Products technical services 30/01/08.
[39] LeapFrog Energy Technology's phone conversations with Jatin at Majestic Fireplace technical services on 30/01/08 and to Stan at ESA Heating Products technical services 30/01/08
[40] Fireplace Retailer survey within Union Gas franchise territory by LeapFrog Energy in Oct-Nov 2007

1.0 GAL/MIN FAUCET AERATOR (KITCHEN)

Residential Existing Homes

Efficient Technology & Equipment Description
Faucet Aerator (Kitchen) (1.0 GPM)
Base Technology & Equipment Description
Average existing stock – 2.5 GPM Faucet Aerator (Kitchen)

Resource Savings Assumptions

Natural Gas	**35 m^3**
Savings based on Navigant's[1], except using a 1.0 GPM efficient technology case	
Electricity	**n/a kWh**
Water	**11,694 L**
Savings based on Navigant's[1], except using a 1.0 GPM efficient technology case	

Other Input Assumptions

Equipment Life	**10 years**
Faucet aerators have an estimated service life of 10 years.[2] As approved in EB 2008-0384 & 0385.	
Incremental Cost	**$1.00**
As per utility program costs, bulk purchase of aerators.	
Free Ridership	**31 %**
Free Ridership rate recommended by Summit Blue Consulting.[3] As approved in EB 2008-0384 & 0385.	

[1] Final Report "Measures and Assumptions for Demand Side Management (DSM) Planning", Navigant Consulting Inc., Ontario Energy Board, Appendix C: Substantiation Sheets, pg. C60-63, April 16, 2009.

[2] U.S. DOE – FEMP, Energy Cost Calculator for Faucets and Showerheads, http://www.eere.energy.gov/femp

[3] "Residential Measure Free Ridership And Inside Spillover Study - Final Report", Summit Blue Consulting, June 2008.

1.0 GAL/MIN FAUCET AERATOR (BATHROOM)

Residential Existing Homes

Efficient Technology & Equipment Description
Faucet Aerator (Bathroom) (1.0 GPM)
Base Technology & Equipment Description
Average existing stock & Ontario Building Code 2006 maximum allowed (2.2 GPM)

Resource Savings Assumptions

Natural Gas (Updated)	**10 m^3**
Savings recommended by Navigant Consulting.[1] adjusted for 1.0 GPM	
Electricity	**n/a kWh**
Water (Updated)	**3,435 L**
Savings recommended by Navigant Consulting[1] adjusted for 1.0 GPM	

Other Input Assumptions

Equipment Life	**10 Years**
Faucet aerators have an estimated service life of 10 years.[1, 2] As approved in EB 2008-0384 & 0385.	
Incremental Cost	**$0.55**
As per utility program costs, bulk purchase of aerators.	
Free Ridership	**31 %**
Free Ridership rate recommended by Summit Blue Consulting.[3] As approved in EB 2008-0384 & 0385.	

[1] Final Report "Measures and Assumptions for Demand Side Management (DSM) Planning", Navigant Consulting Inc., Ontario Energy Board, April 16, 2009

[2] U.S. DOE – FEMP, Energy Cost Calculator for Faucets and Showerheads, http://www.eere.energy.gov/femp

[3] "Residential Measure Free Ridership And Inside Spillover Study - Final Report", Summit Blue Consulting, June 2008.

RESIDENTIAL LOW INCOME EXISTING HOMES

Witnesses: A. Mandyam
P. Squires

1.0 GAL/MIN FAUCET AERATOR (KITCHEN)

Low Income Residential Existing Homes

Efficient Technology & Equipment Description
Faucet Aerator (Kitchen) (1.0 GPM)
Base Technology & Equipment Description
Average existing stock – 2.5 GPM Faucet Aerator (Kitchen)

Resource Savings Assumptions

Natural Gas	**35**	**m^3**
Savings based on Navigant's[1], except using a 1.0 GPM efficient technology case		
Electricity	**n/a**	**kWh**
Water	**11,694**	**L**
Savings based on Navigant's[1], except using a 1.0 GPM efficient technology case		

Other Input Assumptions

Equipment Life	**10**	**years**
Faucet aerators have an estimated service life of 10 years.[2] As approved in EB 2008-0384 & 0385.		
Incremental Cost	**1.00**	$
As per utility program costs, bulk purchase of 1.0 aerators for new/existing market.		
Free Ridership	**1**	**%**
As approved in EB 2009-0103 for 1.5 gpm aerators		

[1] Draft Report "Measures and Assumptions for Demand Side Management (DSM) Planning", Navigant Consulting Inc., Ontario Energy Board, Appendix C: Substantiation Sheets, pg. B-65-68, Feb. 6, 2009.

[2] U.S. DOE – FEMP, Energy Cost Calculator for Faucets and Showerheads, http://www.eere.energy.gov/femp

1.0 GAL/MIN FAUCET AERATOR (BATHROOM)

Low Income Residential Existing Homes

Efficient Technology & Equipment Description
Faucet Aerator (Bathroom) (1.0 GPM)
Base Technology & Equipment Description
Average existing stock & Ontario Building Code 2006 maximum allowed (2.2 GPM)

Resource Savings Assumptions

Natural Gas (Updated)	**10**	**m^3**
Savings recommended by Navigant Consulting.[1] adjusted for 1.0 GPM		
Electricity	**n/a**	**kWh**
Water (Updated)	**3,435**	**L**
Savings recommended by Navigant Consulting[1] adjusted for 1.0 GPM		

Other Input Assumptions

Equipment Life	**10**	**Years**
Faucet aerators have an estimated service life of 10 years.[1, 2] As approved in EB 2008-0384 & 0385.		
Incremental Cost	**.55**	$
As per utility program costs, bulk purchase of 1.0 aerators for new/existing market via Union.		
Free Ridership	**1**	**%**
As approved in EB 2009-0103 for 1.5 gpm aerators.		

[1] Final Report "Measures and Assumptions for Demand Side Management (DSM) Planning", Navigant Consulting Inc., Ontario Energy Board, April 16, 2009

[2] U.S. DOE – FEMP, Energy Cost Calculator for Faucets and Showerheads, http://www.eere.energy.gov/femp

COMMERCIAL NEW/EXISTING BUILDINGS

Witnesses: A. Mandyam
P. Squires

CONDENSING UNIT HEATERS

Commercial – New/Existing

Efficient Technology & Equipment Description
Condensing Unit Heaters
Base Technology & Equipment Description
% Sales Weighted Average model, equivalent in efficiency to a power-vented or separated combustion unit heater (78% Annually Efficient)[41]. For the Existing Building case, since it's not cost-effective to replace their existing unit heater prematurely, this measure is only applicable in cases of replacing their existing equipment when it's getting too old (i.e., in cases of "natural" replacement).

Resource Savings Assumptions

Natural Gas	**0.00631 m3/(BTU/H)**

Gas savings is based on the NGTC report, but modified to use a % Annual Sales Weighted base case scenario.[42] NGTC used the BIN Method combined with ASHRAE weather data[43] to estimate the annual operating hours of two Ontario regions: South (London) and North (North Bay). An oversizing factor of 100% was applied according to design practices.[44],[45] Operating hours were based on an average of the UG Northern & Southern climates (see table below).

Annual Operating Hours (BIN Method)

Region	Design Temp.	Indoor Temp.	Operating Hours
UG South (London)	-18.8 (°C)	18.3 (°C)	1,347 (hr/year)
UG North (North Bay)	-27.9 (°C)	18.3 (°C)	1,392 (hr/year)
Average	N/A	18.3 (°C)	1,370 (hr/year)

It should be noted that NRCan indicates that a unit heater's typical duty is 2,122 hrs/yr[46]. This number is significantly higher than the one obtained using the recognized ASHRAE standard. The difference could be explained by the fact that numbers obtained by NGTC using the BIN method account for the industry practice, which is to oversize unit heaters by 100%. Since no detailed information exists about how NRCan calculated typical operating hours, and given that the BIN method is an industry-recognized standard, an average operating time of 1,370 hours per year will be used for the energy consumption calculations.

The annual savings was normalized using input capacity (BTU/H)

Electricity	**(-)0.00186 kWh/(BTU/H)**

Electrical consumption will increase with the installation of condensing unit heaters. The electrical savings is based the NGTC report results modified to use a % Annual Sales Weighted base case scenario.[47] Electrical consumption values were based on manufacturer's specifications which were aggregated and summarized below.

Electricity Consumption for Unit Heater[48]

Technology	125 – 200 kBtu/hr	225 – 300 kBtu/hr
Gravity-vented	275 kWh	280 kWh
Power-vented	392 kWh	747 kWh
Separated-combustion	392 kWh	747 kWh
Condensing	657 kWh	1,020 kWh

The annual savings was normalized using input capacity (BTU/H)

Water	**NA**

Other Input Assumptions

Equipment Life	**18 yrs**
Equipment life is based on NGTC, "DSM Opportunities Associated with Unit Heaters", April 22, 2009, pg 7	
Lifetime (years) Source	
20-25	Gas Research Institute (GRI, 1998, US)
10-15	University of Wisconsin – greenhouse application, 2006
19 (North of US)	ACEEE (GRI source, 1997, US)
25 (South of US)	ACEEE (GRI source, 1997, US)
15	Davis Energy Group, 2004 (prepared for California)
21.5	DOE (average data from GRI, 1997, US)
18	NRCan, 2007
18	Ecotope, Inc., 2003, prepared for Oregon
18	NGTC's estimate
NGTC estimated 18 years for the average lifetime of unit heaters.	
Incremental Cost	**0.0129 $/(BTU/H)**
Incremental costs were based equipment costs and installation costs found from Canadian manufacturers as well as a US website prices converted to Canadian currency.[49] The NGTC reported incremental costs were modified to use a % Sales Weighted average base case installed cost. The incremental installed cost was normalized by input capacity (BTU/H)	
Free Ridership	**0 %**
Free Ridership was estimated using % annual sales for Condensing Unit Heaters (~0.01-0.02%) in UG territory.[50]	

[41] based on NGTC, "DSM Opportunities Associated with Unit Heaters", April 22, 2009, pg 6 and TRC Test Bed - Feb 25 2010 426pm.xlsx
[42] based on NGTC, "DSM Opportunities Associated with Unit Heaters", April 22, 2009, pg 6 and TRC Test Bed - Feb 25 2010 426pm.xlsx
[43] ASHRAE. Weather Data Viewer: London and North Bay (Ontario). Version 3.0. 2005.
[44] Davis Energy Group. Analysis of Standards Options for Unit Heaters and Duct Furnaces. May 2004, 8 pages.
[45] NGTC. NGTC Review (no. 123807-02) - Unit Heaters Savings (retainer task for Union Gas). August 17, 2007, 9 pages.
[46] NRCan. Canada's Energy Efficiency Regulations: Gas-Fired Unit Heaters – April 2007. [On line]. October 2008. http://oee.nrcan.gc.ca/regulations/bulletin/gas-unit-heatersaprilr007.cfm?text=N&printview=N.
[47] based on NGTC, "DSM Opportunities Associated with Unit Heaters", April 22, 2009, pg 6 and TRC Test Bed - Feb 25 2010 426pm.xlsx
[48] based on NGTC, "DSM Opportunities Associated with Unit Heaters", April 22, 2009, pg 5
[49] based on NGTC, "DSM Opportunities Associated with Unit Heaters", April 22, 2009, pg 7-8 and TRC Test Bed - Feb 25 2010 426pm.xlsx
[50] NGTC, "DSM Opportunities Associated with Unit Heaters", April 22, 2009, pg iii

ENERGY STAR DISHWASHERS

Commercial – New/Existing

Efficient Technology & Equipment Description
Energy Star versions of (6) different types of Commercial Dishwashers: Undercounter Type – High Temperature (HT) Undercounter Type – Low Temperature (LT) Stationary Rack, (Door type, or Single rack) - HT Stationary Rack, (Door type, or Single rack) - LT Rack Conveyor, Single (Tank) – HT Rack Conveyor, Multi (Tank) - HT
Base Technology & Equipment Description
Non-Energy Star Dishwashers

Resource Savings Assumptions

Natural Gas	**See below**

Energy Savings were based on the results of NGTC study and savings calculator. NGTC racks or loads/day data for stationary Rack dishwashers was updated using UG territory data. The remaining load data came from FSTC & Energy Star. NGTC booster heater fuel type was updated to electric, due to popularity in Ontario. The idle energy rate & water use per rack values were adjusted by NGTC to represent an Energy Star dishwasher model that is not of average E-Star efficiency and not that just meets the minimum, but halfway in-between (25th percentile E-Star model, based on efficiency).

Assumptions[51]:

DW supply water temperature: 140°F (60°C)
Temperature increase for building water heating: 90°F (50°C)[52]
Natural gas water heater annual efficiency (recovery rate): 78%[53]
Electric booster water heater efficiency: 96%[54]
Wash water circulation temperature differential: 20°F (11°C)[55].
The 25th percentile E-Star models (in terms of efficiency) are sold more often than the average E-Star model.[56]

Undercounter - HT	**801 m3/yr**
Undercounter - LT	**326 m3/yr**
Stationary Rack - HT	**619 m3/yr**
Stationary Rack - LT	**841 m3/yr**
Rack Conveyor Single – HT	**2,203 m3/yr**
Rack Conveyor Multi - HT	**3,708 m3/yr**

Electricity	**See below**

Electrical savings based on idle energy, pump energy, conveyor energy (where applicable), electric booster heater energy (for HT models). The assumptions above also apply.[57]

Undercounter - HT	**3,754 kWh/yr**
Undercounter - LT	**559 kWh/yr**
Stationary Rack - HT	**3,553 kWh/yr**

Stationary Rack - LT	**855 kWh/yr**
Rack Conveyor Single – HT	**9,811 kWh/yr**
Rack Conveyor Multi - HT	**15,822 kWh/yr**

Water	**See below**

Water savings is based on Energy Star Criteria, LBNL data, manufacturer wash tank capacity data, and associated differences in water use in wash & rinse cycles.[58]

Undercounter - HT	**112,795 L/yr**
Undercounter - LT	**45,891 L/yr**
Stationary Rack - HT	**87,119 L/yr**
Stationary Rack - LT	**118,369 L/yr**
Rack Conveyor Single – HT	**310,271 L/yr**
Rack Conveyor Multi - HT	**522,192 L/yr**

Other Input Assumptions

Equipment Life	**See below**

The equipment lifetime came from FSTC (Food Service Technology Centre) who contributed to the development of the Energy Star US calculator.[59],[60] No lifetime distinction was identified relative to the sanitation method (high or low temperature) or to the efficiency (Energy Star qualified or not) of the dishwashers.

Undercounter - HT	**10 yrs**
Undercounter - LT	**10 yrs**
Stationary Rack - HT	**15 yrs**
Stationary Rack - LT	**15 yrs**
Rack Conveyor Single – HT	**20 yrs**
Rack Conveyor Multi - HT	**20 yrs**

Incremental Cost	**See below**

According to DW manufacturers and their sales representatives there is no distinguishable difference in installation costs between the base case & upgrade cases, therefore they were left out. NGTC updated their pricing to reflect the 25th percentile (in terms of efficiency) E-Star models because it was presumed to be sold more often than the average E-Star model.[61] List pricing was used because this analysis couldn't be done using the report's original pricing source because not enough information (pricing according to exact efficiency wasn't available).

List prices for Energy Star (ES) and Non-ES models were obtained from manufacturers' lists when available and from online commercial dishwasher vendors such as dishwasherworld.com, greatdishwashers.com, restaurantequipment.net, foodservicewarehouse.com and retrevo.com.

Undercounter - HT	(-) **$13**
Undercounter - LT	(-) **$13**
Stationary Rack - HT	(-) **$350**
Stationary Rack - LT	(-) **$350**
Rack Conveyor Single – HT	**$2,375**
Rack Conveyor Multi - HT	**$288**

Free Ridership	**See below**

Free Ridership is estimated using market share for Energy Star Dishwashers in UG territory.[62]

Undercounter - HT	**40%**
Undercounter - LT	**40%**
Stationary Rack - HT	**20%**
Stationary Rack - LT	**20%**
Rack Conveyor Single – HT	**27%**
Rack Conveyor Multi - HT	**27%**

[51] NGTC, DSM Opportunities Associated with Commercial Dishwashers, Final Report, April 27, 2009, Pg 13 and calculator, 100201_DSM_analysis_final - PK.xlsx.
[52] DHW DW supply – Water city average = 140°F-50°F = 90°F (60°C-10°C = 50°C).
[53] GAMA
[54] Minimum EF for a 5 gallon booster; 98% of boosters are electric (source: Steve Garvin, UG)
[55] Phone conversation with Joel Dipp from Hobart, worst case.
[56] As discussed with the EAC & UG during conversation, estimated, no data, April 2010.
[57] NGTC, DSM Opportunities Associated with Commercial Dishwashers, Final Report, April 27, 2009, Pg 13 and calculator, 100201_DSM_analysis_final - PK.xlsx.
[58] NGTC, DSM Opportunities Associated with Commercial Dishwashers, Final Report, April 27, 2009, Pg 14 and calculator, 100201_DSM_analysis_final - PK.xlsx.
[59] NGTC, DSM Opportunities Associated with Commercial Dishwashers, Final Report, April 27, 2009, Pg 17
[60] US Energy Star. Energy Star Program Requirements for Commercial Dishwashers. [On line]. September 2008. http://www.energystar.gov/ia/partners/product_specs/eligibility/comm_dishwashers_elig.pdf.
[61] As agreed upon with the EAC & UG, estimated, no data, April 9, 2010.
[62] NGTC, DSM Opportunities Associated with Commercial Dishwashers, Final Report, April 27, 2009, Pg

OZONE LAUNDRY

Commercial – New/Existing

Efficient Technology & Equipment Description
Commercial Laundry Washing Equipment with Ozone In the commercial laundry industry, ozone is generated via corona discharge or ultraviolet light. It dissolves in cold to ambient temperature water (light and medium soil laundry) and activates the detergents, improving their activity and leading to a stronger cleaning action. However, since the solubility of ozone is low and its decomposition is faster at higher temperatures (38degC, (100degF)), the use of ozone is not recommended for heavy soils, which require warmer water. Generally, heavy soil laundry is treated with traditional laundry techniques.
Qualifier/Restriction
- No residential style clothes washers - Minimum required annual laundry load for each washer using ozone is: Washer Type Minimum Laundry Load (Lbs/yr) Washer extractor – 60 lbs 100,000 lbs/yr Washer extractor – 500 lbs260,000 lbs/yr Tunnel Washer – 120 lbs 600,000 lbs/yr Tunnel Washer – 500 lbs 1,900,000 lbs/yr
Base Technology & Equipment Description
Commercial Laundry Washing Equipment without Ozone

Resource Savings Assumptions

Natural Gas	**See below**
Washer Type Gas Savings per Pounds washed per year (Lbs/yr) Washer extractor – 60 lbs **0.0328 m3/(lbs/yr)** Washer extractor – 500 lbs**0.0328 m3/(lbs/yr)** Tunnel Washer – 120 lbs **0.0240 m3/(lbs/yr)** Tunnel Washer – 500 lbs **0.0240 m3/(lbs/yr)** Operating conditions used to calculate the energy consumptions per pound of laundry evaluated using input data from the "Ozone Company" and from a linen service: "La Buanderie Centrale de Montréal". These operating conditions are typical of what may be found in high production industrial laundries[63]. Assumptions: supply water temperature of 9 degC and natural gas water heater efficiency of 78%. Note that 120 lbs is a typical tunnel washer capacity. Larger tunnel washers (up to 500 lbs) do exist but are less frequent. The savings was normalized by dividing the estimated savings by the annual laundry load (lbs/yr) of laundry found in the report.	
Electricity	**See below**
Electrical savings were based on the same conditions as described above. Washer Type Electricity savings per Pounds washed per year (Lbs/yr) Washer extractor – 60 lbs **0.00219 kWh/(lbs/yr)** Washer extractor – 500 lbs**0.00219 kWh/(lbs/yr)** Tunnel Washer – 120 lbs **0.00152 kWh/(lbs/yr)** Tunnel Washer – 500 lbs **0.00152 kWh/(lbs/yr)**	

Water	**See below**

Electrical savings were based on the same conditions as described above.

Washer Type	Water savings
Washer extractor – 60 lbs **2.01**	**L/(lbs/yr)**
Washer extractor – 500 lbs **2.01**	**L/(lbs/yr)**
Tunnel Washer – 120 lbs **1.22**	**L/(lbs/yr)**
Tunnel Washer – 500 lbs **1.22**	**L/(lbs/yr)**

Other Input Assumptions

Equipment Life	**15 yrs**

Savings attributed to the measures are expected to last the life expectancy of the equipment. This data was obtained from suppliers.[64]

Incremental Cost	**See below**

Washer Type	Incremental Costs
Washer extractor – 60 lbs	**$10,970**
Washer extractor – 500 lbs	**$30,270**
Tunnel Washer – 120 lbs	**$49,667**
Tunnel Washer – 500 lbs	**$160,065**

Capital and installation costs were obtained in US dollars from The Ozone Company and converted to Canadian dollars.[65],[66]

Free Ridership	**8 %**

Free Ridership was estimated using market penetration in UG territory, according to the results of a survey conducted by TNS Canadian Facts. Further penetration of ozone systems for laundry is presently limited by the type of washing machines used (ozone cannot be used with residential type commercial machines)[67].

[63] Riesenberg, James, "PBMP- Commercial Laundry Facilities", Koeller and Company, November 4th, 2005
[64] NGTC, DSM OZONE LAUNDRY TREATMENT Final Report_v02 (#134809) November 25, 2009, Pgs iv-vi
[65] NGTC, DSM OZONE LAUNDRY TREATMENT Final Report_v02 (#134809) November 25, 2009, Pg 6
[66] NGTC, DSM OZONE LAUNDRY TREATMENT Final Report_v02 (#134809) November 25, 2009, Pgs iv-vi
[67] NGTC, DSM OZONE LAUNDRY TREATMENT Final Report_v02 (#134809) November 25, 2009, Pgs 19

COMMERCIAL EXISTING BUILDING

Witnesses: A. Mandyam
P. Squires

Pre-Rinse Spray Nozzle (0.64 GPM)

Commercial – Existing Market

Efficient Equipment and Technologies Description
Low-flow pre-rinse spray nozzle/valve (0.64 GPM) Due to the variability in energy savings resulting from variability in daily water use, resource savings were calculated for three types of commercial enterprise using this technology[68]: Scenario **A**: Full service restaurant Scenario **B:** Limited service (fast food) restaurant Scenario **C:** Other
Base Equipment and Technologies Description
Less efficient pre-rinse spray nozzle/valve (1.6 GPM)

Decision Type	Target Market(s)	End Use
Retrofit	Commercial (existing)	Water heating

Codes, Standards, and Regulations

N/A

Resource Savings Table

Year (EUL=)	Electricity and Other Resource Savings			Equipment & O&M Costs of Conservation Measure ($)	Equipment & O&M Costs of Base Measure ($)
	Natural Gas (m^3))	Electricity (kWh)	Water (L)		
1	**A:** 457 **B:** 90 **C:** 109	0	**A:** 97,292 **B:** 19,197 **C:** 23,166	150	0
2	**A:** 457 **B:** 90 **C:** 109	0	**A:** 97,292 **B:** 19,197 **C:** 23,166	0	0
3	**A:** 457 **B:** 90 **C:** 109	0	**A:** 97,292 **B:** 19,197 **C:** 23,166	0	0
4	**A:** 457 **B:** 90 **C:** 109	0	**A:** 97,292 **B:** 19,197 **C:** 23,166	0	0
5	**A:** 457 **B:** 90 **C:** 109	0	**A:** 97,292 **B:** 19,197 **C:** 23,166	0	0
TOTALS	**A:** 2,284 **B:** 451 **C:** 544	**0**	**A:** 486,462 **B:** 95,987 **C:** 115,829	**150**	**0**

Resource Savings Assumptions

Annual Natural Gas Savings	**A:** 457 m^3 **B:** 90 m^3 **C:** 109 m^3

Assumptions and inputs:

- Average water inlet temperature: 14.5 ^oC (58 ^oF)[69]
- Average food service water heater set point temperature: 63 ^oC (145 ^oF)[70]
- Water heater thermal efficiency: 0.78[71]
- Percentage of water used that is hot: 69%[72]

Annual gas savings calculated as follows:

$$Savings = Ws * Phot * 8.33 * (T_{out} - T_{in}) * \frac{1}{Eff} * 10^{-6} * 27.8$$

Witnesses: A. Mandyam
P. Squires

Where:

Ws = Water savings (gallons)
Phot = Percentage of water used that is hot
T_{out} = Water heater set point temperature (^{o}F)
T_{in} = Water inlet temperature (^{o}F)
Eff = Water heater thermal efficiency
8.33 = Energy content of water (Btu/gallon/^{o}F)
10^{-6} = Factor to convert Btu to MMBtu
27.8 = Factor to convert MMBtu to m^3

Gas savings were determined to be 60% over base equipment:

$$Percent\ Savings = \frac{\left(G_{base} - G_{eff}\right)}{G_{base}}$$

Where:

Full service restaurant:
G_{eff} = Annual natural gas use with efficient equipment, 305 m^3
G_{base} = Annual natural gas use with base equipment, 761 m^3

Limited service restaurant:
G_{eff} = Annual natural gas use with efficient equipment, 60 m^3
G_{base} = Annual natural gas use with base equipment, 150 m^3

Other:
G_{eff} = Annual natural gas use with efficient equipment, 73 m^3
G_{base} = Annual natural gas use with base equipment, 181 m^3

Annual Electricity Savings	**0 kWh**
N/A	
Annual Water Savings	**A:** 97,292 L **B:** 19,197 L **C:** 23,166 L

Assumptions and inputs:

- The study by Energy Profiles Ltd cited above measured average daily use for each facility examined before and after a 3.0 GPM nozzle was replaced with a 1.24 GPM nozzle. The difference in average usage time by facility, before and after replacement was tested by Navigant Consulting and found to be not statistically significant. Additionally, the same study reports that its findings suggest no difference in the duration of use between a 0.64 GPM nozzle and a 3.0 GPM nozzle. Given these results, Navigant Consulting has assumed that duration of use will be identical before and after replacement.
- From the Energy Profiles Ltd. study cited above, the following average durations of use were calculated:

  Full-service restaurant: 1.26 hours per day.

  Limited-service restaurant: 0.24 hours per day

  Other: 0.33 hours per day
- The average numbers of days of operation per year for each restaurant type were drawn from the Energy Profiles Ltd. report. They are:

  Full-service restaurant: 355 days per year.

  Limited-service restaurant: 365 days per year.

  Other: 320 days per year.

Annual water savings calculated as follows:

$$Savings = \left(Fl_{base} - Fl_{eff}\right) * 60 * Hr * Days$$

Where:

Fl_{base} = Flow rate of base equipment (GPM)

Fl_{eff} = Flow rate of efficient equipment (GPM)

60 = Minutes per hour

Hr = Hours used per day

Days = Days per year

Water savings were determined to be 60% over base equipment:

$$Percent\ Savings = \frac{\left(W_{base} - W_{eff}\right)}{W_{base}}$$

Where:

Full service restaurant:

W_{eff} = Annual water consumed with efficient equipment, 64,862 litres

Witnesses: A. Mandyam
P. Squires

W_{base}= Annual water consumed by showers with base equipment: 162,154 litres

Limited service restaurant:

W_{eff} = Annual water consumed with efficient equipment, 12,798 litres

W_{base}= Annual water consumed by showers with base equipment: 31,996 litres

Other:

W_{eff} = Annual water consumed with efficient equipment, 15,444 litres

W_{base}= Annual water consumed by showers with base equipment: 38,610 litres

Other Input Assumptions

Effective Useful Life (EUL)	**5 Years**
Studies conducted for the City of Calgary[73], the U.S. DOE's FEMP[74] and by Puget Sound Energy[75] all give EUL for this measure as five years.	
Base & Incremental Conservation Measure Equipment and O&M Costs	**150 $**
Equipment cost: $100 (Enbridge bulk price). Installation cost: $50 (Contracted price with third-party installer).	
Free Ridership	**0%**
Basis: Relatively new product probably only aware of one manufacturer (Bricor).	

[68] These bins are chosen based on empirical research conducted by Energy Profiles Ltd on behalf of Union Gas
Energy Profiles Ltd, *Deemed Savings for (Low Flow) Pre-Rinse Spray Nozzles*, January 2009

[69] [1] A simple average of Toronto inlet temperature, cited in the following as personal communication with City of Toronto Works Dept.
VEIC, *Comments on Navigant's Draft Gas Measure Characterizations*, March 2009, and the average inlet water temperatures found in four jurisdictions examined as part of the following study: Energy Profiles Ltd, *Deemed Savings for (Low Flow) Pre-Rinse Spray Nozzles*, January 2009

[170] Average of temperatures found in a survey of restaurants in four Ontario municipalities.
Energy Profiles Ltd, *Deemed Savings for (Low Flow) Pre-Rinse Spray Nozzles*, January 2009

[171] Minimum thermal efficiency for compliance with ASHRAE 90.1 standard.

[72] [1] Average of ratio found in a survey of restaurants in four Ontario municipalities.
Energy Profiles Ltd, *Deemed Savings for (Low Flow) Pre-Rinse Spray Nozzles*, January 2009

[73] [1] Ibid.

[74] [1] U.S. DOE, Federal Energy Management Program, *How to Buy a Low-Flow Pre-Rinse Spray Valve*
http://www1.eere.energy.gov/femp/pdfs/prerinsenozzle.pdf

[75] [1] Quantec *Comprehensive Assessment of Demand-Side Resource Potentials (2008-2027)* Prepared for Puget Sound Energy

1.25 GAL/MIN LOW-FLOW SHOWERHEAD (PER SUITE)

Commercial Building Retrofit (Installed) – Multi-Residential

Efficient Technology & Equipment Description
Low-flow showerhead 1.25 gal/min.
Base Technology & Equipment Description
Average existing stock (see below).

Resource Savings Assumptions

Natural Gas	**84 m3**	**2.6 +**
Based on Navigant savings calculation adjusted to account for 1.25 gpm replacement unit and percentage of showers taken with efficient unit in Multi- Residential setting (92%) compared to 76% in Low Rise residential as per Summit Blue, Resource Savings in selected Residential DSM Programs, June 2008		
Water	**14,333 L**	**2.6 +**
Based on Navigant savings calculation adjusted to account for 1.25 gpm replacement and percentage of showers taken with efficient unit in Multi- Residential setting (92%) compared to 76% in Low Rise residential as per Summit Blue, Resource Savings in selected Residential DSM Programs, June 2008.		
Electricity	**n/a kWh**	

Other Input Assumptions

Equipment Life	**10 years**
Low flow showerheads have an estimated service life of 10 years as recommended by Navigant and approved in EB 2008-0384 & 0385 / EB 2009-0154.	
Incremental Cost (Contractor Install)	**$12.50**
As per utility program costs.	
Free Ridership	**10 %**
As per EB 2008-00384 & 0385 / EB 2009-0154.	

1.5 GAL/MIN LOW-FLOW SHOWERHEAD (PER SUITE)

Commercial Building Retrofit (Installed) – Multi-Residential

Efficient Technology & Equipment Description
Low-flow showerhead 1.5 gal/min.
Base Technology & Equipment Description
Average existing stock. (See below)

Resource Savings Assumptions

Natural Gas	**91 m3**	**3.6 + GPM**
Based on Navigant savings calculation adjusted to account for 1.5 gpm replacement unit and percentage of showers taken with efficient unit in Multi- Residential setting (92%) compared to 76% in Low Rise residential as per Summit Blue, Resource Savings in selected Residential DSM Programs, June 2008		
Water	**15,114 L**	**3.6 + GPM**
Based on Navigant savings calculation adjusted to account for 1.5 gpm replacement and percentage of showers taken with efficient unit in Multi- Residential setting (92%) compared to 76% in Low Rise residential as per Summit Blue, Resource Savings in selected Residential DSM Programs, June 2008.		
Electricity	**n/a kWh**	

Other Input Assumptions

Equipment Life	**10 Years**
Low flow showerheads have an estimated service life of 10 years as recommended by Navigant and approved in EB 2008-0384 & 0385 / EB 2009-0154.	
Incremental Cost (Contractor Install)	**$12.50**
As per utility program costs.	
Free Ridership	**10 %**
As per EB 2008-00384 & 0385 / EB 2009-0154.	

2.0 GAL/MIN LOW-FLOW SHOWERHEAD (PER SUITE)

Commercial Building Retrofit (Installed) – Multi-Residential

Efficient Technology & Equipment Description
Low-flow showerhead 2.0 gal/min.
Base Technology & Equipment Description
Average existing stock (see below).

Resource Savings Assumptions

Natural Gas	**40 m3**	**3.6 + GPM**
Based on Navigant savings calculation adjusted to account for 2.0 gpm replacement unit and percentage of showers taken with efficient unit in Multi- Residential setting (92%) compared to 76% in Low Rise residential as per Summit Blue, Resource Savings in selected Residential DSM Programs, June 2008		
Water	**7,351 L**	**3.6 + GPM**
Based on Navigant savings calculation adjusted to account for 2.0 gpm replacement and percentage of showers taken with efficient unit in Multi- Residential setting (92%) compared to 76% in Low Rise residential as per Summit Blue, Resource Savings in selected Residential DSM Programs, June 2008.		
Electricity	**n/a kWh**	

Other Input Assumptions

Equipment Life	**10 years**
Low flow showerheads have an estimated service life of 10 years. As per EB 2008 – 0384 & 0385 / EB 2009-0154.	
Incremental Cost (Contractor Install)	**$12.50**
As per utility program costs.	
Free Ridership	**10 %**
As per EB 2008 – 0384 & 0385 / EB 2009-0154.	

CUSTOM RESOURCE ACQUISITION TECHNOLOGIES

1. Measure Life Assumptions

	Commercial	***Industrial***	***Multi-residential***
Boiler Related			
Boilers – DHW	*25*[1]	*n/a*	*25*[1]
Boilers - Industrial Process	*n/a*	*20*	*n/a*
Boilers – Space Heating	*25*[1]	*25*[1]	*25*[1]
Combustion Tune-up	*5*	*5*	*n/a*
Controls	*15*	*15*	*15*
Steam pipe/tank insulation	*n/a*	*15*	*n/a*
Steam trap	*13*[3]	*13*[3]	*n/a*
Building Related			
Building envelope	*25*	*25*	*25*
Windows	*25*	*25*	*25*
Greenhouse curtains	*na*	*10*	*na*
Double Poly greenhouse	*n/a*	*5*	*n/a*
HVAC Related			
Dessicant cooling	*15*	*n/a*	*n/a*
Heat Recovery	*15*	*15*	*n/a*
Infra-red heaters	*10*	*10*	*n/a*
Make-up Air	*15*	*15*	*15*
Novitherm panels	*15*	*n/a*	*15*
Furnaces (gas-fired)	*18*[2]	*n/a*	*18*[2]
Re-Commissioning	***5***[4]	*n/a*	***5***[4]
Process Related			
Furnaces (gas-fired)	*n/a*	*18*[2]	*n/a*

Source: EB-2006-0021.
[1]Source: ASHRAE
[2]Source: ASHRAE updated in EB-2006-0021
[3]Source: Measure Life of Steam Traps Research Study, Enbridge Gas Distribution, November, 2007.
[4]Source: Measure Life For Retro-Commissioning And Continuous Commissioning Projects, Finn Projects,

Witnesses: A. Mandyam
P. Squires

This scenario assumes reduction of 2011 TRC equivalent of LI weatherization O&M

CURRENT

Operating Budget and TRC

		RA	MT	OH	
O&M (Baseline for 2011)	$26,708,068	$19,030,001.00	$ 1,600,000.00	$ 6,078,067.00	
O&M excldg LI Weatherization	$26,708,068	$ 17,752,201.00	$ 1,600,000.00	$ 6,078,067.00	
TRC (Baseline for 2011)	$211,142,603	$ 217,220,670.41	$ -	$ (6,078,067.00)	**O&M related to LI weatherization $1,277,800**
TRC excluding LI Weatherization		$ 216,615,688.41			**TRC related to LI weatherization $604,982**
	TRC per RA O&M	**$ 12.20**	**after LI-W adjustment**	$ 6,078,067.00	

SSM

	SSM - 2010	Prescribed O&M $	Consultative Offer April 20 O&M $
RA	$ 4,750,000	$ 17,752,201.00	$ 16,863,876.00
MT	$ 500,000	$ 1,600,000.00	$ 3,766,125.00
SSM Base	$ 5,250,000	$ 19,352,201.00	$ 20,630,001.00

Settlement Calculation

Operating Budget and TRC

	Settlement Summary	MT Breakdown	
A) Total O&M	$ 26,708,068.00	$ 1,536,125.00	Low Income Weatherization
B) MT O&M (settled value)	$ 3,766,125.00	$ 2,230,000.00	DWHR
C) Overheads	$ 6,078,067.00	$ 3,766,125.00	
D) RA O&M (A-B-C)	$ 16,863,876.00		
E) TRC per RA O&M (from above)	$ 12.20		
		$ 2,166,125.00	
F) Resulting TRC Gross value	$ 205,776,180.04	135%	
G) Resulting TRC traget (net of OH)	**$ 199,698,113.04**		

SSM

	SSM -2010	Consultative Last Counter 100% SSM Split	Consultative Last Counter 100% MT Split	Consultative Last Counter MT Split
RA	$ 4,750,000	4,000,000.00	650,000.00	DWHR
MT	$ 500,000	900,000.00	250,000.00	LI Weatherization
SSM Base	$ 5,250,000	4,900,000.00	900,000.00	Total

Summary:

1. 2011 Market Transformation (Scorecard measurement) budget increased to $3.76 Million.
1a. Low Income Weatherization program budget will be $1.53 Million.
1b. Drain Water Heat Recovery program budget will increase to $2.2 Million.

2. 2011 Resource Acquisition budget will be $16.86 Million and the Total Resource Acquistion required to meet the 100% target is $199.7 Million
2a. The Company will continue with the Low Income TAPS program in 2011 and look to offer enhanced TAPS where eligibility matches occur with the Low Income Weatherization program
2b. As per standard yearly DSM processes, the baseline 2011 100% TRC target (found on "2011 Target Derivation" worksheet) amount that is used to derive the TRC per Resource Acquisition Dollar ratio (currently 12.20 above) will be recalculated prior to Jan

3. For 2011 the Resource Acquisition 100% Target Shared Savings Mechanism (SSM) amount will be $4 Million and the 100% Market Transformation SSM amount will be $900 K.
3a. For the Market Transformation SSM components: The Drain Water Heat Recovery payout for meeting the 100% Target is $650 K. The Low Income Weatherization payout for meeting the 100% Target is $250 K.

4. For 2011 the Shared Savings Mechanism recalculated payment amounts based on the Company achieving specific pivot points is presented in the worksheet labelled "Settlement SSM Pivot Payments"

Notes:
1. Overall 2011 plan does not increase operating budget beyond current framework escalator
2. TRC per Resource Acquisition ratio (12.20) is retained between Current and Proposed Operating Budget and TRC
3. Proposed 2011 SSM split for 100% Target reflects Operating Cost ratio between Resource Acquisition and Market Transformation

Witnesses: A. Mandyam
P. Squires

Settlement 2011 SSM Payment vs Target Calculation

% of pivot	2010 RA SSM Payouts	Revised MT SSM Payouts	Revised Total Available SSM	Revised Increment Payments	Revised
25%	***$200,000***			**$800**	For achievement of between 0 and up to 25.0% of the annual target, the SSM payout shall equal $800 for each 1/10 of 1% of target achieved.
50%	***$600,000***			**$1,600**	For achievement of greater than 25.0% up to 50% of the annual target, the SSM payout shall equal $200,000 plus $1,600 for each 1/10 of 1% of target achieved.
75%	***$2,000,000***			**$5,600**	For achievement of greater than 50.0% up to 75.0% of the annual target, the SSM payout shall equal $600,000-plus $5,600 or each 1/10 of 1% of target achieved above 50.0%, and
100%	***$4,000,000***	$900,000	$4,900,000	**$8,000**	For achievement of greater than 75.0% of the annual target, the SSM payout shall equal $2,000,000 plus $8,000 for each 1/10 of 1% of target achieved above 75.0% to a maximum of the SSM annual cap.
125%	***$6,000,000***	$900,000	$6,900,000		Up to 125% of the annual target, a total payout of $6,000,000.
over 125% (Note2)	***$8,100,000***	$900,000	$9,000,000		In excess of 125% of the annual target, a total that is capped at no more than $8,100,000 for 2007. The parties agree that the annual 'cap' of $8.1 million will increase annually by the Ontario CPI as determined in October of the preceding year.

Notes:

1. Proposed 2011 Resource Acquisition SSM payouts are set based on settled 100% of Target SSM value

2. 2010 over 125% Resource Acquisition SSM cap will be adjusted for October, 2010 CPI value. This is as per the 2006 Generic Hearing decision

Cap + CPI Calculation

	$8,100,000
1.73%	$8,240,130
1.05%	$8,326,651
1.82%	$8,478,196

Witnesses: A. Mandyam
P. Squires