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May 21, 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. – 2010 DSM Input Assumptions Update

In accordance with Chapter 5 of the EB-2006-0021 Decision with Reasons, dated August 25, 2006, please find attached an updated package of DSM measure assumptions for application to the 2010 program year. The list includes assumptions for new measures not previously submitted to the Board and updates to measure assumptions based on changes in program delivery.

The assumption updates were jointly developed for the Board's consideration and approval by Enbridge Gas Distribution Inc. ("EGDI" or the "Company") and Union Gas (jointly referred to as the "utilities"). In preparing the submission, the utilities reviewed plans for new programs and changes to delivery of existing programs, information that was not available when the 2010 DSM plan was submitted in May of 2009. The utilities also consulted with their respective Evaluation Audit Committees (EACs).

Approval of these new and updated measures for implementation in 2010 will enable Enbridge to respond to emerging market conditions in a timely manner and avoid lost opportunities in the marketplace. Also, by introducing new programs mid-year in 2010 the programs can then be in full delivery mode at the outset of the 2011 program year.

In January of this year, Enbridge initiated consultation with the Enbridge EAC on proposed new measures for 2010 and updates to 2010 measure assumptions based on changes in program delivery. Since then, the Company has held numerous meetings with the EAC and consulted on all measures included in this submission. Through these discussions, on May 13th, the Company gained the full consensus support of the EAC for all input assumptions included in this submission.

This submission consists of two parts. The first is an Assumption Table. For ease of reference the Table includes all measure assumptions applicable to EGD 2010 programs, both new assumptions which are the subject of this submission as well as measure assumptions previously approved for 2010 in EB 2009-0154. The Assumption Table includes notes indicating new measures, changes to measure assumptions and the basis for the change. The second document contains the Substantiation Documents for all new and updated 2010 measures on the Assumption Table.

At your earliest convenience, we ask that the Board consider and approve the Updated 2010 Input Assumptions in order for Enbridge to implement these changes in 2010 DSM program delivery.

Sincerely,

Norm Ryckman

Enbridge Gas Distribution

DSM Input Assumptions for 2010 Program Year

as per EB 2009-0154

indicates new program

indicates update based on change in program

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 2010 Program Year

as per EB 2009-0154

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	(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%	
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%	

Enbridge Gas Distribution

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	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
	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%	
43	Weatherization	No Weatherization	weather	1,134.0	165	-	23	$2,284.00	0%	
	COMMERCIAL NEW BUILDING CONSTRUCTION									
44	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
45	Energy Star Dishwasher - Undercounter - High Temperature	Non- Energy Star Dishwasher		801	3,754	112,795	10	($13.00)	40%	New measure

Enbridge Gas Distribution

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	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
46	Energy Star Dishwasher - Undercounter - Low Temperature	Non- Energy Star Dishwasher		326	559	45,891	10	($13.00)	40%	New measure
47	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
48	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
49	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
50	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
51	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

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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)	
52	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
53	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
54	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
55	Condensing Gas Water Heater 100 gals	Storage Tank Water Heater	base	332			13	$2,230.00	5%	
56	Condensing Gas Water Heater 500 gals	Storage Tank Water Heater	base	873			13	$2,230.00	5%	
57	Condensing Gas Water Heater 1000 gals	Storage Tank Water Heater	base	1,551			13	$2,230.00	5%	
58	Rooftop Unit (2 stage roof top unit)	Single stage rooftop unit	weather	255	-	-	15	$375.00	5%	
59	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%	
60	Infrared Heaters (0 - 75,000BTUH)	Regular Unit Heater	weather	0.015 m3/BTUH	245	-	20	$0.0122 BTUH/hr	33%	
61	Infrared Heaters (76,000 - 150,000 BTUH)	Regular Unit Heater	weather	0.015 m3/BTUH	559	-	20	$0.0122 BTUH/hr	33%	

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	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
62	Infrared Heaters (151,000 0 - 300,000 BTUH)	Regular Unit Heater	weather	0.015 m3/BTUH	870	-	20	$0.0122 BTUH/hr	33%	
63	Demand Control Kitchen Ventilation (0 - 4999 CFM)	Ventilation without DCKV	weather	4,801	13,521	-	15	$10,000.00	5%	
64	Demand Control Kitchen Ventilation (5000 - 9999 CFM)	Ventilation without DCKV	weather	11,486	30,901	-	15	$15,000.00	5%	
65	Demand Control Kitchen Ventilation (10000 - 15000 CFM)	Ventilation without DCKV	weather	18,924	49,102	-	15	$20,000.00	5%	
66	Energy Recovery Ventilators (ERV) savings vary by sector	Ventilation without ERV	weather	1.75-4.89 / CFM	-	-	20	$3.00/CFM	5%	
67	Heat Recovery Ventilator (HRV) - savings vary by sector	Ventilation without HRV	weather	1.62-4.55 / CFM	-	-	20	$3.40/CFM	5%	
68	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%	
69	Destratification Fans	No destratification fans	weather	0.56/ft^2	(-)0.0034/ft^2	-	15	$7,021.00	10%	
70	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%	
71	Pre-Rinse Spray Nozzle (1.24 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	190	-	36,484	5	$60	12.4%	
72	Pre-Rinse Spray Nozzle (1.24 GPM) (Other)	standard pre-rinse spray nozzle (3.0 GPM)	base	200	-	38,383	5	$60	12.4%	
73	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%	
74	Pre-Rinse Spray Nozzle (0.64 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	339	-	66,400	5	$88	0%	
75	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									
76	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
77	Energy Star Dishwasher - Undercounter - High Temperature	Non- Energy Star Dishwasher		801	3,754	112,795	10	($13.00)	40%	New Measure

Enbridge Gas Distribution

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	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
78	Energy Star Dishwasher - Undercounter - Low Temperature	Non- Energy Star Dishwasher		326	559	45,891	10	($13.00)	40%	New Measure
79	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
80	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
81	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
82	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
83	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
84	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
85	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
86	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
87	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
88	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
89	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
90	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%	

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	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
91	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%	
92	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%	
93	Faucet Aerator (kitchen, installed, 1.5 GPM)	Average existing stock	base	16	-	5,377	10	$2	10%	
94	Faucet Aerator (kitchen, installed, 1.0 GPM)	Average existing stock	base	24	-	8,072	10	$2	10%	
95	Faucet Aerator (bathroom, installed, 1.5 GPM)	Average existing stock	base	4	-	1,382	10	$2	10%	
96	Faucet Aerator (bathroom, installed, 1.0 GPM)	Average existing stock	base	7	-	2,371	10	$1.50	10%	
97	High Efficiency Condensing Furnace (AFUE 96)	High Efficiency Furnace (AFUE 90)		1.7/kBtu/hr			18	8.4/kBtu/hr	17.5%	
98	Low-Flow Showerhead (Per unit, distributed, 1.5 GPM)	Average existing stock	base	33	-	5,228	10	$4	10%	
99	Low-Flow Showerhead (Per unit, distributed, 1.25 GPM)	Average existing stock	base	45	-	8,824	10	$4	10%	
100	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%	
101	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.
102	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%	
103	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%	
104	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%	
105	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.
106	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%	
107	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%	
108	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.
109	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%	
110	Pre-Rinse Spray Nozzle (1.24 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	190	-	36,484	5	$60	12.2%	

Enbridge Gas Distribution

DSM Input Assumptions for 2010 Program Year

as per EB 2009-0154

indicates new program

indicates update based on change in program

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)	
111	Pre-Rinse Spray Nozzle (1.24 GPM) (Other)	standard pre-rinse spray nozzle (3.0 GPM)	base	200	-	38,383	5	$60	12.4%	
112	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%	
113	Pre-Rinse Spray Nozzle (0.64 GPM) (Limited)	standard pre-rinse spray nozzle (3.0 GPM)	base	339	-	66,400	5	$88	0%	
114	Pre-Rinse Spray Nozzle (0.64 GPM) (Other)	standard pre-rinse spray nozzle (3.0 GPM)	base	318	-	62,200	5	$88	0%	
115	Programmable Thermostats (Warehouse, Recreation, Agriculture, Industrial)	Standard thermostat	weather	538	266	-	15	$110	20%	
116	Programmable Thermostats (Multi family, food service)	Standard thermostat	weather	223	156	-	15	$110	20%	
117	Programmable Thermostats (Office, Information & Culture, Educational services)	Standard thermostat	weather	211	112		15	$110	20%	
118	Programmable Thermostats (Retail, hotel/motel)	Standard thermostat	weather	82	63		15	$110	20%	
119	Rooftop Unit	Standard Rooftop Unit	weather	255	-	-	15	$375.00	5%	
120	Tankless Water Heater 100 USG/day	84% Thermal Efficiency	base	154	-	-	18	-$1,102.00	2%	
121	Enhanced Furnace (continuous)	Standard PSC motor	weather	-2.7 kBtu/hr	22.7kBtu/hr	-	15	$960.00	10%	
122	Enhanced Furnace (Non-continuous)	Standard PSC motor	weather	-0.4 kBtu/hr	4.8kBtu/hr		15	$960.00	10%	
123	Heat Recovery Ventilator (HRV)-savings vary by sector	Ventilation without HRV	weather	1.75-4.90 / CFM	-	-	20	$3.40/CFM	5%	
124	Energy Recovery Ventilators (ERV)-savings vary by sector	Ventilation without ERV	weather	1.84-5.14 m3/CFM	-	-	20	$3.00/CFM	5%	
125	Condensing Boilers	Non-condensing Boiler (76% estimated seasonal efficiency)	base	0.0104 m3/BTUH	-	-	25	$12.00/$10^3$ BTUH	5%	
126	Infrared Heaters (0 - 75,000 BTUH)	Unit Heater	weather	0.015 m3/BTUH	245	-	20	$0.0122/$10^3$ BTUH/hr	33%	
127	Infrared Heaters (76,000 - 150,000 BTUH)	Unit Heater	weather	0.015 m3/BTUH	559	-	20	$0.0122/$10^3$ BTUH/hr	33%	
128	Infrared Heaters (151,000 - 300,000 BTUH)	Unit Heater	weather	0.015 m3/BTUH	870	-	20	$0.0122/$10^3$ BTUH/hr	33%	
129	Demand Control Kitchen Ventilation (0 - 49,999 CFM)	Ventilation without DCKV	weather	4,801	13,521	-	15	$10,000.00	5%	

Enbridge Gas Distribution

DSM Input Assumptions for 2010 Program Year

as per EB 2009-0154

indicates new program

indicates update based on change in program

Item #	Efficient Equipment & Technologies	Base Equipment & Technologies	Load Type	Resource Savings Assumptions: Natural Gas	Electricity	Water	Equipment Life	Incremental Cost	Free Ridership	Reference
				m3	kWh	L	Years	$	%	
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	
130	Demand Control Kitchen Ventilation (5000 - 9999 CFM)	Ventilation without DCKV	weather	11,486	30,901	-	15	$15,000.00	5%	
131	Demand Control Kitchen Ventilation (10000 - 15000 CFM)	Ventilation without DCKV	weather	18,924	49,102	-	15	$20,000.00	5%	
132	Air Curtains (Single Door)		weather	667	172	-	15	$1,650.00	5%	
133	Air Curtains (Double Door)		weather	1,529	1,023	-	15	$2,500.00	5%	
134	Destratification Fans	No destratification fans	weather	0.56 / ft^2	(-)0.0034 / ft^2	-	15	$7,021.00	10%	
135	CEE Qualified Energy Efficient Washers	Conventional top loading washers.	base	117	396	58,121	11	$600.00	10%	
136	Prescriptive School Boilers (Elementary)	Space Heating, Hydronic Boiler with Comb. Eff. Of 80%-82%.	base	10,830	-	-	25	$8,646.00	12%	
137	Prescriptive School Boilers (Secondary)	Space Heating, Hydronic Boiler with Comb. Eff. Of 80%-82%.	base	43,859	-	-	25	$14,470.00	12%	
138	Energy Efficient Fryers	Standard fryer	base	913	0	-	12	$2,648.00		
139	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%	
140	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%	
141	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%	
142	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%	

	Enbridge Gas Distribution										
	DSM Input Assumptions for 2010 Program Year										
		as per EB 2009-0154									
		indicates new program									
		indicates update based on change in program									
				Resource Savings Assumptions							
Item #	**Efficient Equipment & Technologies**	**Base Equipment & Technologies**	**Load Type**	**Natural Gas**	**Electricity**	**Water**	**Equipment Life**	**Incremental Cost**	**Free Ridership**		**Reference**
				m3	**kWh**	**L**	**Years**	**$**	**%**		
	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)		
	COMMERCIAL/INDUSTRIAL CUSTOM PROJECTS										
143	Custom Projects			Actual	Actual	Actual	Actual	Actual			
	Agriculture								40%		
	Industrial								50%		
	Commercial								12%		
	Multi-Residential								20%		
	New construction								26%		
	OTHER MEASURES										
144	CFL (13W)	60W Incandescent	n/a	0	45	0	8	$0.00	24%		
145	CFL (23W)	75W Incandescent	n/a	0	49.7	0	8	$0.00	24%		

Substantiation Sheets for 2010 UPDATE to Input Assumptions

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RESIDENTIAL NEW CONSTRUCTION

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

[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 behaviour 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

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.[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

[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

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.

	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]

[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

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).	
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%.	

[20] Fireplace Retailer survey within Union Gas franchise territory by LeapFrog Energy in Oct-Nov 2007

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

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 during the non-heating season.

	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

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

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

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 lbs — 260,000 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

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:

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

Where:

Ws = Water savings (gallons)
Phot = Percentage of water used that is hot
T_{out} = Water heater set point temperature (^oF)
T_{in} = Water inlet temperature (^oF)
Eff = Water heater thermal efficiency
8.33 = Energy content of water (Btu/gallon/^oF)
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:

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

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

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.	