



**2007 Annual Report, CDM Third Tranche Funding, Halton
Hills Hydro – RP-2004-0203\EB-2005-0374**

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1. Introduction

Halton Hills Hydro (HHH) developed a multi-pronged plan for CDM that expected energy savings from residential, commercial and industrial customer classes as well as from HHH's system operations. HHH submitted our Demand Side Management Program on December 7, 2004. Education was given a priority in HHH's CDM plan in order to encourage and foster a conservation culture among customers.

With the majority of the customer base being residential historically, HHH expects a significant impact to the utility as new commercial/industrial properties move into Halton Hills. Finding innovative solutions to the new demands that will be placed on HHH's distribution system will continue to be key.

The learning around the cost effectiveness of various energy conservation and demand management initiatives will assist HHH in achieving our goal of a 5% reduction in energy usage.

1.1. Discount Rate

The discount rate used in all the Net Present Value (NPV) calculations used in the TRC analysis is 7.63%. This discount rate was determined using 50% of the rate of return and 50% of the debt rate for 2007. This level of discount rate ensures that there will be no change to the 50:50 ratio of debt to equity required of HHH.

2. Evaluation of the CDM Plan

HHH's CDM Plan was evaluated by following the OEB Total Resource Cost (TRC) Guide of October 14, 2005 as updated. A TRC analysis was done for each initiative and then the results were summarized for each initiative in the required formats for Appendices A, B and C. These Appendices have been provided in Sections 6.1, 6.2 and 6.3, respectively.

2.1. 2007 TRC Results at the Portfolio Level

Overall TRC results at the Portfolio level have been provided in Appendix A, attached as Section 6.1 to this report.

The overall portfolio TRC Benefit to Cost ratio for all of HHH's Third Tranche CDM initiatives for 2007 was 1.76 including Net TRC Benefits of \$74,484.



3. Discussions of Programs

An overview of HHH's 2007 CDM initiatives has been provided below along with the associated CDM Budget expenditures and TRC Results. A summary of the TRC results by initiative can also be found in Sections 6.2, Appendix B – Discussion of the Program and 6.3, Appendix C – Program and Portfolio Totals. An overview of each initiative including a description of the actions taken has been provided below.

3.1. Residential

3.1.1. Residential Customer Conservation Education

Overview

The Residential Customer Conservation Education program has the primary role of encouraging a conservation culture in HHH's customer base. During 2007, the primary educational initiative funded by HHH was the Halton Learning Foundation's energy conservation program for Halton schools. HHH also contributed to the Acton Agricultural Centre to help raise the profile of the initiatives undertaken to increase the energy efficiency of this building. The external costs incurred for CDM reporting have also been included in Residential Customer Conservation and Education.

CDM Budget Expenditures

During 2007, HHH spent \$26,434 on Residential Customer Conservation Education initiatives.

The Halton Learning Foundation received a payment of \$4,356. The foundation works with over 76,000 students and in collaboration with other regional, municipal, conservation and environmental organizations aims to significantly reduce the use of electrical energy throughout the region by a minimum of 6%. With the addition of smart meters and continued advances in Building Automation Systems, the foundation is able to have an even greater impact in reducing electricity consumption and is able to measure that impact more accurately and more quickly. The program incorporates a comprehensive and effective array of resources and training involving school board staff from the Facilities and Curriculum departments as well as the environmental Management Team representing all employee groups and students. HHH also contributed \$5,000 to the Acton Agricultural Centre to help raise the profile of the initiatives undertaken to increase the energy efficiency of this building. The remaining costs reflect external costs incurred for CDM reporting.



TRC Results

There were no TRC Benefits associated with this initiative in 2007, so only the costs have been reported.

3.1.2. Customer Coupons

Overview

In 2007, the program again involved providing CFLs to customers visiting Home Hardware stores in order to raise awareness about energy efficient options and promote a conservation culture in Ontario.

Description of Actions Taken

In 2007, a total of \$2,884 was spent on this program including a refund from a previous year. A total of 861 CFLs were given away through Home Hardware. Total costs for this initiative included \$2,265 for CFLs and \$2,860 for advertisements in two local newspapers - the Independent & Free Press and the New Tanner.

TRC Results

The Appliance Survey had positive TRC results with a TRC Benefit to Cost ratio of 4.28 and Net TRC Benefits of \$14,467.

3.2. Commercial

3.2.1. System Loss Reduction – Municipal Lighting Retrofits

Overview

HHH funded lighting retrofits at five municipal sites in the Town of Halton Hills. These included the Town Hall, Mold Masters Sportsplex, Georgetown Memorial Arena, Georgetown Indoor Pool, and the Acton Library.

Description of Actions Taken

A total of 1,315 lights were upgraded to more efficient technology at the five facilities. The TRC was completed using the OEB measures for the majority of the replacements. However, the OEB measures list did not have data for a few of the technologies. Any replacements that did not have a listing in the OEB measures list used the next most



conservative value (e.g. if there was a replacement for 23 W but no measure provided, then the OEB savings for a 26W unit were used). All the lights upgraded were at the end of their equipment life.

TRC Results

The TRC Benefit to Cost ratio for the Municipal Lighting Retrofits for 2007 was 2.09 with Net TRC Benefits of \$66,841.

3.2.2. System Loss Reduction – HHH Lighting Retrofits

Overview

The HHH building was retrofitted with energy efficient lighting as described below.

Description of Actions Taken

A total of 276 lights were upgraded to more efficient technology at the HHH location. The TRC was completed using the OEB measures for the majority of the replacements. However, the OEB measures list did not have data for a few of the technologies. Any replacements that did not have a listing in the OEB measures list used the next most conservative value (e.g. if there was a replacement for 23 W but no measure provided, then the OEB savings for a 26W unit were used). All the lights upgraded were at the end of their equipment life.

TRC Results

The TRC Benefit to Cost ratio for the HHH Lighting Retrofit for 2007 was 2.25 and Net TRC Benefits were \$13,928.

3.2.3. Boiler Upgrade

Overview

In 2006, HHH converted the electric powered HVAC system for our head office to gas powered heating, air conditioning and make-up air units. This change displaced all electricity consumption for the old units.

Description of Actions Taken

In 2007, HHH received a rebate of \$2,799 related to this project.



TRC Results

There were no TRC Benefits associated with this initiative in 2007, so only the costs have been reported.

3.2.4. Load Shifting – ZEBRA Battery Pilot

Overview

As described in Section 2.1, Ontario needs to develop technologies that reduce the peak requirements or help to shift load requirements to off-peak periods. In response to this need, HHH investigated the use of automated technology to shift load requirements to off-peak using batteries. The ZEBRA (zero-emission battery research activity) batteries have a sodium-nickel-chloride composition which makes them non-hazardous, non-corrosive, safe to operate, relatively quick to charge and discharge and tolerant to temperature extremes. Once spent, these batteries can be recycled in steel making furnaces where they are melted, and used as raw material for new nickel, chrome and iron. Copper is reclaimed from the melt and sold, while the remaining materials, including ceramics and salts are used for road construction materials.

This pilot project aims to store electricity and discharge it during times of peak demand. The batteries are charged during off-peak hours when electricity demand and prices are low and then discharged during the day, when demand and prices for power are high. The system is connected to software that will continuously calculate the best and most cost-efficient times to charge and discharge the battery units in future.

This prototype projects uses only five batteries with a total output of 100 kilowatt hours but could be scaled up to multiple megawatt hours. Local distributors can use the energy storage capabilities to purchase lower-cost power over night and deliver it to our customers during peak hours when the price is high. Generators, including wind and solar, could help smooth their delivery to the market by storing the energy produced during off-peak hours until the next peak cycle. Across all sectors, energy could also be stored to be available for emergencies removing the need to rely on small back-up diesel generators.

The ZEBRA battery is extremely efficient delivering over 90% of the stored energy as output, depending on how the battery is being used. The cycle life is better than 1,000 cycles. The battery is tolerant of short circuits and typical cell failure is a short circuit that does not cause a complete failure of the battery due to the independent nature of the 216 cells in each battery. This battery is safer than sodium sulfur cells and made of low cost material.



In addition to HHH CDM support, this pilot project has received funding from the LDC Tomorrow Fund, and Scientific Research and Experimental Development. With the assistance of all of these funding partners, HHH is exploring the economic feasibility of reducing Ontario's peak load through the use of battery technology. The Electric Power Research Institute based in Palo Alto, California has provided funding to investigate the use of this technology for responding to solely economic triggers to charge and discharge the batteries.

Description of Actions Taken

Five 20 kW batteries were installed during 2006 at a total cost of \$509,468. CDM expenditures accounted for \$175,000 of this cost. The TRC was calculated and included in the report of 2006 CDM expenditures.

During 2007, HHH rented the batteries for the load shifting project from SouthWestern Energy Inc (SWE). SWE is a wholly owned affiliate of HHH and provides competitive market services and solutions. In addition, there were some additional controls added to the system. Total expenditures in 2007 were \$26,903.

TRC Results

The TRC was completed and reported in 2006, so only the costs have been reported.

4. Lessons Learned

4.1. Residential

The Ontario Power Authority (OPA) has taken on the role of providing many of the educational aspects required to generate a conservation culture in Ontario. However, there are still local educational needs related to CDM that HHH should continue to deliver. Continuing to assist the Halton Learning Foundation and to work with local small businesses in order to generate energy savings benefits all of HHH's customers.

4.2. Commercial

There are significant lead times required for most commercial or municipal initiatives. With a concerted effort, HHH was able to get a number of these initiatives completed in the timelines for the Third Tranche.



5. Conclusion

In 2007, the actual expenditures since program inception compared to budget have been shown in Table 1 below. As of the end of 2007, 100% of the total budget has been spent on CDM initiatives.

Table 1: CDM Budget and Expenditures – 2007 Life-to-Date

Program	Budget Amount	Expenditures to Dec 31 2007
Load Shifting	\$200,000	\$229,903
Smart Metering	\$50,000	\$24,479
System Loss Reduction	\$275,000	\$217,496
Water Heater Load Control	\$80,000	\$89,056
C/I Energy Audits	\$90,000	\$48,648
Customer Education	\$20,000	\$105,555
TOTAL	\$715,000	\$715,137 100.0%

In addition to helping customers save energy and reduce their demand, HHH has provided educational information that will help to create a conservation culture in Ontario and invested in creating new and innovative solutions to the electricity problems faced by Ontario.

Overall program performance has exceeded our initial objectives in terms of the types of projects we planned to initiate and the annual energy reduction from installed measures equates to a 0.6% reduction in energy usage and a life cycle reduction of 5.4%, exceeding our target of 5% after the third year of CDM program offerings.



6. Appendices

6.1. Appendix A: Evaluation of the HHH 2007 CDM Plan

Appendix A - Evaluation of the HHH 2007 CDM Plan

Highlighted boxes are to be completed manually, white boxes are linked to Appendix C and will be brought forward automatically.

	⁵ Cumulative Totals Life-to-date	Total for 2007	Residential	Commercial	Institutional	Industrial	Agricultural	LDC System	⁴ Smart Meters	Other #1	Other #2
Net TRC value (\$):	\$ 227,069	\$ 74,484	\$ (9,083)	\$ 83,567	\$ -	\$ -	\$ -	\$ -		\$ -	\$ -
Benefit to cost ratio:	1.23	1.76	0.68	2.20	0.00	0.00	0.00	0.00		0.00	0.00
Number of participants or units delivered:	67,481	19,866	19,861	5							
Lifecycle (kWh) Savings:	27,687,415	5,735,742	3,758,400	1,977,342	0	0	0	0		0	0
Report Year Total kWh saved (kWh)	3,095,282	1,342,772	939,600	403,172	0	0	0	0		0	0
Total peak demand saved (kW)	238	87	0	87	0	0	0	0		0	0
Total kWh saved as a percentage of total kWh delivered (%):	0.60%	0.29%	0.20%	0.09%							
Peak kW saved as a percentage of LDC peak kW load (%):		0.09%	0.00%	0.09%							
¹ Report Year Gross C&DM expenditures (\$)	\$ 715,137	\$ 180,497	\$ 26,434	\$ 154,063	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
² Expenditures per kWh saved (\$/kWh):	0.03	\$ 0.03	\$ 0.01	\$ 0.08	\$ -	\$ -	\$ -	\$ -		\$ -	\$ -
³ Expenditures per kW saved (\$/kW):	3,010.63	\$ 2,085.76	\$ -	\$ 1,780.30	\$ -	\$ -	\$ -	\$ -		\$ -	\$ -
Utility discount rate (%):	7.63										



6.2. Appendix B: Discussion of the Programs

6.2.1. Residential

6.2.1.1. Residential Customer Conservation Education (2 pages)

Appendix B - Discussion of the Program

Residential Customer Conservation Education

A. **Name of the Program:** RESIDENTIAL - Customer Conservation Education

Description of the program (including intent, design, delivery, partnerships and evaluation):

The Residential Customer Conservation Education program has the primary role of encouraging a conservation culture in HHH's customer base. During 2007, several educational initiatives were funded by HHH including the Halton Learning Foundation's energy conservation program for Halton schools and the Acton Agricultural Centre. The external costs incurred for CDM reporting have also been included in Residential Customer Conservation and Education.

Measure(s):	Measure 1	Measure 2 (if applicable)	Measure 3 (if applicable)
Base case technology:			
Efficient technology:			
Number of participants or units delivered for reporting year:	19000		
Measure life (years):			
Number of Participants or units delivered life to date	19,000		

B. TRC Results:	Reporting Year	Life-to-date TRC Results:
¹ TRC Benefits (\$):	\$ -	\$ -
² TRC Costs (\$):		
Utility program cost (excluding incentives):	\$ 23,550.00	\$ 63,585.00
Incremental Measure Costs (Equipment Costs)	\$ -	\$ -
Total TRC costs:	\$ 23,550.00	\$ 63,585.00
Net TRC (in year CDN \$):	-\$ 23,550.00	-\$ 63,585.00
Benefit to Cost Ratio (TRC Benefits/TRC Costs):	\$ -	\$ -

C. **Results:** (one or more category may apply) **Cumulative Results:**

Conservation Programs:			Cumulative Lifecycle	Cumulative Annual Savings
Demand savings (kW):	Summer			
	Winter			
	lifecycle	in year		
Energy saved (kWh):				
Other resources saved :				
Natural Gas (m3):				
Other (specify):				
Demand Management Programs:				
Controlled load (kW)				
Energy shifted On-peak to Mid-peak (kWh):				
Energy shifted On-peak to Off-peak (kWh):				
Energy shifted Mid-peak to Off-peak (kWh):				
Demand Response Programs:				
Dispatchable load (kW):				
Peak hours dispatched in year (hours):				
Power Factor Correction Programs:				
Amount of KVar installed (KVar):				
Distribution system power factor at beginning of year (%):				
Distribution system power factor at end of year (%):				
Line Loss Reduction Programs:				
Peak load savings (kW):				



Appendix B: Residential Customer Conservation Education (page 2)

	<i>lifecycle</i>	<i>in year</i>	
<i>Energy savings (kWh):</i>			
<u>Distributed Generation and Load Displacement Programs:</u>			
<i>Amount of DG installed (kW):</i>			
<i>Energy generated (kWh):</i>			
<i>Peak energy generated (kWh):</i>			
<i>Fuel type:</i>			
<u>Other Programs (specify):</u>			
<i>Metric (specify):</i>			
<hr/>			
D. <u>Actual Program Costs:</u>		<u>Reporting Year</u>	<u>Cumulative Life to Date</u>
<i>Utility direct costs (\$):</i>	<i>Incremental capital:</i>	\$ -	\$ -
	<i>Incremental O&M:</i>	\$ 23,550.00	\$ 63,585.00
	<i>Incentive:</i>	\$ -	\$ -
	<i>Total:</i>	\$ 23,550.00	\$ 63,585.00
<i>Utility indirect costs (\$):</i>	<i>Incremental capital:</i>	\$ -	\$ -
	<i>Incremental O&M:</i>	\$ -	\$ -
	<i>Total:</i>	\$ -	\$ -

E. Assumptions & Comments:

This program is for educational initiatives and there are no TRC benefits. These costs are included in Appendix A as HHH expenditure for 2006.



6.2.1.2. Customer Coupons (2 pages)

Appendix B - Discussion of the Program

Customer Coupon

A. **Name of the Program:** RESIDENTIAL - Customer Coupon - Appliance Survey

Description of the program (including intent, design, delivery, partnerships and evaluation):

In 2007, the program again involved giving CFLs to customers visiting Home Hardware stores. In addition, there was a refund on expenditures related to a previous year.

Measure(s):

	Measure 1	Measure 2 (if applicable)	Measure 3 (if applicable)
Base case technology:	Incandescent Light		
Efficient technology:	15W CFL		
Number of participants or units delivered for reporting year:	861		
Measure life (years):	4		
Number of Participants or units delivered life to date	861		

B. TRC Results:	Reporting Year	Life-to-date TRC Results:
¹ TRC Benefits (\$):	\$ 18,876.66	\$ 33,254.33
² TRC Costs (\$):		
Utility program cost (excluding incentives):	\$ 2,860.00	\$ 6,783.00
Incremental Measure Costs (Equipment Costs)	\$ 1,549.80	\$ 2,737.80
Total TRC costs:	\$ 4,409.80	\$ 9,520.80
Net TRC (in year CDN \$):	\$ 14,466.86	\$ 23,733.53
Benefit to Cost Ratio (TRC Benefits/TRC Costs):	\$ 4.28	\$ 3.49

C. **Results:** (one or more category may apply) **Cumulative Results:**

Conservation Programs:

	Summer		Winter	
	lifecycle	in year	Cumulative Lifecycle	Cumulative Annual Savings
Demand savings (kW):		0	0	
Energy saved (kWh):	3,758,400	939,600	4,034,016	1,008,504
Other resources saved :				
Natural Gas (m3):				
Other (specify):				

Demand Management Programs:

Controlled load (kW)		
Energy shifted On-peak to Mid-peak (kWh):		
Energy shifted On-peak to Off-peak (kWh):		
Energy shifted Mid-peak to Off-peak (kWh):		

Demand Response Programs:

Dispatchable load (kW):		
Peak hours dispatched in year (hours):		

Power Factor Correction Programs:

Amount of KVar installed (KVar):		
Distribution system power factor at beginning of year (%):		
Distribution system power factor at end of year (%):		

Line Loss Reduction Programs:

Peak load savings (kW):		
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Appendix B: Customer Coupons (page 2)

	<i>lifecycle</i>	<i>in year</i>
<i>Energy savings (kWh):</i>		
<u>Distributed Generation and Load Displacement Programs:</u>		
<i>Amount of DG installed (kW):</i>		
<i>Energy generated (kWh):</i>		
<i>Peak energy generated (kWh):</i>		
<i>Fuel type:</i>		
<u>Other Programs (specify):</u>		
<i>Metric (specify):</i>		
<hr/>		
D. <u>Actual Program Costs:</u>		Reporting Year
<i>Utility direct costs (\$):</i>		Cumulative Life to Date
<i>Incremental capital:</i>	\$	-
<i>Incremental O&M:</i>	\$	619.00
<i>Incentive:</i>	\$	2,265.00
<i>Total:</i>	\$	2,884.00
<i>Incremental capital:</i>	\$	-
<i>Incremental O&M:</i>	\$	-
<i>Total:</i>	\$	-
<i>Incremental capital:</i>	\$	-
<i>Incremental O&M:</i>	\$	-
<i>Total:</i>	\$	-

E. Assumptions & Comments:

The appliance surveys were completed to gain information to support future CDM services for our residential customers. The CFL provided a reward for completing this survey and generated benefits in terms of kWh savings as well.



6.2.2. Commercial

6.2.2.1. System Loss Reduction – Municipal Lighting Retrofits (2 pages)

Appendix B - Discussion of the Program

System Loss Reductions - Municipal Lighting Retrofits

A. **Name of the Program:** COMMERCIAL - System Loss Reductions: Municipal Lighting Retrofits

Description of the program (including intent, design, delivery, partnerships and evaluation):

HHH funded lighting retrofits at 5 municipal sites in the Town of Halton Hills. The buildings included the Town Hall, Mold Masers Sportsplex, Georgetown Memorial Arena, Georgetown Indoor Pool, and the Acton Library.

Measure(s):

	Measure 1	Measure 2 (if applicable)	Measure 3 (if applicable)
<i>Base case technology:</i>			
<i>Efficient technology:</i>	1-T8/2-T8/4-T8	13 W CFLs/15 W CFLs/26 W CFLs	26 W Flood/250 W Metal Halide/3 W Exit
<i>Number of participants or units delivered for reporting year:</i>	25/265/683	159/104/12	16/24/27
<i>Measure life (years):</i>	5	2.5/2/2.5	5/4/25
<i>Number of Participants or units delivered life to date</i>	973	275	67

	<u>Reporting Year</u>	<u>Life-to-date TRC Results:</u>
¹ TRC Benefits (\$):	\$ 127,905.78	\$ 151,200.63
² TRC Costs (\$):		
Utility program cost (excluding incentives):	\$ -	\$ 5,008.00
Incremental Measure Costs (Equipment Costs)	\$ 61,065.00	\$ 69,437.70
Total TRC costs:	\$ 61,065.00	\$ 74,445.70
<u>Net TRC (in year CDN \$):</u>	<u>\$ 66,840.78</u>	<u>\$ 76,754.93</u>
Benefit to Cost Ratio (TRC Benefits/TRC Costs):	\$ 2.09	\$ 2.03

C. **Results:** (one or more category may apply) **Cumulative Results:**

Conservation Programs:

	Summer	Winter	Cumulative Lifecycle	Cumulative Annual Savings
Demand savings (kW):	72		90,231	
Energy saved (kWh):	1,639,680	335,202	1,990,673	405,401
Other resources saved :				
Natural Gas (m3):				
Other (specify):				

Demand Management Programs:

Controlled load (kW)		
Energy shifted On-peak to Mid-peak (kWh):		
Energy shifted On-peak to Off-peak (kWh):		
Energy shifted Mid-peak to Off-peak (kWh):		

Demand Response Programs:

Dispatchable load (kW):		
Peak hours dispatched in year (hours):		

Power Factor Correction Programs:

Amount of KVar installed (KVar):		
Distribution system power factor at beginning of year (%):		
Distribution system power factor at end of year (%):		

Line Loss Reduction Programs:

Peak load savings (kW):		
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Appendix B: System Loss Reduction – Municipal Lighting Retrofits (page 2)

	<i>lifecycle</i>	<i>in year</i>	
<i>Energy savings (kWh):</i>			
<u>Distributed Generation and Load Displacement Programs:</u>			
<i>Amount of DG installed (kW):</i>			
<i>Energy generated (kWh):</i>			
<i>Peak energy generated (kWh):</i>			
<i>Fuel type:</i>			
<u>Other Programs (specify):</u>			
<i>Metric (specify):</i>			
<hr/>			
D. <u>Actual Program Costs:</u>		Reporting Year	Cumulative Life to Date
<i>Utility direct costs (\$):</i>	<i>Incremental capital:</i>	\$ -	\$ 3,739.00
	<i>Incremental O&M:</i>	\$ 67,868.00	\$ 171,096.00
	<i>Incentive:</i>	\$ -	\$ 9,303.00
	<i>Total:</i>	\$ 67,868.00	\$ 184,138.00
<i>Utility indirect costs (\$):</i>	<i>Incremental capital:</i>	\$ -	\$ -
	<i>Incremental O&M:</i>	\$ -	\$ -
	<i>Total:</i>	\$ -	\$ -

E. Assumptions & Comments:

The TRC was completed using the correct technology information for the majority of the replacements. However, the OEB measures list did not have data for a few of the technologies. Any replacements that did not have a listing in the OEB measures list used the next most conservative value (e.g. if there was a replacement for 23 W but no measure provided, then the OEB savings for a 26W unit were used).



6.2.2.2. System Loss Reduction – HHH Lighting Retrofits (2 pages)

Appendix B - Discussion of the Program

System Loss Reductions - HHH Lighting Retrofits

A. **Name of the Program:** COMMERCIAL - System Loss Reductions: HHH Retrofits

Description of the program (including intent, design, delivery, partnerships and evaluation):

The HHH building was retrofitted with energy efficient lighting as documented below.

Measure(s):	Measure 1	Measure 2 (if applicable)	Measure 3 (if applicable)
Base case technology:			
Efficient technology:	1 T8/ 2 T8/ 4 T8	15 W/26 W	
Number of participants or units delivered for reporting year:	113/107/39	5/12	
Measure life (years):	5		
Number of Participants or units delivered life to date	259	17	

B. TRC Results:	Reporting Year	Life-to-date TRC Results:
¹ TRC Benefits (\$):	\$ 25,100.31	\$ 25,100.31
² TRC Costs (\$):		
Utility program cost (excluding incentives):	\$ -	\$ -
Incremental Measure Costs (Equipment Costs)	\$ 11,172.60	\$ 11,172.60
Total TRC costs:	\$ 11,172.60	\$ 11,172.60
Net TRC (in year CDN \$):	\$ 13,927.71	\$ 13,927.71
Benefit to Cost Ratio (TRC Benefits/TRC Costs):	\$ 2.25	\$ 2.25

C. **Results:** (one or more category may apply) **Cumulative Results:**

Conservation Programs:		Summer	14.5377	14.5377
Demand savings (kW):		Winter		
		lifecycle	in year	Cumulative Lifecycle
Energy saved (kWh):	337,662		67,970	Cumulative Annual Savings
Other resources saved :				
Natural Gas (m3):				
Other (specify):				

Demand Management Programs:			
Controlled load (kW)			
Energy shifted On-peak to Mid-peak (kWh):			
Energy shifted On-peak to Off-peak (kWh):			
Energy shifted Mid-peak to Off-peak (kWh):			

Demand Response Programs:			
Dispatchable load (kW):			
Peak hours dispatched in year (hours):			

Power Factor Correction Programs:			
Amount of KVar installed (KVar):			
Distribution system power factor at beginning of year (%):			
Distribution system power factor at end of year (%):			

Line Loss Reduction Programs:			
Peak load savings (kW):			



Appendix B: System Loss Reduction – HHH Lighting Retrofits (page 2)

		lifecycle	in year
<i>Energy savings (kWh):</i>			
<u>Distributed Generation and Load Displacement Programs:</u>			
<i>Amount of DG installed (kW):</i>			
<i>Energy generated (kWh):</i>			
<i>Peak energy generated (kWh):</i>			
<i>Fuel type:</i>			
<u>Other Programs (specify):</u>			
<i>Metric (specify):</i>			
<hr/>			
D. <u>Actual Program Costs:</u>		Reporting Year	Cumulative Life to Date
<i>Utility direct costs (\$):</i>	<i>Incremental capital:</i>	\$ 3,739.00	\$ 3,739.00
	<i>Incremental O&M:</i>	\$ 30,352.00	\$ 30,352.00
	<i>Incentive:</i>	\$ -	\$ -
	<i>Total:</i>	\$ 34,091.00	\$ 34,091.00
 <i>Utility indirect costs (\$):</i>	 <i>Incremental capital:</i>	 \$ -	 \$ -
	<i>Incremental O&M:</i>	\$ -	\$ -
	<i>Total:</i>	\$ -	\$ -

E. Assumptions & Comments:

The TRC was completed using the correct technology information for the majority of the replacements. However, the OEB measures list did not have data for a few of the technologies. Any replacements that did not have a listing in the OEB measures list used the next most conservative value (e.g. if there was a replacement for 23 W but no measure provided, then the OEB savings for a 26W unit were used).



6.2.2.3. System Loss Reduction – Boiler Upgrades (2 pages)

Appendix B - Discussion of the Program

System Loss Reductions - Boiler Upgrades

A. **Name of the Program:** COMMERCIAL - System Loss Reductions - Boiler Upgrades

Description of the program (including intent, design, delivery, partnerships and evaluation):

In 2007, there was a rebate reallocated to this 2006 project. HHH converted the electric powered HVAC system for our head office to gas powered heating, air conditioning and make-up air units. This change displaced all electricity consumption for the old units.

Measure(s):	Measure 1	Measure 2 (if applicable)	Measure 3 (if applicable)
Base case technology:			
Efficient technology:	Electric HVAC System	Gas Make-up Air and A/C	
Number of participants or units delivered for reporting year:	0	0	
Measure life (years):	20	20	
Number of Participants or units delivered life to date	1	1	

B. TRC Results:	Reporting Year	Life-to-date TRC Results:
¹ TRC Benefits (\$):	\$ -	\$ 364,209.06
² TRC Costs (\$):		
Utility program cost (excluding incentives):	\$ -	\$ -
Incremental Measure Costs (Equipment Costs):	-\$ 2,799.00	\$ 86,973.81
Total TRC costs:	-\$ 2,799.00	\$ 86,973.81
Net TRC (in year CDN \$):	\$ -	\$ 277,235.25
Benefit to Cost Ratio (TRC Benefits/TRC Costs):	\$ -	\$ 4.19

C. **Results:** (one or more category may apply) **Cumulative Results:**

Conservation Programs:				
Demand savings (kW):	Summer			
	Winter			
	lifecycle	in year	Cumulative Lifecycle	Cumulative Annual Savings
Energy saved (kWh):			8,438,860	16,877,720
Other resources saved :				
Natural Gas (m3):				
Other (specify):				
Demand Management Programs:				
Controlled load (kW)				
Energy shifted On-peak to Mid-peak (kWh):				
Energy shifted On-peak to Off-peak (kWh):				
Energy shifted Mid-peak to Off-peak (kWh):				
Demand Response Programs:				
Dispatchable load (kW):				
Peak hours dispatched in year (hours):				
Power Factor Correction Programs:				
Amount of KVar installed (KVar):				
Distribution system power factor at beginning of year (%):				
Distribution system power factor at end of year (%):				
Line Loss Reduction Programs:				
Peak load savings (kW):				



Appendix B: System Loss Reduction – Boiler Upgrades (page 2)

	lifecycle	in year	
Energy savings (kWh):			
<u>Distributed Generation and Load Displacement Programs:</u>			
Amount of DG installed (kW):			
Energy generated (kWh):			
Peak energy generated (kWh):			
Fuel type:			
<u>Other Programs (specify):</u>			
Metric (specify):			
<hr/>			
D. Actual Program Costs:		Reporting Year	Cumulative Life to Date
Utility direct costs (\$):	Incremental capital:	-\$ 2,799.00	\$ 96,949.00
	Incremental O&M:	\$ -	\$ -
	Incentive:	\$ -	\$ -
	Total:	-\$ 2,799.00	\$ 96,949.00
Utility indirect costs (\$):	Incremental capital:	\$ -	\$ -
	Incremental O&M:	\$ -	\$ -
	Total:	\$ -	\$ -

E. Assumptions & Comments:



6.2.2.4. Load Shifting – ZEBRA Battery Pilot (2 pages)

Appendix B - Discussion of the Program

Load Shifting - ZEBRA Battery Pilot

A. **Name of the Program:** COMMERCIAL - Load Shifting - ZEBRA Battery Pilot

Description of the program (including intent, design, delivery, partnerships and evaluation):

The TRC was completed for the 2006 report, the 2007 expenditures were operating costs as reported below. As described in the 2006 report, this pilot project aims to store electricity and discharge it during times of peak demand. Based on technology that uses advanced sodium-nickel-chloride batteries that are charged during off-peak hours when electricity demand and prices are low. The batteries are then discharged during the day, when demand and prices for power are high. The system is connected to software that will continuously calculate the best and most cost-efficient times to charge and discharge the batter units in future. The ZEBRA Battery pilot uses off-the-shelf technologies including 5 environmentally friendly batteries each with a capability of 20 kWh to shift load from peak to offpeak times. Funding parnters included LDC Tomorrow Fund, the OPA Technology Fund and Scientific Research and Experimental Development. With the assistance of all of these funding partners, HHH is exploring the economic feasibility of reducing OntarioOs peak load through the use of battery technology.

Measure(s):	Measure 1	Measure 2 (if applicable)	Measure 3 (if applicable)
Base case technology:			
Efficient technology:	ZEBRA Battery Pilot		
Number of participants or units delivered for reporting year:	0		
Measure life (years):	10		
Number of Participants or units delivered life to date	1		

B. TRC Results:	Reporting Year	Life-to-date TRC Results:
¹ TRC Benefits (\$):	\$ -	\$ 23,022.63
² TRC Costs (\$):		
Utility program cost (excluding incentives):	\$ -	\$ -
Incremental Measure Costs (Equipment Costs)	\$ -	\$ 509,468.00
Total TRC costs:	\$ -	\$ 509,468.00
Net TRC (in year CDN \$):	\$ -	\$ 486,445.37
Benefit to Cost Ratio (TRC Benefits/TRC Costs):	#DIV/0!	\$ 0.05

C. Results: (one or more category may apply)	Cumulative Results:			
Conservation Programs:				
Demand savings (kW):	Summer		19	
	Winter			
	lifecycle	in year	Cumulative Lifecycle	Cumulative Annual Savings
Energy saved (kWh):	0	0	0	0
Other resources saved :				
Natural Gas (m3):				
Other (specify):				
Demand Management Programs:				
Controlled load (kW)				
Energy shifted On-peak to Mid-peak (kWh):				
Energy shifted On-peak to Off-peak (kWh):				7500
Energy shifted Mid-peak to Off-peak (kWh):				
Demand Response Programs:				
Dispatchable load (kW):				
Peak hours dispatched in year (hours):				
Power Factor Correction Programs:				
Amount of KVar installed (KVar):				
Distribution system power factor at beginning of year (%):				
Distribution system power factor at end of year (%):				
Line Loss Reduction Programs:				
Peak load savings (kW):				



Appendix B: Load Shifting – ZEBRA Battery Pilot (page 2)

	<i>lifecycle</i>	<i>in year</i>
<i>Energy savings (kWh):</i>		
Distributed Generation and Load Displacement Programs:		
<i>Amount of DG installed (kW):</i>		
<i>Energy generated (kWh):</i>		
<i>Peak energy generated (kWh):</i>		
<i>Fuel type:</i>		
Other Programs (Load Shifting):		
<i>Savings (\$/kWh/yr) obtained by shifting load</i>		\$ 242.00
<hr/>		
D. Actual Program Costs:	Reporting Year	Cumulative Life to Date
<i>Utility direct costs (\$):</i>		
<i>Incremental capital:</i>	\$ -	\$ 175,000.00
<i>Incremental O&M:</i>	\$ 54,903.00	\$ 54,903.00
<i>Incentive:</i>	\$ -	\$ -
<i>Total:</i>	\$ 54,903.00	\$ 229,903.00
 <i>Utility indirect costs (\$):</i>		
<i>Incremental capital:</i>	\$ -	\$ -
<i>Incremental O&M:</i>	\$ -	\$ -
<i>Total:</i>	\$ -	\$ -
<hr/>		
E. Assumptions & Comments:		
No changes of the TRC completed in 2006 required.		



6.3. Appendix C: HHH Program and Portfolio Totals (7 pages)

Appendix C - HHH Program and Portfolio Totals

Report Year: 2007

1. Residential Programs

List each Appendix B in the cells below; Insert additional rows as required.

Note: To ensure the integrity of the formulas, please insert the additional rows in the middle of the list below.

	TRC Benefits (PV)	TRC Costs (PV)	\$ Net TRC Benefits	Benefit/Cost Ratio	Report Year Total kWh Saved	Lifecycle (kWh) Savings	Total Peak Demand (kW) Saved	Report Year Gross C&DM Expenditures (\$)
Res. Customer Conservation Education	\$ -	\$ 23,550	\$ 23,550	0.00	0	0	0	\$ 23,550
Customer Coupons	\$ 18,877	\$ 4,410	\$ 14,467	4.28	\$ 939,600	\$ 3,758,400	\$ -	\$ 2,884
Name of Program C		\$ -	\$ -	0.00				
Name of Program D		\$ -	\$ -	0.00				
Name of Program E		\$ -	\$ -	0.00				
Name of Program F		\$ -	\$ -	0.00				
Name of Program G		\$ -	\$ -	0.00				
Name of Program H		\$ -	\$ -	0.00				
Name of Program I		\$ -	\$ -	0.00				
Name of Program J		\$ -	\$ -	0.00				
*Totals App. B - Residential	\$ 18,877	\$ 27,960	\$ 9,083	0.68	939,600	3,758,400	0	\$ 26,434
Residential Indirect Costs not attributable to any specific program								
Total Residential TRC Costs		\$ 27,960						
**Totals TRC - Residential	\$ 18,877	\$ 27,960	\$ 9,083	0.68				



Appendix C: HHH Program and Portfolio Totals (page 2)

2. Commercial Programs

List each Appendix B in the cells below; Insert additional rows as required.

Note: To ensure the integrity of the formulas, please insert the additional rows in the middle of the list below.

	TRC Benefits (PV)	TRC Costs (PV)	\$ Net TRC Benefits	Benefit/Cost Ratio	Report Year Total kWh Saved	Lifecycle (kWh) Savings	Total Peak Demand (kW) Saved	Report Year Gross C&DM Expenditures (\$)
System Loss - Municipal Lighting Retro.	\$ 127,906	\$ 61,065	\$ 66,841	2.09	335,202	1,639,680	72	\$ 67,868
System Loss - HHH Lighting Retrofits	\$ 25,100	\$ 11,173	\$ 13,928	2.25	67,970	337,662	15	\$ 34,091
System Loss - Boiler Upgrade	\$ -	-\$ 2,799	\$ 2,799	0.00	0	0	0	-\$ 2,799
Load Shifting - ZEBRA Battery Pilot	\$ -	\$ -	\$ -	0.00	0	0	0	\$ 54,903
Name of Program E			\$ -	0.00				
Name of Program F			\$ -	0.00				
Name of Program G			\$ -	0.00				
Name of Program H			\$ -	0.00				
Name of Program I			\$ -	0.00				
Name of Program J			\$ -	0.00				
*Totals App. B - Commercial	\$ 153,006	\$ 69,439	\$ 83,567	2.20	403,172	1,977,342	87	\$ 154,063
Commercial Indirect Costs not attributable to any specific program								
Total TRC Costs		\$ 69,439						
**Totals TRC - Commercial	\$ 153,006	\$ 69,439	\$ 83,567	2.20				



Appendix C: HHH Program and Portfolio Totals (page 3)

3. Institutional Programs

List each Appendix B in the cells below; Insert additional rows as required.

Note: To ensure the integrity of the formulas, please insert the additional rows in the middle of the list below

	TRC Benefits (PV)	TRC Costs (PV)	\$ Net TRC Benefits	Benefit/Cost Ratio	Report Year Total kWh Saved	Lifecycle (kWh) Savings	Total Peak Demand (kW) Saved	Report Year Gross C&DM Expenditures (\$)
Name of Program A			\$ -	0.00				
Name of Program B			\$ -	0.00				
Name of Program C			\$ -	0.00				
Name of Program D			\$ -	0.00				
Name of Program E			\$ -	0.00				
Name of Program C			\$ -	0.00				
Name of Program G			\$ -	0.00				
Name of Program H			\$ -	0.00				
Name of Program I			\$ -	0.00				
Name of Program J			\$ -	0.00				
*Totals App. B - Institutional	\$ -	\$ -	\$ -	0.00	0	0	0	\$ -
Institutional Indirect Costs not attributable to any specific program								
Total TRC Costs		\$ -						
**Totals TRC - Institutional	\$ -	\$ -	\$ -	0.00				



Appendix C: HHH Program and Portfolio Totals (page 4)

4. Industrial Programs

List each Appendix B in the cells below; Insert additional rows as required.

Note: To ensure the integrity of the formulas, please insert the additional rows in the middle of the list below.

	TRC Benefits (PV)	TRC Costs (PV)	\$ Net TRC Benefits	Benefit/Cost Ratio	Report Year Total kWh Saved	Lifecycle (kWh) Savings	Total Peak Demand (kW) Saved	Report Year Gross C&DM Expenditures (\$)
Name of Program A			\$ -	0.00				
Name of Program C			\$ -	0.00				
Name of Program C			\$ -	0.00				
Name of Program D			\$ -	0.00				
Name of Program E			\$ -	0.00				
Name of Program F			\$ -	0.00				
Name of Program G			\$ -	0.00				
Name of Program H			\$ -	0.00				
Name of Program I			\$ -	0.00				
Name of Program J			\$ -	0.00				
*Totals App. B - Industrial	\$ -	\$ -	\$ -	0.00	0	0	0	\$ -
Industrial Indirect Costs not attributable to any specific program								
Total TRC Costs		\$ -						
**Totals TRC - Industrial	\$ -	\$ -	\$ -	0.00				



Appendix C: HHH Program and Portfolio Totals (page 5)

5. Agricultural Programs

List each Appendix B in the cells below; Insert additional rows as required.

Note: To ensure the integrity of the formulas, please insert the additional rows in the middle of the list below

	TRC Benefits (PV)	TRC Costs (PV)	\$ Net TRC Benefits	Benefit/Cost Ratio	Report Year Total kWh Saved	Lifecycle (kWh) Savings	Total Peak Demand (kW) Saved	Report Year Gross C&DM Expenditures (\$)
Name of Program A			\$ -	0.00				
Name of Program C			\$ -	0.00				
Name of Program C			\$ -	0.00				
Name of Program D			\$ -	0.00				
Name of Program E			\$ -	0.00				
Name of Program F			\$ -	0.00				
Name of Program G			\$ -	0.00				
Name of Program H			\$ -	0.00				
Name of Program I			\$ -	0.00				
Name of Program J			\$ -	0.00				
*Totals App. B - Agricultural	\$ -	\$ -	\$ -	0.00	0	0	0	\$ -
Agricultural Indirect Costs not attributable to any specific program								
Total TRC Costs		\$ -						
**Totals TRC - Agricultural	\$ -	\$ -	\$ -	0.00				



Appendix C: HHH Program and Portfolio Totals (page 6)

6. LDC System Programs

List each Appendix B in the cells below; Insert additional rows as required.

Note: To ensure the integrity of the formulas, please insert the additional rows in the middle of the list below.

	TRC Benefits (PV)	TRC Costs (PV)	\$ Net TRC Benefits	Benefit/Cost Ratio	Report Year Total kWh Saved	Lifecycle (kWh) Savings	Total Peak Demand (kW) Saved	Report Year Gross C&DM Expenditures (\$)
Name of Program A			\$ -	0.00				
Name of Program B			\$ -	0.00				
Name of Program C			\$ -	0.00				
Name of Program D			\$ -	0.00				
Name of Program E			\$ -	0.00				
Name of Program F			\$ -	0.00				
Name of Program G			\$ -	0.00				
Name of Program H			\$ -	0.00				
Name of Program I			\$ -	0.00				
Name of Program C			\$ -	0.00				
*Totals App. B - LDC System	\$ -	\$ -	\$ -	0.00	0	0	0	\$ -
LDC System Indirect Costs not attributable to any specific program								
Total TRC Costs		\$ -						
**Totals TRC - LDC System	\$ -	\$ -	\$ -	0.00				




Appendix C: HHH Program and Portfolio Totals (page 7)

7. Smart Meters Program

Only spending information that was authorized under the 3rd tranche of MARR is required to be reported for Smart Meters.

Report Year Gross C&DM Expenditures (\$) 

LDC's CDM PORTFOLIO TOTALS

	TRC Benefits (PV)	TRC Costs (PV)	\$ Net TRC Benefits	Benefit/Cost Ratio	Report Year Total kWh Saved	Lifecycle (kWh) Savings	Total Peak Demand (kW) Saved	Report Year Gross C&DM Expenditures (\$)
*TOTALS FOR ALL APPENDIX B	\$ 171,883	\$ 97,398	\$ 74,484	1.76	1,342,772	5,735,742	87	\$ 180,497
Any <i>other</i> Indirect Costs not attributable to any specific program								
TOTAL ALL LDC COSTS		\$ 97,398						
**LDC' PORTFOLIO TRC	\$ 171,883	\$ 97,398	\$ 74,484	1.76				

* The savings and spending information from this row is to be carried forward to Appendix A.

** The TRC information from this row is to be carried forward to Appendix A.