

## **Waterloo North Hydro Inc.**

**RP-2004-0203**

### **Conservation and Demand Annual Report**

**March 2009**

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## **1. INTRODUCTION AND BACKGROUND**

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Waterloo North Hydro Inc. (WNH) is the local electricity distribution company providing electricity distribution services to 50,000 customers in the City of Waterloo, the Township of Wellesley and the Township of Woolwich. Our service territory is 672 square kilometres, consisting mostly of rural areas – 607 square kilometres of rural territory and 65 square kilometers of urban territory. However, only 20% of our customer base is in the rural and small villages outside the City of Waterloo.

In December of 2003, the Minister of Energy indicated the government's intention to permit Local Distribution Companies (LDCs) to apply to the Ontario Energy Board (OEB) for the next installment of their allowable return on equity beginning March 1, 2005. The approval by the OEB for this final installment or third tranche was on the condition that LDCs reinvest an amount equal to one year's incremental returns of their third tranche, in conservation and demand management activities. The Minister of Energy in a letter dated May 31, 2004, granted written approval to all distributors to apply to the Ontario Energy Board for approval to establish a deferral account to record costs incurred with respect to conservation and demand management activities.

The Minister's letter indicated that LDCs should pursue a broad range of programs that support the more efficient use of electricity in Ontario, including those that were discontinued on the opening of the electricity market, to reduce customers' overall energy demand and/or demand for purchased energy.

The letter also indicated that reasonable expenditures on the planning, delivery and evaluation of any of the following measures should be supported by the Ontario Energy Board:

- energy efficiency;
- behavioural and operational changes, including the application of benchmarking or "smart" control systems;
- load management measures which facilitate interruptible and dispatchable loads, dual fuel applications, thermal storage, and demand response; measures to encourage fuel switching which reduces the total system energy for a given end-use;

- programs and initiatives targeted to low income and other hard to reach consumers; and
- distributed energy options behind a customer's meter such as tri-generation, co-generation, ground source heat pumps, solar, wind, and biomass systems.

On October 5, 2004 the Board issued a procedural order (RP-2004-0203) setting out the process for how distributors may apply for approval of a Conservation and Demand Management Plan, and stipulating the filing requirements for a distributor's plan. Distributors were given the option of applying for interim or final approval of their plan.

This section outlines Waterloo North Hydro's conservation and demand management programs carried out between 2005 and 2007 in response to the Minister's Directive and the Procedural Order from the OEB.

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## OUR APPROACH

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Prior to the opening of the electricity market, Waterloo North Hydro had an Energy Services Group that provided advice to customers on energy conservation and demand side management. Under restructuring for the electricity market, this function was discontinued. Our water heaters were sold to an energy services company; some of our staff with expertise in this area retired and some were deployed elsewhere in the company.

Our approach to responding to the Minister's directive was to draw on the internal expertise, some outside expertise, discussion of programs with other utilities and information from various websites and sources listed by groups such as The Canadian Energy Efficiency Alliance. We have borrowed ideas from the experiences of B.C. Hydro, Manitoba Hydro and a few energy efficiency and geothermal websites in the United States.

We have put together a number of programs to touch on several customer sectors and address several of the objectives from the Minister's letter.

We found that programs involving outside agencies required quite an amount of work to lay the foundation for moving forward. As such, after we received approval for our CDM plans in March, 2005, the remainder of 2005 was a planning year for Waterloo North Hydro and many of the programs were implemented in 2006 and 2007.

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## CONSERVATION AND DEMAND MANAGEMENT PROGRAMS

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### 1. **Residential Energy Efficiency Project:**

The Residential Energy Efficiency Project (REEP) is a non-profit initiative of the Faculty of Environmental Studies at the University of Waterloo and the Elora Centre for Environmental Excellence. Evaluators are trained and certified in accordance to Natural Resources Canada standards. R.E.E.P. uses the *Energuide for Houses* system to conduct a comprehensive assessment of a home's energy efficiency and provide recommendations for improvement.

The audit involves examining the windows and doors, attic and wall insulation, foundation, and heating/ventilation system, as well as executing a scientific air leakage test.

This program is aimed at raising consumer awareness of the benefits of energy efficiency, such as energy-cost savings, improved home comfort and indoor air quality. It will also identify and prioritize energy efficiency upgrades, providing consumers the facts needed to make informed decisions about their home energy use. The program leverages an existing program that is well established in the area.

In REEP's report to WNH it was stated, "By supporting REEP, WNH is demonstrating a clear commitment to energy conservation and promoting a healthy environment in Waterloo Region."

**CDM Funds Spent:** **\$78,680**

**Measurable Results Available:** **No**

**Comments:** **WNH considers the REEP program to be educational in nature and has reported its costs as Program Costs in Appendix B.**

**In addition to kWh Savings, it has been reported that WNH customers have also reduced 385 tonnes of CO<sub>2</sub> emissions in 2006.**

2. **Energy Efficient Traffic Lights and Street Lighting**

The Region of Waterloo provides traffic lights at all signalized intersections throughout the Regional Municipality of Waterloo. New traffic light installations use LED lights to illuminate the vehicle and pedestrian signals, while older installations use incandescent light bulbs. The LED lights use significantly less electricity than incandescent bulbs and the LED lights last six to ten times longer. However, the LED lamps are substantially more expensive and can range up to \$150 per LED lamp compared to \$2 per incandescent bulb.

Waterloo North Hydro, along with Cambridge and North Dumfries Hydro and Kitchener-Wilmot Hydro, partially funded the replacement of incandescent bulbs with LED bulbs in the traffic lights throughout the Region.

This program will result in significant energy savings as the LED lights use 80 to 90% less electricity. It will also reduce maintenance costs as the LED bulbs last longer and are more visible.

<b>CDM Funds Spent:</b>	<b>\$100,000</b>
<b>Measurable Results Available:</b>	<b>Yes</b>
<b>Comments:</b>	<b>The project was completed in 2007. Installations resulted in approximately 7.6 million lifecycle kWh savings.</b>

2. **Energy Efficient Traffic Lights and Street Lighting - continued**

Several years ago, Waterloo North Hydro worked with the municipalities in our service area to replace old street lighting with energy efficient high-pressure sodium (HPS) streetlights. A number of streetlights were not replaced at the time in the rural areas and some villages of the townships in the service area. Waterloo North Hydro worked with the municipalities to fund the replacement of these old street light fixtures with newer, energy efficient HPS streetlights.

This program will result in energy savings, as the HPS streetlights are more efficient. This program will also reduce maintenance costs.

**CDM Funds Spent:** **\$50,491**

**Measurable Results Available:** **Yes**

**Comments:** **WNH had completed the installation of streetlights in 2007. Installations resulted in approximately 6.9 million lifecycle kWh savings.**

### **3. Loss Reduction on the Distribution System**

Waterloo North Hydro has installed technologies that will reduce losses on the distribution system. These technologies will include the deployment of capacitor banks, voltage conversion programs and upgrading of old transformers to newer low loss transformers.

All of these programs are aimed at energy efficiency of the distribution system, will help to reduce distribution system losses and will reduce the system demand. This in turn will help relieve growth strains on transmission network capacity and demand for generation capacity. These reductions will benefit all customers and will effect permanent changes that are not reliant on sustained changes in customer consumption.

**CDM Funds Spent:** **\$385,693**

**Measurable Results Available:** **Yes**

**Comments:** **Capacitor banks were installed in 2006. Installation resulted in approximately 48 million lifecycle kWh savings.**

**4. Smart Metering Pilot Project**

Waterloo North Hydro has completed its pilot project for metering replacements for single-phase customers less than 50 kW demand (mostly residential). The pilot involved approximately 500 locations retrofitted with Smart Meters. Installation of these smart meters occurred in 2007. Lessons learned from the pilot project will be applied when WNH commences its full-scale rollout of smart meters in 2009.

This project will support the Ministry of Energy commitment to deploy Smart Meters and is a technology that will enable behavioural changes in conservation and demand management. In accordance with OEB Instructions, TRC Benefit Calculations are not to be undertaken for Smart Meters.

**CDM Funds Spent:** **\$263,022**

**Measurable Results Available:** **No**

**Comments:** **Pilot Project completed in 2007. WNH will be commencing a full-scale rollout of smart meter installations upon receiving meters from the vendor which is currently expected in June 2009.**

## **5. Geothermal Energy Program**

About 5% of Waterloo North Hydro customers are rural customers without access to natural gas for their primary heating source. Approximately 20% of our customers use electricity for the primary fuel source for home heating and hot water heating, and a larger percentage use electricity for home air conditioning.

An alternative source is available in geothermal energy systems for heating and cooling of homes, as well as hot water heating. The technology has been used in commercial buildings and custom homes for many years, and the technology has developed to a point where it is quite feasible to heat and cool all sizes of homes. The hurdle for some homebuilders is that the initial investment of installing a geothermal system costs more than the installation of a traditional furnace. The savings in energy costs however will more than pay for the extra initial costs of the geothermal system.

Waterloo North Hydro believes that finding alternative energy sources is very important for our rural customers and customers on electric heating. We also see fuel switching to geothermal systems as a long term and more dependable form of conservation, than programs where we need to rely on customer awareness and self-discipline to conserve energy. Waterloo North Hydro invested seed money in 2006 into a local initiative that will promote the installation of geothermal systems for residential customers by funding the initial capital costs and then obtain repayment for the capital costs from the energy savings that the customer will be expected to see on their electricity bill.

Waterloo North Hydro matched the funds put into this initiative by a local geothermal energy company to allow the joint venture initiative to obtain support and funding from the financial institutions.

This initiative encouraged fuel switching from electricity as a heating and cooling source. Waterloo North Hydro sees this as a more permanent and sustainable reduction in demand on the electricity energy supply as well as being a form of distributed energy sources. Waterloo would also like to note that other types of fuel savings have occurred as a result of installation of these geothermal systems.



**5. Geothermal Energy Program - continued**

**CDM Funds Spent:** \$250,000

**Measurable Results Available:** Yes

**Comments:** The Joint Venture Project has resulted in Lifetime Energy Inc. formally launching their marketing and product offering in early 2006. Geothermal Installation Services were actively offered to customers at that time. Sales in 2006 resulted in lifetime cycle kWh savings of approximately 21 million and demand savings of 114 kW.

## 6. Energy Audits for Industrial, Commercial and Institutional Customers

Waterloo North Hydro (WNH) recognizes that we need to work with our customers to keep them competitive in business if we are to retain them as viable successful customers. Energy Audits for Industrial, Commercial and Institutional customers will help these customers to shift load from peak times and to find ways to conserve energy. WNH partnered with a local Energy Audit Services provider to deliver audits to our customers. Waterloo North Hydro will continue to investigate methods to promote to our customers the use of Energy Audits and the implementation of the recommendations from Energy Audits.

This program is aimed at consumer awareness and education at the business and institutional level. It should encourage behavioural and operational changes that will reduce demand and conserve energy. This program leveraged the expertise of a local, established services provider.

**CDM Funds Spent:**

**\$58,071**

**Measurable Results Available:**

**Yes**

**Comments:**

**Waterloo North Hydro presented the Cool Shops Program to customers in the Region of Waterloo in 2006. 279 Customers were audited, resulting in over 5,500 energy efficient products installed and approximately 3 million lifecycle kWh savings, 281 kW of demand savings and an annual reduction of CO<sub>2</sub> emissions of 284 tonnes.**

**7. Low Income Consumer Retrofit Program**

Waterloo North Hydro (WNH) has been a supporter of the Heat Bank in the Region of Waterloo. The Heat Bank is a service in its fourth year of operation, funded by the local hydro companies and administered through the Regional Social Services. The Heat Bank serves as a last source of support to purchase heat and energy for low-income households.

In the 2005 season, Waterloo North Hydro worked with the Regional Social Services to identify and implement energy efficiency programs for Heat Bank recipients. In 2007 WNH again worked with Regional Social Services on new programs for low-income consumers. This program provided compact fluorescent light bulbs.

This project was aimed at raising awareness of the benefits of energy efficiency and energy-cost savings for low-income consumers. The project leveraged the expertise of an existing program in the area for home audits as well as the knowledge of the Regional Social Services network.

**CDM Funds Spent :** **\$24,424**

**Measurable Results Available:** **Yes**

**Comments:** **In 2007 WNH worked with Regional Social Services to provide lighting upgrades for low-income consumers. The upgrades resulted in approximately 145,000 kWh per annum savings.**

**8. Energy Conservation Information for Consumers**

Waterloo North Hydro has updated its website that has to provide easier access to more information on energy efficiency and links to other conservation related websites.

Waterloo North Hydro has also invested in providing brochures educating and promoting energy efficiency to its customers.

**CDM Funds Spent: \$31,576**

**Measurable Results Available: No**

**Comments: Loss reductions from CDM activities related to this customer education program do not have quantifiable benefits. As the majority of the funds to date have been spent on brochures, measurable results are difficult to obtain.**

## 2. LESSONS LEARNED

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Waterloo North Hydro commenced many of its programs in 2006 and completed the balance of its programs prior to the third tranche spending deadline of September 30, 2007.

Waterloo North Hydro assesses its contribution towards the REEP program as a success, in terms of the social good. As mentioned above, REEP stated, “By supporting REEP, WNH is demonstrating a clear commitment to energy conservation and promoting a healthy environment in Waterloo Region.” The REEP Program also was a source of information to customers regarding the merits of the Geothermal Program that WNH has been involved with. WNH considers the REEP Program to be a success. The introduction of mandatory home audits in the recently announced Green Energy Act, 2009 demonstrates the continuing importance of home audits.

WNH assesses its Street Light Replacement Program, whereby it replaces older fixtures with new energy efficient high pressure sodium fixtures, to be valuable. This program has resulted in a Net TRC Benefit of approximately \$222,000 and approximately 6.9 million kWh in lifecycle savings. WNH recommends that where necessary, and with funding available, municipalities replace any existing incandescent fixtures with high pressure sodium fixtures. As LED street lights become readily available, WNH will evaluate the move to LED street lighting fixtures.

WNH has also assessed its involvement with the Region of Waterloo’s replacement of Traffic Light Incandescent Light Bulbs with LED Bulbs in 100 intersections as a successful venture. This program resulted in a Net TRC Benefit of approximately \$62,000 and approximately 7.6 million kWh in lifecycle savings. WNH recommends that projects of this nature be considered across the province with appropriate funding and incentive levels.

Installation of Capacitor Banks for the Loss Reduction Program on the Distribution System has yielded significant kWh lifecycle savings (approximately 48 million kWh) and a Net TRC Benefit of \$1,780,000. Support for switched capacitor banks would result in additional peak demand load reduction and additional energy savings.

WNH’s investment of seed monies in a geothermal energy initiative is in its early stage of operation. Installation of geothermal energy systems result in not only electricity savings, they also result in savings of other resources. Sales in 2006 resulted in a Net TRC Benefit of \$471,209, lifetime kWh savings of approximately 21 million and 114.31 kW of demand savings. Lifetime Energy has been successful in creating great interest for Contractors and New Dealers to offer this alternative energy source to its customers. It also has raised awareness to our customers in general. WNH does note though, that uptake of the on-bill financing opportunity was low as most customers either purchased the system outright or arranged their own financing.

The 279 Industrial, Commercial and Institutional Customers that undertook an educational energy services audit with the 'Cool Shops Program' also availed themselves of 708 free energy efficient products and purchased an additional 4,857 energy efficient products. WNH's customers had the highest uptake on product purchases of all cities that participated in this program. Reasons cited for this success include an excellent Cool Shops staff and greater visibility of WNH in the marketing, communications and media. Surveys were also taken of participating businesses and these lessons learned will be used in future audits. WNH is encouraged that the Ontario Power Authority (OPA) has introduced a similar program, the Power Savings Blitz Program.

WNH also successfully partnered with Regional Social Services to provide Lighting Upgrades to Low Income Consumers. WNH was pleased that this program resulted in energy savings (approximately 145,000 kWh per annum), raised awareness of the benefits of energy efficiency and energy-cost savings for low-income customers and provided the upgrades free of charge to those that may not have the available resources to perform the upgrades. The OEB has recognized the importance of conservation and demand management for low-income consumers in its recently released report "EB-2008-0150 Report of the Board, Low-Income Energy Assistance Plan", issued on March 10, 2009.

### **3. CONCLUSION**

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Waterloo North Hydro gained valuable experience and knowledge in administering its eight programs under the third tranche of MARR to apply in its future administering of its CDM programs.

Waterloo North Hydro has a Measurable Cumulative Net TRC value of \$2,931,045 with the execution of its CDM Programs.

WNH completed all of its MARR based third tranche programs prior to the Board mandated deadline of September 30, 2007 and also continues to participate in the OPA sponsored CDM Program Initiatives.

WNH welcomes that the OEB is reviewing all LDC's MARR based third tranche programs after the completion of all projects, in order to ascertain if any of the programs undertaken by LDCs may be appropriate on a province wide basis.

WNH submits that the OEB may wish to consider calculation of TRC benefits based on customers maintaining their energy efficient technology (i.e. replacing CFLs with CFLs) in order to help achieve the Ministry of Energy's target of 6.3 GW of demand savings by 2025.

# WATERLOO NORTH HYDRO INC.

## Appendix D - Total Life Evaluation of the CDM Plan

Table is to be completed manually by totalling the information from each year of activity

	<sup>5</sup> Cumulative Totals Life-to-date	Residential	<sup>6</sup> Low Income	Commercial	Institutional	Industrial	Agricultural	LDC System	<sup>4</sup> Smart Meters	Other #1	Other #2
<i>Net TRC value (\$):</i>	2,931,045		\$ 126,958.00	\$ 222,597.00	\$	\$	\$	\$ 1,780,322.35		801,168.00	\$
<i>Benefit to cost ratio:</i>	2.60		6.20	11.64				5.61		3.32	
<i>Number of participants or units delivered:</i>	44,590	43,000	1,245	279				1		65	
<i>Lifecycle (kWh) Savings:</i>	87,378,835		621,553	3,138,313				48,035,636		35,583,333	
<i>Total kWh saved (kWh):</i>	6,510,457		152,480	1,482,893				2,081,544		2,793,540	
<i>Total peak demand saved (kW):</i>	546		12	280				17		238	
<i>Total kWh saved as a percentage of total kWh delivered (%):</i>	0.23%		0.01%	0.05%				0.07%		0.10%	
<i>Peak kW saved as a percentage of LDC peak kW load (%):</i>	0.21%		0.00%	0.11%				0.01%		0.09%	
<sup>1</sup> <i>Gross C&amp;DM expenditures (\$):</i>	1,252,582	\$ 110,256.00	\$ 24,424.00	\$ 67,976.00	\$	\$	\$	\$ 385,963.00	\$ 263,022.00	\$ 400,941.00	\$
<sup>2</sup> <i>Expenditures per kWh saved (\$/kWh):</i>	0.19	\$ -	\$ 0.16	\$ 0.05	\$	\$	\$	\$ 0.19		\$ 0.14	\$
<sup>3</sup> <i>Expenditures per kW saved (\$/kW):</i>	2,292	\$ -	\$ 2,054.16	\$ 242.77	\$	\$	\$	\$ 22,703.71		\$ 1,687.75	\$
<i>Utility discount rate (%):</i>	6.50583%										

<sup>1</sup> Expenditures are reported on cumulative basis.

<sup>2</sup> Expenditures include all utility program costs (direct and indirect) for all programs which primarily generate energy savings.

<sup>3</sup> Expenditures include all utility program costs (direct and indirect) for all programs which primarily generate capacity savings.

<sup>4</sup> Please report spending related to 3rd tranche of MARR funding only. TRC calculations are not required for Smart Meters. Actual expenditures for the total third tranche period need to be reported.

<sup>5</sup> Includes total for the reporting year, plus prior years, if any (for example, 2008 CDM Annual report for third tranche will include 2007, 2006, 2005 and 2004 numbers, if any).

<sup>6</sup> Includes totals from Low Income programs that fall under both commercial and residential.